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BARRIERS TO, AND ENABLERS OF URBAN TREE PLANTING IN LOW-COST HOUSING AREAS: LESSONS FROM PARTICIPATORY LEARNING PROCESSES IN SOUTH AFRICA

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ABSTRACT

The recent pronouncement of low-cost housing areas as sustainable human settlements came with an expectation for their development in line with Sustainable Development Goal (SDG) 11. Unfortunately, the historical legacy and various socio-economic, socio-political, and socio-cultural dynamics characteristic of these areas have proven it challenging for them to conform to all requirements of urban sustainability, as evidenced in part by the virtual lack of greenspaces and urban trees.

Through a three-tier inquiry of urban tree planting in low-cost housing areas using inductive and deductive mixed methods approaches, the aim of this research was to investigate the barriers to, and enablers of, tree planting in low-cost housing areas, and explore participatory learning opportunities to address the challenges and enhance the enablers. In the first segment, a participatory urban forest governance conceptual framing lens was used to situate the various actors in the development of the low-cost housing area urban forest and the dynamics of their involvement in that regard. Inquiry focused on an overview of tree planting across South Africa using key informant interviews, observations and document analysis. Secondly, distribution of trees, and barriers and enablers of tree planting in selected low-cost housing areas in the Eastern Cape province using household surveys, observations, key informant interviews and document analysis were investigated. Finally, drawing on interventionist methodology and adoption of Cultural-Historical Activity Theory (CHAT), the third segment tested scenarios of tree planting in three different small towns through focus group discussions and knowledge-sharing awareness events about trees and tree planting using an activity systems approach.

Findings from the first segment ascertain the national Department of Environment, Forestry and Fisheries (DEFF) as the custodian of forestry, and by extension urban forestry in South Africa. Municipalities are tasked with implementing greening plans and strategies for public space planting, while private businesses collaborate with entities to contribute to tree-planting as part of their Corporate Social Responsibility (CSR). Civil society, including residents and Non-Governmental Organizations (NGOs) also contribute, especially for private space planting. However, there are currently very few initiatives implemented in low-cost housing areas. An assessment of ten tree planting initiatives revealed that the DEFF is the most common partner and stakeholder, and normally provides resources such as funding and trees. Most programs reported having undertaken community engagement before and during the tree planting. The general outcomes of these initiatives were centred on the survival rate of trees, job creation, and development of parks and gardens.

Findings from the first part of the second segment, conducted in eight small-medium sized towns in the Eastern Cape, revealed a general lack of trees along streets of both the newly developed and old low-cost housing areas. In the private spaces, most households (52 %) reported having at least one tree in their yard, with households in the older suburbs (60 %) reporting more trees than the newer ones (44 %). Most of these trees (66 %) had been planted as opposed to natural regeneration. Previous participation in urban

tree planting programs was low, but 75 % of residents expressed willingness to participate in the future. Municipal officials from these towns corroborated that they do not host tree planting events or initiatives, which was demonstrated by the limited incorporation of urban forestry and urban greening in municipal Integrated Development Plans (IDP).

In the second part of the second segment, three groupings of barriers and enablers into biophysical, social, and resources revealed that the most mentioned barriers for the private space were resource barriers. The most prominent barriers were limited space in people's yards, insufficient funds for tree purchases and associated resources, the lack of equipment, and damage to planted trees. Private space enablers of tree planting suggested include the availability of funds, allocation of space, and changes in attitudes towards trees. According to residents, the most prominent barriers to public space planting include the perceived incompetence of municipalities, limited space on the street, insufficient funds for tree planting programmes, damage to trees in public spaces, crime associated with street trees, and politics. Additionally, municipal officials reported that their efforts to plant trees were hindered by lack of communication and coordination between municipal departments. Residents suggested that enlisting the skills of residents for tree planting, engaging in education and awareness initiatives about trees and tree planting, and changing attitudes towards trees could enable tree planting. Municipal officials opined that education and awareness, revisions to and implementation of Environmental Management Plans, and inter-departmental collaborations and partnerships could improve the prospects for public space planting.

Drawing on key findings from the second segment, an intervention to involve communities in tree planting using a case study approach in three towns ensued. Here an activity systems analysis of participatory tree planting initiatives was used. Findings revealed an array of multi-activity systems with multiple and partially overlapping objectives related to tree planting. Residents demonstrated that, with support, they can champion urban tree planting for their suburbs. However, contradictions and tensions within and between various activity systems emerged, creating opportunities for the expansive transformation of an activity that was previously not a priority.

This study highlights the current distribution of power and resources in the governance system of the urban forest, ascertains the spatial heterogeneity of urban trees in areas of a similar socio-economic context, and provides lessons for best-practice in tree planting that involves multiple actors. It provides in-depth insights into what constrains tree planting, and highlights the importance of residents in the governance system of urban forests and how this can constrain or advance tree planting. Further research in participatory urban forest governance for a developing country, low-income context could utilize an expansive learning platform as this will provide first-hand experiences into learning what is not yet there, and provide communities with the opportunities to explore and devise localized solutions to the lack of trees in their residential areas.

Keywords: activity system; decision-making; low-cost housing areas; participation; tree planting; urban forest governance

DECLARATION

I, Nanamhla Gwedla, student number 609G1935, hereby declare that the thesis for Doctor of Philosophy (Environmental Science) entitled “Barriers to, and enablers of, urban tree planting in low-cost housing areas: lessons from participatory learning processes in South Africa” is my own original work and that all other sources used or quoted have been fully acknowledged and referenced. This thesis has not previously been submitted for assessment or completion of any postgraduate qualification to any other university or for another qualification.

Signature: _____

Date: _____

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NOTES ON NAME CHANGES AND ANONYMITY

Some names have changed since the beginning of this study. However, I have decided to retain the names that were in use when this study began, and any use of the new names refers to material produced or published after the name change. For example, the Department of Agriculture, Forestry and Fisheries was renamed to the Department of Environment, Forestry and Fisheries in 2019, and Grahamstown was renamed Makhanda in 2018. I have also concealed the identities of certain municipalities and towns. This was done as to not compromise the identities of municipal officials who participated in the study.

LIST OF ACRONYMS AND ABBREVIATIONS

ADC	Assumption Development Centre
ANC	African National Congress
BCRP	Baltimore City Department of Recreation & Parks
BNG	Breaking New Ground
BSSA	Botanical Society of South Africa
CBD	Central Business District
CBO	Community Based Organization
CDW	Community Development Worker
CHAT	Cultural Historical Activity Theory
COGTA	Department of Cooperative Governance and Traditional Affairs
CWP	Community Works Program
CSR	Corporate Social Responsibility
DAFF	Department of Agriculture, Forestry and Fisheries
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
DCR	Department of Conservation and Recreation
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DES	Department of Environmental Science
DHS	Department of Human Settlements
DoE	Department of Education
DoH	Department of Housing
DPWI	Department Of Public Works And Infrastructure
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
ECRDA	Eastern Cape Rural Development Agency
ECSECC	Eastern Cape Socio Economic Consultative Council
EDO	Education District Officer
EMA	Environmental Management Agency
EPWP	Expanded Public Works Program
ESWM	Environmental And Solid Waste Management
FAO	Food and Agriculture Organization
FIFA	Fédération Internationale De Football Association
FTFA	Food and Trees for Africa
GDLGH	Gauteng Department of Local Government and Housing
GGCP	Greening the Gateway Cities Program
GI	Green Infrastructure

IDP	Integrated Development Plan
IERM	Institute for Environment and Recreation Management
JCPZ	Johannesburg City Parks and Zoo
KIB	Keep Indianapolis Beautiful
KPA	Key Performance Area
LACC	Los Angeles Conservation Corps
MEA	Millennium Ecosystem Assessment
MTI	Million Trees Initiatives
MTLA	Million Trees Los Angeles
NDP	National Development Plan
NEMA	National Environmental Management Act
NGO	Non-Governmental Organization
NHW	Neighbourhood Watch
NPO	Non-Profit Organization
NTFP	Non-Timber Forest Product
NYRP	New York Restoration Project
ORTDM	Oliver Reginald Tambo District Municipality
PAR	Participatory Action Research
PGS	Public Green Spaces
PPR	Philadelphia Parks and Recreation
RDP	Reconstruction and Development Program
RSA	Republic of South Africa
SANBI	South African National Biodiversity Institute
SDG	Sustainable Development Goals
SGB	School Governing Body
SES	Social-Ecological Systems
STATS SA	Statistics South Africa
TEEB	The Economics of Ecosystems and Biodiversity
TPC	Total Plantable Cover
UDS	Urban Development Strategy
UFGF	Urban Forest Governance Framework
UGS	Urban Green Spaces
UN	United Nations
UN DESA	United Nations Department of Economic and Social Affairs
WTI	Worcester Tree Initiative

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DEDICATION

This thesis is dedicated to the memory of my late sister, **Pumza Gwedla**, who passed away on 16 September 2017, while I was collecting data. In her absence, I achieved what she observed and wished for everyday in her workplace. May her soul continue to rest in peace, *Jola, Mphankomo, Mpondomise, Qengeba, Somarhwarhwa, Phahlo, Thole lomthwakazi!*

&

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PART I

SETTING THE SCENE

Chapter 1

Background to South African low-cost housing areas



Sustainable Development Goal 11: By 2030, make cities and human settlements inclusive, safe, resilient and sustainable. (Source: UN-DESA, 2019).

1.1 Introduction

Urban green spaces and urban trees are important features of the green infrastructure (GI) of cities (Pauleit et al., 2017; Dorst et al., 2019). GI refers to an interconnected network of green space, including waterways, wetlands, woodlands, wildlife habitats, and other natural areas; greenways, parks and other conservation lands; working farms, ranches and forests; and wilderness and other open spaces that support native species, maintain natural ecological processes, sustain air and water resources and contribute to the health and quality of life for communities and people (Benedict and McMahon, 2006). The GI concept is based on the principle that nature and natural processes should be integrated into spatial planning and urban development to maintain and enhance ecosystem services delivery, and thus the ecological, sociological, and psychological benefits to human society (Mell, 2017). As vital components of GI, urban trees are important for environmental quality, quality of life in towns and cities, sustainable urban development (Duinker et al., 2015), and the resilience of cities.

Urban trees have in the past been planted for their aesthetic benefits, such as beautifying the streetscapes (Young, 2011). However, in recent years more of their benefits such as livelihood support (Shackleton et al., 2015), climate moderation (Ng et al., 2012a), and stimulating social cohesion (Schroeder, 2004) have been identified and appreciated (Grant, 2012). Urban forest research parallels broader efforts to better link ecosystem functions with human well-being through the identification of positive services provided by ecosystems (MEA, 2005; TEEB, 2011), resulting in goals related to a variety of ecosystem services (Seamans, 2013; Young, 2010). Of particular importance is the relationship between the benefits offered by urban trees and the Sustainable Development Goals (SDGs) as these goals relate to governments' commitments to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030 (Simon et al., 2016). Table 1.1 outlines the contribution of urban trees to meeting some of these SDGs, as presented by the FAO (2016).

Table 1.1: Contribution of urban forests and green spaces to SDGs (Source: FAO, 2016).

Sustainable Development Goal	Target	The role of urban forests and/green spaces
1 NO POVERTY 	1.5	Urban forests create employment, provide a resource for entrepreneurs, reduce the cost of urban infrastructure, provide ecosystem services for all citizens, improve the living environment and increase property values, ultimately boosting local green economies
2 ZERO HUNGER 	2.1 2.2 2.3 2.4	Urban forests are direct sources of food (e.g. fruits, seeds, leaves, mushrooms, berries, bark extracts, saps and roots, herbs, wild meat and edible insects). Indirectly, they support healthy eating by providing affordable woodfuel, high-quality water and improved soil for sustainable agricultural production
3 GOOD HEALTH AND WELL-BEING 	3.4 3.9	Forests and other green spaces in and around cities provide ideal settings for many outdoor recreation and relaxation activities, thereby contributing to the prevention and treatment of non-communicable diseases and the maintenance of mental health. Urban forests filter and efficiently remove pollutants and particulates, which also helps reduce the incidence of non-communicable diseases
6 CLEAN WATER AND SANITATION 	6.3 6.6	Urban forests are efficient regulators of urban hydrological cycles. They filter drinking water by reducing biological and chemical pollutants, reduce the risk of floods and erosion, and reduce water losses by minimizing mesoclimatic extremes through evapotranspiration processes
7 AFFORDABLE AND CLEAN ENERGY 	7.1	The sustainable management of urban forests can produce renewable energy for use by urban communities. This is a vital function for billions of urban and peri-urban dwellers worldwide, particularly in lower-income countries, where woodfuel is often the most affordable and sometimes only available source of energy
8 DECENT WORK AND ECONOMIC GROWTH 	8.4 8.9	Investments in urban forests and other green infrastructure add significantly to green economic growth by providing an attractive environment for tourism and business, improving home values and rental rates, creating job opportunities, providing materials for housing, and generating savings in the costs associated with energy and the maintenance of human health
11 SUSTAINABLE CITIES AND COMMUNITIES 	11	Well-designed and managed urban forests make significant contributions to the environmental sustainability, economic viability and liveability of cities. They help mitigate climate change and natural disasters, reduce energy costs, poverty and malnutrition, and provide ecosystem services and public benefits
13 CLIMATE ACTION 	13.1 13.2 13.3	Trees and forests in and around cities contribute to climate-change mitigation directly by sequestering carbon and reducing greenhouse gas emissions and indirectly by saving energy, reducing the urban heat island effect, and mitigating flooding
15 LIFE ON LAND 	15.2 15.3 15.9	Urban forests help create and enhance habitats, constitute a pool of biodiversity, significantly improve soil quality, and contribute to land restoration

In summary, urban forests and green spaces can provide a key contribution to the achievement of the recently approved SDGs by increasing the sustainability of cities and urban communities (SDG 11), by providing food and clean water (SDG 2 and SDG 6), by increasing incomes and job opportunities thus contributing to decreased poverty (SDG 1), by promoting outdoor recreation activities and cleaning the air (SDG 3), by producing renewable energy and contributing to climate change mitigation and adaptation (SDG 7 and SDG 13), by improving soil quality and hosting biodiversity (SDG 15), and by fostering green economy (SDG 8) (FAO, 2016). Accordingly, urban forestry and greening is a growing institutional strategy in promoting urban sustainability (Cilliers et al., 2004; Kaoma and Shackleton, 2014b) and to maximise the provision of ecosystem services (Livesley et al., 2016). Therefore, more trees are needed in urban areas because they can improve quality of life and human well-being, which is the basic goal of sustainable development (World Bank, 2003). For these reasons, cities worldwide are investing in urban greening to improve the well-being of urban residents and urban sustainability (Duinker et al., 2015). However, these efforts are not equitably distributed across the different parts of towns and cities.

The recent pronouncement of South African low-cost housing areas, colloquially known as RDP suburbs, as sustainable human settlements came with an expectation for their development in line with goals for urban sustainability in line with sustainable development and with particular emphasis on the SDGs as outlined in Table 1.1, specifically SDG 11. One of the targets of this goal is to provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities by the year 2030 (UN-DESA, 2019). Unfortunately, previous research has shown that this is barely the case in these newly developed low-cost housing areas (McConnachie and Shackleton, 2010; Kuruneru-Chitepo and Shackleton, 2011; Gwedla and Shackleton, 2017; Venter et al., 2020). In contextualizing the need for green infrastructure in the form of urban green spaces and urban trees in low-cost housing areas and what has impacted their development in some areas more than others, it is important to understand the genesis of low-cost housing areas and how the circumstances around their development may have been influential to the model of urban greening we see today.

1.1.1 Accommodating an increasing urban population

The world population is projected to grow from 7.7 billion in 2019 to 8.5 billion in 2030, and further to 9.7 billion by 2050 (UN DESA, 2019). A large and increasing proportion (55 %) of this population resides in urban areas (UN DESA, 2019), a natural pattern (Bradshaw and Noonan, 1997) which Bao and Fang (2012) describe as urbanization. According to Knox (1994), urbanization is characterized by an array of interrelated processes in the cultural, economic, demographic, political, social, and technological realms, which transforms the regional or national landscape into one where more and more people live in towns and cities. Although the UN DESA (2018) estimates the proportion of the urban population in Africa at 42.5 %, sub-Saharan Africa is the fastest urbanizing region in the world (Shackleton et al., 2018; Titz and Chiotha, 2019). Consequently, the urban population will reach approximately 58 % in

2050 and home to nearly a quarter of the world's urban population (Cobbinah et al., 2015a, 2015b). Most of this population growth happens in small and medium-sized cities and towns (Andreasen et al., 2017; Pickett et al., 2013). In Africa, 57 % of urban dwellers live in smaller cities and towns (UN Habitat, 2016; Wisner et al., 2015). Therefore, urgent attention needs to be given to the environmental and socio-economic consequences of this demographic and spatial transition, and discourses on the transformations required to address the challenges posed by rapid urbanization, such as poverty and vulnerability, should also be analyzed for the small and medium-sized towns (Shackleton et al., 2018).

Rural to urban migration has been one of the major drivers of urban growth globally (Reman and Jones, 2005; Titz and Chiotha, 2019), and accounts for approximately 40-50 % of urban population growth in Africa (Cobbinah et al., 2015a). Perceived amenities provided by cities, such as the promise of jobs, the access to education, or the desire for a healthier and easier life, draw people to cities (Glaeser, 2012). In some instances, cities may be the only option, as environmental hazards, conflict, and reduced access to traditional livelihoods make rural life ways untenable (Pickett et al., 2013). According to McGregor et al. (2010), African cities are also expanding through various forms of encroachment, mostly by integrating peri-urban or rural areas into the administrative areas of cities. South Africa is the most urbanized country in Africa (Massey and Gunter, 2020), a pattern primarily associated with the country's relatively high levels of industrialization, and its role as an economic powerhouse of the continent (Goebel, 2007).

In South Africa, rural-urban migration is a long-experienced phenomenon, especially from the mid-20th century at the dawn of apartheid. The pattern of urbanization in the country has been deeply influenced by its extreme political history (Baffi et al., 2018). Pre-1994, urban policy in the country was predominantly based on the dictates of apartheid racially defined spatial planning, where the precise form of the South African city was codified by the 1950 Group Areas Act and the notion of segregated urban space (Pillay, 2008). A major consequence of this was the suppression of the levels of rural-urban migration by indigenous Black South Africans for several decades during apartheid (Wilkinson, 1998), a direct result of the many complex political, social, and economic decisions made by the apartheid government. The South African political climate of the time led to the racial division of the country, and some areas had more economic opportunities than others. Homelands, which were ethnically defined, geographically separate and barely serviced (Shackleton et al., 2014), were an elaborate and inhumane attempt to limit the numbers of Black South Africans living in the then Republic of South Africa. Those who were fortunate enough to work in urban areas were further confined to spatially segregated residential areas, locally termed 'townships' (Wilkinson, 1998), characterized by relatively high density suburbs, lack of service delivery, economic opportunity and hence high levels of poverty (Todes and Turok, 2018). This was in direct contrast to the more affluent neighbourhoods occupied by White South Africans, which were characterized by infrastructural and social attributes typical of first-world cities, with well laid out and maintained leafy suburbs and low housing densities, adequate infrastructure and efficient service delivery (Gwedla and Shackleton, 2015). Post-1994 "elite blacks could move to these affluent areas, but they remain exclusive, often gated and social interaction among different race and ethnic groups remains limited" (Goebel, 2007).

A post-apartheid response to the marginalization of Black people came in two ways, namely i) the repeal of laws that restricted where Black South Africans could live and work (Gwedla and Shackleton, 2015), and ii) the introduction of a national program by the newly elected democratic government to address the racially defined backlogs of service provision and housing created during apartheid (Hunter and Posel, 2012). The repeal of laws catalyzed a surge of people moving to urban areas (although many retain links with their rural homestead and kin) (Tacoli, 2003), a pattern that has now led to approximately 66 % of South Africans now living in urban areas (UN DESA, 2018), which is expected to increase to 71 % by 2030 (PMG, 2018). In the first instance, the repeal of laws that restricted where black people could live and work meant they were no longer confined to live in homelands, but be full citizens of the Republic of South Africa, and could therefore live anywhere in the country. This meant that Black South Africans could live in any residential area of their choice and affordability without being discriminated against based on race. This migration has led to significant increases in the urban populations of the small and medium-sized towns and cities, as much as it has in large cities. Much like large cities, small and medium-sized towns have become elementary vehicles of balanced prosperity and development (de Noronha and Vaz, 2015). However, current models and prescripts of urban development and sustainability derived and examined in large cities may well be found wanting in these smaller ones because of their lower revenue and skills bases (Gwedla and Shackleton, 2015; Pickett et al., 2013; Wisner et al., 2015), and their potentially smaller ecological footprint (Shackleton et al., 2018).

In the second instance, the new government initiated a housing program under the Reconstruction and Development Program (RDP) (Gilbert, 2004). The RDP pays homage to the 1955 South African Freedom Charter in the words: “It is upon this tradition [of the Freedom Charter] that the RDP seeks to mobilize all [the] people and [the] country’s resources towards the final eradication of apartheid and the building of a democratic, non-racial and non-sexist future” (ANC, 1994 as cited by Ramutsindela (2001)). The White Paper on the RDP (1994) describes the program as “a policy framework for integrated and coherent socio-economic progress that seeks to mobilize all our people and our country’s resources toward the final eradication of the results of apartheid”. The program is a holistic process of setting a broader agenda of the transformation of the state (Ramutsindela, 2001), with the objective of “improving the quality of life of all South Africans, and in particular the poorest and marginalized sections of our communities” (ANC, 1994: 15). One of the foundational principles of the RDP pertains to the meeting of basic needs and building infrastructure, and states that “nation-building links reconstruction and development, and the key to this link is an infrastructural program that will provide access to modern and effective services such as housing, electricity, water, telecommunications, transport, health, education, and training for all our people” (Section 1.3.6). In meeting these basic needs, the RDP states that such development is not just about the delivery of goods to a passive citizenry, but also about active involvement and growing empowerment (ANC, 1994). This informed the White Paper on Local Government (1998) and other legislation including the Municipal Structures Act (1998) and Municipal Systems Act (2000).

1.1.2 From houses to housing: The South African housing approach

In fulfilling the need to rapidly address growing housing backlogs, and the principle of meeting basic needs and building the infrastructure, the RDP encompassed large scale provision of houses to the urban poor. The South African housing approach has been informed by a number of policy and statutory documents since 1994, beginning with the RDP in 1994. The provision of houses and services was a key component of the RDP (DoH, 1994), as seen in one of its priority programs which were focused on establishing the long-term social objectives of the RDP and saw housing as a basic need (White Paper on RDP, 1994). This was later enshrined in the country's constitution, where the right to housing was espoused as a 'basic human right' and raised the expectation of millions of South Africans that the new government would construct and provide millions of houses (RSA, 1996). In one of its programs, the RDP recognized that "the basic needs of people extend from job creation, land and agrarian reform to housing, water and sanitation, energy supplies, transport, nutrition, health care, the environment, social welfare and security" (White Paper on RDP, 1994).

A major advance in housing within the RDP was the launch of the White Paper on Housing (1994) shortly after the implementation of the White Paper on the RDP (1994). The White Paper on Housing (1994) posited that housing is a basic human right, but also acknowledged that housing is one of the greatest challenges facing the South African government. As a result of the processes outlined above, most South African towns currently display at least three spatially discrete and visually distinctive residential areas (Kaoma and Shackleton, 2014b), including the "(i) relatively new, low-cost RDP housing areas occupied by poor black South Africans, (ii) townships with a mix of old and new housing occupied mostly by poor, and less poor, Black South Africans and (iii) suburbs ranging from middle to high income areas, occupied mostly by White South Africans, but with an increasing presence of other racial groups" Shackleton et al. (2018). Added to this are sprawling informal settlements in many towns, especially large ones (Maharaj, 2020).

Therefore, urban housing in South Africa post-1994 has played a significant role in redressing past wrongs while building cities that are inclusive and liveable (Bond and Tait, 1997), although "urban housing in the country remains a collection of ambitious social housing projects, billion rand developments juxtaposed with informal dwellings and urban sprawl" (Huchzermeyer and Misselwitz, 2016). Ownership of houses in RDP suburbs is reserved for the indigent (Shackleton et al., 2014) who do not pay any fees to have or occupy the property, and an application process in this regard is followed. Furthermore, residents usually have control of what happens in their private spaces (the portion allocated to them as a household) and can therefore make decisions about fencing, gardening, or tree planting, for example. While occupants may have title deeds to these houses, there are rules governing the tenure and sale of these houses, including the prohibition of lease and for their sale within the first eight years of receiving the house unless they would like to return it back to the state (GDLGH, 2009). However, evidence on the ground suggests that many people lease their houses which results in a significant population with no vested interest in the outlook of the suburbs as it is not their permanent home. Many

of the occupants of these RDP houses are also usually of the opinion that the land outside of their yards belongs to the municipality, and they are therefore not allowed to interfere with it in any way (Gwedla, 2016). This also becomes tricky when the occupants have not fenced their yards because they do not know the boundaries of the delineation between the private and public space.

While the RDP was closed in 1996, RDP housing still remains a prominent term, retaining the symbolic connection between housing and social transformations (Hunter and Posel, 2012). In October 1995, the Office of the Presidency released the Urban Development Strategy (UDS), whose goal was to integrate the segregated city by concentrating on rebuilding the townships, creating employment opportunities, providing housing and urban amenities, reducing commuting distances, and “facilitating better use of underutilized or vacant land” (Ministry of the Office of the President, 1995). In this instance, the role for urban housing in the newly democratic South Africa was to redress past wrongs while building cities that were inclusive and liveable (Gunter and Manuel, 2020). Unfortunately, new housing developments under the RDP were perceived to perpetuate the spatial patterns of apartheid and rapid urbanization of rural communities, and this meant that the formal housing backlog persisted (Gunter, 2013). Moreover, beneficiaries of these houses expressed dissatisfaction with the delivery product and process, which led to a shift in reference to “housing opportunities instead of actual houses”, thus diverting attention from the housing product (Huchzermeyer, 2001). Housing developments have for a long time been synonymous with a specific type of social housing in South Africa, which are small, uniform block brick housing estates on the urban periphery (Gunter and Manuel, 2020; Shackleton et al., 2018), and this pattern still persists, as seen in Fig. 1.1. An amendment to the Housing Act (1997) in relation to the size of individual houses required state-subsidized houses to be constructed to a minimum of 30 m² (Huchzermeyer, 2001), and by 2010 most houses were single storey, on a 40 m² foundation (McConnachie and Shackleton, 2010) and an average plot size of 80 m² (Shapurjee and Charlton, 2013).



Figure 1.1: A recently developed low-cost housing area in the Eastern Cape, 3 km from the CBD exhibiting a spatial pattern of apartheid (Picture taken by researcher, 2017).

Although the provision of housing under this program has been a slow, complex and often politicized task which has frustrated a large portion of the population (Massey and Gunter, 2019), approximately 3.8–4.2 million houses had been built under the program between 1994-2016 (Huchzermeyer and Misselwitz, 2016). However, the focus on the number of units built overlooks the issues of poor quality and low liveability. Occupants of these housing developments often express a great deal of

dissatisfaction with them pertaining to, among other things, their quality and distance from services such as public transport, schools, clinics, libraries, and police stations (Tissington, 2011). Furthermore, these developments have been flagged as undermining the ethos of place-making around elements of culture and nature, which include recreational spaces, green spaces and biodiversity elements (Cocks et al., 2016).

1.1.3 From 'housing' to 'human settlements'

Indeed, the South African government has made some commendable progress in the delivery of houses and establishment of residential areas for the urban poor. However, the social and environmental sustainability of these is still of grave concern, especially with regards to its impacts on the surrounding environment and human health (Goebel, 2007). In the Comprehensive Plan for Housing Delivery, the Department of Housing (DoH) (2004) put forward that the new human settlements plan reinforced the vision of the department, which is “to promote the achievement of a nonracial, integrated society through the development of sustainable human settlements and quality housing” (DoH, 2004). Recognizing a need for change and in response to criticisms to this housing delivery approach, where developments lacked appropriate infrastructure, basic services, clinics, schools, green spaces and other amenities that higher-income areas took for granted (Donaldson, 2001), the then Department of Housing moved for the development of a revised medium term (ten year) housing policy framework for housing delivery (BNG, 2004). In this framework, the new housing vision contends that “whilst Government believes that the fundamentals of the policy remain relevant and sound, a new plan is required to redirect and enhance existing mechanisms to move towards more responsive and effective delivery. The new human settlements plan reinforces the vision of the Department of Housing, to promote the achievement of a non-racial, integrated society through the development of sustainable human settlements and quality housing” (BNG, 2004).

In a bid to shift from housing to human settlements, the Department of Housing recognized the need to move beyond the provision of basic shelter towards achieving the broader vision of developing sustainable human settlements and more efficient cities, towns and regions (BNG, 2004). Section 3.6 of this framework acknowledges that “there is a need to move away from a housing-only approach towards the more holistic development of human settlements, including the provision of social and economic infrastructure and primary municipal facilities such as parks, playgrounds, sport fields, crèches, community halls, taxi ranks, satellite police stations, municipal clinics and informal trading facilities”.

Unfortunately, these changes in policy have barely been implemented in the actual development of new low-cost housing areas as the vast majority of housing built by government, and still is being built, under this policy still resembles the RDP housing type from the 1990s, where quality and size are still compromised (Gunter and Manuel, 2020). Furthermore, other facilities such as schools, healthcare and other facilities often take years to materialize within these areas (Turok and Scheba, 2018). Opportunities for the creation of sustainable human settlements are still being missed, and this unwittingly reinforces the geography and spatial inequalities of apartheid (Bradlow et al., 2011).

1.1.4 Sustainability of human settlements

The sustainability of human settlements lies within a broader international debate on sustainable development and quality of life (du Plessis and Landman, 2002). While South Africa has adopted many international protocols and frameworks on environmental conservation and sustainable development (Irurah and Boshoff, 2003), very little has been followed through in implementation in various sectors of the economy. In the housing sector this is particularly significant as the delivery of housing to low-income communities has been one of the key programs of the South African government since 1994 (Ross et al., 2010). Sustainable human settlements and urban sustainability consider many dimensions of how people live, work and relax in towns and cities, and aspects receiving the most attention include energy efficiency in buildings and of transportation, waste disposal and sanitation, air quality, urban liveability and quality of life (Shackleton et al., 2014). In terms of the last, access to and use of public and private green spaces are deemed a crucial strategy (Sundaram, 2011).

The Habitat Agenda posits that quality of life is a key determinant of sustainability in human settlements, which speaks to the quality of the built environment, and considers factors such as the area of open green space per capita, urban greening initiatives, maintenance of public open spaces, maintenance of infrastructure, to name a few (du Plessis and Landman, 2002). Unfortunately, an analysis of South Africa's urban settlements reveals a past, present and projected future of unsustainability by most measures (Goebel, 2007). Legacies of social and environmental injustices can leave an imprint on the present and constrain transitions for more sustainable futures (Grove et al., 2018), and this is not just a South African reality. In the USA, Baltimore's contemporary social–environmental landscape is the result of changing patterns of racial and economic segregation, and practices of social exclusion in the city's history have co-produced patterns of environmental inequality and racism, such as environmentally related zoning variances (Grove et al., 2018).

As part of the commitment to the development of sustainable human settlements, Section 43(p) of the Habitat Agenda Goals and Principles, Commitments and the Global Plan of Action (1996) committed to “promoting optimal use of productive land in urban and rural areas and protecting fragile ecosystems and environmentally vulnerable areas from the negative impacts of human settlements, inter alia, through developing and supporting the implementation of improved land management practices that deal comprehensively with potentially competing land requirements for agriculture, industry, transport, urban development, green space, protected areas and other vital needs”. Furthermore, governments, including local authorities (municipalities), are encouraged to support the efforts of human settlements to establish sustainable urban land-use patterns and planning by “developing and supporting the implementation of improved land management practices that deal comprehensively with competing urban land requirements for housing, industry, commerce, infrastructure, transport, green spaces and forested areas, taking into account the need for spaces for everyday activities - for playgrounds, parks, sports and recreation areas and areas suitable for gardening and urban agriculture” (Section 113(h)). Additionally, global development agendas such as the Sustainable Development Goals (SDGs) call for nature-based

strategies to make urban areas sustainable (Diko and Palazzo, 2019). The United Nations (UN) 2030 Agenda for Sustainable Development prescribed under the goal for Sustainable Cities and Communities (Goal 11) the universal access to safe, inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities (Diko and Palazzo, 2019). South Africa is a signatory to both these agendas, and in emphasizing the country's continued support for the Habitat Agenda Goals and Principles at the 2016 Habitat III conference in Egypt, the then Minister of Human Settlements, Lindiwe Sisulu said:

"...any new agenda must build upon the Habitat Agenda. What was agreed to in 1996 still remains valid and we should continue to achieve those important principles even as we move forward to address new challenges. The new agenda should seek to radically transform our human settlements to harness their social and economic development potential (...) Hence it is our wish that the new urban Agenda to be adopted in 2016 will take African realities into account".

Unfortunately, these commitments are barely reflected on the ground, especially with regards to the provision of green and social spaces. This trend has been noticeable in other parts of the world too, where policies relating to urban green spaces and urban forestry are not always translated into specific actions. Out of 39 urban forest management plans evaluated in Washington State, Gibbons and Ryan (2015) reported that only four (10 %) of them had included the results from an assessment of the current state of urban forest within their plan. This goes to show that the others had no tangible evidence to show that their plans and policies had actually been translated into specific actions. This may have been affected by the vagueness and limited measurable targets or objectives in their goals and vision statements (Gibbons and Ryan, 2015). However, it is worth mentioning that several decades may be needed to fully realize ambitious plans to increase the extent of the urban forest, as demonstrated by Roman et al. (2017).

Exemplifying an ideal sustainable human settlement, the Department of Environmental Affairs (DEA) (2012) described Verkykerskop, a small-scale agricultural town in the Free State province of South Africa. In this example, reference is made to the town's master plan which "allows for a host of transportation options (...), a hierarchy of roads, paths and a livestock route (...), a prominent spine/visual axis with green open space that will link neighbourhoods with one another and with the natural landscape (...), and the addition of recreational facilities such as a gymkhana track, the planting of indigenous trees, and the renewal of existing buildings to enhance commuter movement and activity along this prominent line". From this example, it is clear that the government's vision for a sustainable human settlement included the presence of green spaces and trees in low-cost housing areas. However, the DHS does not seem to embrace this ideology. Several of the broader development or housing policies in South Africa make reference to the need for environmental sustainability and to minimize the impacts of development and housing initiatives, but these are rarely translated into specific guides, standards or actions (Shackleton et al., 2014; Chishaleshale et al., 2015). For example, the White Paper on Housing Policy and Strategy for South Africa, (1994) recognizes that "the environment within which a house is

situated is as important as the house itself in satisfying the needs and requirements of the occupants”. Furthermore, it suggests that to “meet the housing challenge in the country, government was to establish a sustainable housing process which would enable all South African people to obtain housing with secure tenure, and within a safe and healthy environment” (Section 4.2).

1.1.5 Sustainable but without the trees? The paradox of ‘sustainable human settlements’

In its National Development Plan (NDP) 2030 (2012), the South African government acknowledges that indeed, the focus in the development of human settlements “remains on housing rather than on developing quality environments for low-income communities, supported by the necessary physical, social and environmental services” (Chapter 8, Section 3). Furthermore, it acknowledges that quality environments for low-income communities are achievable through the exploration of “opportunities to create greener urban spaces, even in the densest areas” (Chapter 8, Section 3). Notwithstanding this, evidence on the ground suggests missed opportunities (Shackleton et al., 2014), or a rather slow pace in the exploration of opportunities for creating such sustainable human settlements, especially in relation to the development of urban green spaces and tree planting at both the household and suburb scales. McConnachie and Shackleton (2010) highlighted that “despite RDP suburbs being the most recently developed, there seemed to be relatively poor public green space planning, both in terms of size of spaces, as well as the total proportion of the area under public green space”, citing that the RDP areas were significantly lower for both mean public green space size and proportion compared to other types of suburbs (affluent and older township areas). Furthermore, they found that there was less than 4m² of public green space per person in RDP low-cost housing areas, between 50 and 80 m² in townships, and over 200 m² per capita in the affluent areas (McConnachie and Shackleton, 2010).

Shackleton et al. (2018) reported a tendency for increasing dissatisfaction about the limited abundance of green space with increasing poverty status of the local suburb, citing that almost two-thirds of residents in the RDP low-cost housing and township areas of selected small towns felt that there was insufficient public green space available, compared to only 48% of residents from affluent suburbs. This pattern was had initially been emphasized by Kuruneru-Chitepo and Shackleton (2011) with regards to street trees, who reported “a virtual absence of street trees in the poorer township and RDP areas” compared to the Central Business District (CBD) and affluent residential suburbs. They found a significant difference in tree density between suburbs, with the CBD (20 %) and affluent residential suburbs having a higher density than the township and RDP suburbs (<5 %). Recently, Gwedla and Shackleton (2017) corroborated this and reported that approximately 70 % of all street trees enumerated across ten towns were found in affluent areas, compared to 16% in the older township suburbs and 7% in the RDP suburbs. This pattern is not only exhibited in the public spaces (streets, open spaces), but is also evident in private spaces (household yards). Shackleton et al. (2014; 2015) examined the differences in the distribution of private tree holdings and benefits across previously neglected and poorer suburbs in three South African towns, and found that RDP suburbs had a significantly lower number and density of trees per household compared to the township and informal suburbs.

While low-cost housing areas may be uniform in physical structure and design, and share the common trait of limited green spaces and trees, they are also characterized by a number of institutional and systematic socio-economic, socio-cultural, and socio-political dynamics that render them essentially different to other types of residential areas. Thus, the everyday and real-life dynamics of low-cost housing areas may shape the systematic success or failure of initiatives aimed at their development and improvements, including urban greening initiatives. These dynamics may be associated with, among others, i) limited social cohesion, ii) crime and iii) education levels, iv) unemployment and poverty rates, v) the use of urban trees for provisioning ecosystem services which may be linked to livelihood sustenance, vi) together with keeping of livestock, and vii) the participation of residents in local governance.

1.1.5.1 Limited social cohesion

Apart from the prohibiting Black people from accessing viable economic activities and restricting where they could live, apartheid, through forced removals which later led to a massive surge of people to urban areas, left a legacy of division and inequality with massive fragmentation between and within cities across the country (Altman et al., 2009; Ashman et al., 2011). Consequently, poor areas have limited social cohesion. Apartheid policy not only enforced rigid segregation by race, but also effectively drove the poor to the urban peripheries, making for long and expensive commutes between work and home, a vicious cycle of poverty and exclusion (Onatu, 2010), and the perpetual income inequality that is extremely high.

Social cohesion refers to the extent of connectedness and solidarity among groups in society (Easterly et al., 2006) and involves the interpersonal dynamics and sense of connection among people (Jennings and Bamkole, 2019). It is characterized by two intertwined features of society, which may be described as the absence of latent social conflict, and the presence of strong bonds (Berkman and Kawachi, 2000; Witten et al., 2003). The latent social conflict may be in the form of income or wealth inequality, racial or ethnic tensions, disparities in participation, or other forms of polarization (Berkman and Kawachi, 2000; Kawachi et al., 2008). On the other hand, the presence of strong bonds may be measured by levels of trust and norms of reciprocity, the abundance of associations that bridge social division, and the presence of institutions of conflict management (Berkman and Kawachi, 2000; Quinn, 2011). Social cohesion has in recent years emerged as a means to achieving an inclusive and united South Africa post-democracy (Palmary, 2015). It is one of the objectives of the Breaking New Ground (BNG), which include the increasing of densities, the promotion of social cohesion, the de-concentration of poverty, and the improvement of quality of life for the poor (BNG, 2004), and is associated with integrated public space for all, an urban incentive currently experienced by the urban elite (Gunter and Massey, 2020). Public spaces potentially serve as social spaces that may create a sense of community cohesion and provide opportunities for recreation and socialization that do not otherwise exist in impoverished areas, such as township and low-cost housing areas (Dalu et al., 2020). Within these public spaces, availability of green spaces and urban trees may further enhance social cohesion as they encourage positive social

interactions that cultivate social cohesion in ways that enhance health and well-being, where residents may find opportunities to get outdoors and interact with nature and others in ways that may not occur in other settings (Jennings and Bamkole, 2019). This supports the social benefits of urban trees and green spaces associated with enhancing social interaction and stimulating social cohesion (Coley et al., 1997; Peters and Buijs, 2010), such as enhanced health and well-being (Jennings et al., 2016).

Low-cost housing areas not only lack some of these public spaces, but are laden with latent social conflicts because they are segregated by wealth and race (low-cost housing areas are meant for the poor, the majority of whom are poor). This limited social cohesion affects people's interest in participating in the governance of their areas, which are aroused in part by suspicion of the state (Turok and Scheba, 2018) and social obstacles that may perpetuate a culture of silence emanating from the dominance of certain individuals within communities. Social cohesion, or lack thereof, in the poor residential areas of urban South Africa can also be greatly linked to the growing common grievances about community well-being, particularly in relation to inadequate delivery of government services and resources (Lamb, 2019). A response to these grievances is often in the form of service delivery protests (Wafer, 2020), especially in the face of unequal delivery of these services across different pockets of urban areas. A common feature of service delivery protests in relation to urban tree planting in South African low-cost housing areas may be the perceived neglect of other basic services by municipalities by spending resources on tree planting, or even the prioritization of some residential areas over others and exclusion in decision-making. This, according to Richardson and Shackleton (2014), may result in the vandalism of newly planted trees in these areas as a form of protest against the municipality for "wasting money and water on planting and maintaining trees when they do not have adequate services themselves".

1.1.5.2 Participation of residents in local governance

Many municipalities are characterized by weak community organization and suspicion of the state which tends to undermine constructive engagement, and lack the experienced intermediaries to work with local residents and negotiate with gatekeepers to gain their trust and approval to install essential services and public spaces for pedestrian and vehicular circulation (Turok and Scheba, 2018). In the South African context, these intermediaries are ward councilors (Piper and Deacon, 2008). However, ward councilors are politicized and perceived as extensions of political party structures who do not represent the interests of the public they are meant to serve (Smith and De Visser, 2009). Based on personal observations, some residents in low-cost housing areas often express perceptions of despondency when it comes to participating in local governance issues, perceptions that may arise from feelings of inadequacy or having been "given enough" already. Beneficiaries of low cost housing developments are sometimes expected to be passive, and grateful, as they receive houses and services at no financial cost (Dalu et al., 2020), and may thus indirectly not see the need for participating in development and local governance.

Other perceptions may arise from observed patterns of involvement where only certain members of the community can participate in initiatives (or are usually invited to participate), the same individuals who also benefit. Thus, residents become reluctant to participate in initiatives, especially when the

municipality is involved as they expect to be disappointed. This may compromise future initiatives that encourage community participation as lack of trust may deter residents from availing themselves. Notwithstanding this, it is important to note the various challenges associated with participation in general, and in the context of poverty and lack of resources such as low-cost housing areas, and its relationship with initiatives that are introduced in these communities. Emmett (2000) highlighted that community participation is fraught with ‘conceptual and practical difficulties’, where the first desire of a poor community when a promise of a resource to help or uplift the community is introduced is to capture these resources, more than the desire to benefit the community at large, and this is what motivates the community members to participate in the projects or initiatives. This is usually followed by an expectation of receiving a return from their involvement (when they do participate) in development projects (Lizarralde and Massyn, 2008). Such behavior in itself is driven by the rife unemployment and poverty that is prevalent in these areas, and can greatly impact the success of participatory tree planting initiatives, for example. The impairments of the relationships between residents and local authorities or municipalities, which may result from residents not being given decision-making power, can also result in residents resisting urban tree planting. This directly impacts the model of governance of urban forests because residents then do not play their part as actors in the governance structure, which means that power will be disproportionate to one group, and rules governing the governance structure will be those of that respective group.

1.1.5.3 Unemployment and poverty

Low-cost housing areas are designated for the poor (Shackleton et al., 2018), and are therefore characterized by high unemployment rates and poverty. Estimates have indicated that less than a third of RDP low-cost housing homeowners have a job (Turok and Borel-Saladin, 2015) because in the most part these houses have been provided as physical shelter rather than part of an integrated human settlement with access to jobs, amenities and community services (Turok, 2016). A direct consequence of this is widespread poverty in these areas, as the poor areas of South African cities are susceptible to very high levels of food insecurity (Battersby and Haysom, 2020). The locus of poverty and vulnerability in sub-Saharan Africa, and particularly in South Africa, is inexorably adopting an urban visage as many urban areas struggle to accommodate, absorb and provide for their rapidly burgeoning populations (Ward and Shackleton, 2016). Ward and Shackleton (2016) recently reported that approximately one-quarter of poor households in two South African towns suffered from sporadic hunger, with the majority of these households located in township areas. The high unemployment and poverty rates in low-cost housing areas and townships in general may underpin engagement in the informal economy and a range of livelihood activities such as urban farming, including urban livestock (Shackleton et al., 2017a), and the urban poor may be more inclined to extensively use natural resources and non-timber forest products (NTFPs) through foraging, which are daily realities in many low-cost housing communities. On the other hand though, urban trees can greatly contribute to the fulfillment of certain SDGs, as outlined earlier, which means that residents in low-cost housing areas may benefit from having trees planted in their

residential areas more than other groups of residents from the more affluent areas as the trees are likely to contribute to livelihood support.

1.1.5.4 Urban trees for provisioning ecosystem services

Greenery in and around neighbourhoods is of great importance in the context of urban poverty (Gopal and Nagrenda, 2014), especially for food security (Van Leeuwen et al., 2010). Harvesting of non-cultivated plants for food, medicine, floral and greenery, craft products or other purposes, for personal use or sale, which is known as foraging (Shackleton et al., 2017a), is gaining momentum and interest among urban residents, especially the poor, in many urban areas worldwide (Garekae and Shackleton, 2020). Some of this foraging includes the harvesting of wild plants for various purposes such as consumption, decoration and biodiversity experience in formal urban parks (Palliwoda et al., 2017), and as a contribution to household cash and non-cash income (Kaoma and Shackleton, 2015). In the same light, homestead greening is widespread among the urban poor in South Africa, and urban residents actively plant and manage trees on their homesteads (Kaoma and Shackleton, 2014b). Urban residents in poor residential areas mainly plant and retain urban trees for provisioning ecosystem services that support their livelihoods (Kaoma and Shackleton, 2014a; Long and Nair, 1999; Murwendo, 2011). According to Kaoma and Shackleton (2014a), the most prevalent provisioning services urban residents from poor residential areas prioritize include the collection of firewood, fruit harvesting, and other minor tree products including wood for fencing, building and utensils, medicine, and live fencing or hedges. Although some households may be using these tree products to supplement their livelihoods, subsistence use is more prevalent than for household income. For example, Kaoma and Shackleton (2014a) found that very few residents from three South African towns sold the fruit they harvested from their homestead trees, and those who did sold only the excess fruit. This high use of provisioning services shapes the nature of species desired (Shackleton and Mograbi, 2019), but also the potentially low survival of trees in green spaces (Mincey and Vogt, 2014) if they are cut for firewood and wood products.

1.1.5.5 Livestock-keeping

Foraging activities in urban areas are not limited to residents alone, but may extend to livestock as well. Livestock-keeping in urban areas is widespread in developing countries and poorer residential areas (Shackleton et al., 2017b), where they are held for food, cultural or economic reasons (Lee-Smith, 2010). In this context, foraging may result from livestock owners buying food, collecting it by hand and carry it to where their livestock are housed, herding livestock to formal and informal green spaces or fields, or letting them free-range seeking food wherever they can (Amadou et al. 2012). The latter two foraging activities may lead to grazing of the herbaceous layer of formal and informal green spaces or the browsing or lopping of leaves and branches from urban trees (Shackleton et al., 2017b). Shackleton et al. (2017b) found that the two green spaces in township areas had the highest densities of livestock compared to those closer to affluent areas, and the number of dead trees and the extent of damage to living trees (<3 m tall) decreased along the gradient from the township towards affluent areas. Apart

from grazing on urban greenery, livestock may also damage tree seedlings through trampling and uprooting (Reiner and Craig, 2011).

Livestock-keeping is a core attribute that differentiates the planning and practice of urban forestry and greening in many developing countries relative to developed ones (Shackleton, 2012). This is also true for low-cost housing areas compared to the more affluent areas in South Africa, and while municipalities may have by-laws governing the keeping of livestock in urban areas, many residents persist to defy those by-laws, as evidenced by the prevalence of free-roaming livestock in low-cost housing areas across many parts of the country. Livestock-keeping in urban areas is not adequately discussed in urban greening literature, although it poses a real challenge to the establishment of urban greening initiatives for both the public and private spaces. While residents in affluent areas may have the means to protect their private green spaces by walls or fences from livestock foraging and damage, many residents of low-cost housing may not be able to do so. This poses a challenge specific in low-cost housing areas where livelihood dependence is, to some degree, on both urban green spaces, and livestock-keeping.

1.1.5.6 Crime levels

In many developing countries the availability of green spaces is limited in pockets of urban poverty, where access to private green spaces is often non-existent (Gopal and Nagendra, 2014). Consequently, the urban poor may only be confined to using public green spaces. However, crime rates in the poor township and low-cost housing areas are generally high (Breetzke, 2020). This impacts the use of, and access to the few public urban green spaces around township and low-cost housing areas because it deters people from visiting them. Radebe (2019) found that 58 % of respondents from selected low-cost housing and township areas across eight small towns in South Africa reported that crime deterred them from using public green spaces. This was consistent with Willemse (2015) who reported that approximately 40 % of respondents around Mitchelles Plain, South Africa, do not visit parks or only visit them infrequently throughout the year because of an intense fear for their safety and security due to criminal activities. The 2016/2017 Victims of Crime Survey (Stats SA, 2018b) reported that in a population of 30 000 people in South Africa, 32 % reported that they were scared to walk in urban green spaces as they feared being victims of crime. The perception of safety was also a common issue regarding use of public green spaces (PGS) in local suburbs of two Eastern Cape towns, where close to 50 % of respondents from RDP low-cost housing areas did not use PGS in their suburb because they did not feel safe. The high crime rates in low-cost housing areas that potentially deter residents from accessing public green spaces also alienates them from nature and to some degree from one another because of insufficient public spaces in which to foster community and social cohesion. Therefore, high rates of crime influence the probability of success or failure of urban greening initiatives. Additionally, other personal, social, and physical factors, such as gender, poor social integration, physical appearance of public spaces, and different seasons or times of day, may influence residents' decisions to visit urban green spaces or even plant trees (Sreetheran and van den Bosch, 2014).

1.1.5.7 Education and literacy

Education is closely linked to poverty (Christie and Gordon, 1992). Contrary to one of the RDP's objectives of human resources development through providing education and training to all (Ramutsindela, 2001), education and literacy levels in low-cost housing areas remain low (Stats SA, 2015), a pattern that is also synonymous with rural areas (Mafini and Meyer, 2016). The implication of these low literacy levels pertains to communication, where written communication alone may have limited traction in mobilizing people to be involved in community initiatives. For example, pamphlets, newsletters and notices in the monthly municipal accounts or communiques regarding urban greening or by-laws may be better understood or accepted by residents in affluent areas than in low-cost housing areas, which may result in less people participating in such initiatives. This opens up opportunities for other formats of engagement and communication related to by-laws and the importance of urban trees, and community meetings and roadshows for example, can provide platforms in this regard.

In addition to the factors listed above, the transition to mainstreaming GI such as trees and green spaces into urban design has generally become more challenging in small and medium-sized towns and cities in sub-Saharan Africa (Shackleton et al., 2018) because of their generally weaker planning and regulatory institutions, and the higher levels of poverty (Wisner et al., 2015). The same can be said about the post-apartheid low-cost housing areas (Adegun, 2018; Shackleton et al., 2014). Additionally, urban densification, expansion, and consolidation in the face of increasing populations in small and medium-sized towns are challenges facing the greening agenda (Boulton et al., 2018; Haaland and Konijnendijk van den Bosch, 2015; Ordóñez et al., 2020). Furthermore, officials in small municipalities and towns usually have limited capacity to implement and promote urban forestry and tree planting (Chishalelshale et al., 2015). This capacity relates to formal qualifications related to urban forestry or arboriculture, interest and knowledge in urban greening, and the development visions of senior municipal officials, which focus less on environmental issues or urban forestry, but more on infrastructure development (Gwedla and Shackleton, 2015). Moreover, while environmental and forestry policies and legislation are well articulated in planning processes at the national level, their recognition, adoption and implementation at local level is variable (Ruwanza and Shackleton, 2016; Shackleton et al., 2014).

Within the context of this study, the dynamics highlighted above have two-fold implications. In the first instance, they provide insights into a uniquely South African case which highlights the limitations in both the residential areas and municipalities which may influence the probability of success of certain participatory projects or initiatives, especially those related to tree planting, and what may be possible even with new approaches and ideas. In the second instance, these dynamics show that the direct adaptation or implementation of participatory projects and initiatives with a western background may be challenging. Not only are the contexts completely different, which undermines the likelihood that a direct transfer of models will be a success, but developing world contexts are generally limited in resources and capacity, and usually have other pressing challenges such as higher poverty and housing backlogs they need to address before investing in urban forestry (Gwedla and Shackleton, 2015).

According to Gwedla and Shackleton (2015), the planting and presence of trees, or any other greenery for that matter, is a low priority in many municipalities because their towns are under developed, with high poverty and unemployment. This cannot necessarily be frowned upon, because the RDP itself, which was the basis for the development of low-cost housing, adopted a basic-needs approach to the post-apartheid development project of addressing past injustices to the majority of the country's population (Everatt et al., 2010). Notwithstanding this, lessons on best practices used by developed countries can provide insights into what needs to be done as opposed how it should be done. By all accounts, urban forestry, and by extension tree planting, is profoundly interrelated to urban development, and with the general socio-economic and cultural development patterns in cities at upper spatial scales (Kowarik, 2019). This makes it an agenda cities need to be invested in much more than they currently are, if sustainable cities are to be achieved.

1.2 Problem Statement

With the continued growth of cities, especially in small and medium-sized towns both globally and in South Africa, urban forests are becoming increasingly important to urban well-being (Bertram and Rehman, 2015; Dallimer et al., 2012; Nesbitt et al., 2019) and quality of life of urban residents (Ostojic and Konijnendijk van den Bosch, 2015). Universal access to safe, inclusive, and accessible green and public space is one of the prescribed global goals by the UN 2030 Agenda for Sustainable Development (Klopp and Petretta, 2017). Unfortunately, some people in certain parts of urban areas do not have the privilege of access to green infrastructure like trees and public green spaces. This is because areas of public green space and urban forests are often considerably less in poorer towns and cities of developing countries (McConnachie and Shackleton, 2010), with even fewer guidelines to improve accessibility of these green spaces (Shackleton et al., 2014). Similarly, low-cost housing suburbs in South African towns have the least abundance and distribution of green spaces (McConnachie and Shackleton, 2010) and urban trees compared to both the older "township" and affluent suburbs, both at street (Kuruner-Chitepo and Shackleton, 2011; Gwedla and Shackleton, 2017) and household level (Shackleton et al., 2014). Therefore, an understanding of the barriers to the successful establishment of the urban forest in these areas and what opportunities can be explored in addressing these challenges is key before Target 7 of SDG 11 is met. To this end, the planting of trees in low-cost housing areas is desirable, but will require the mobilisation of resources through municipal involvement and residents' participation. Participation is crucial in creating spaces of decision-making informed by co-learning and knowledge-sharing between different stakeholders. However, many of the participatory models to urban greening are western-based and focused on citizen-led initiatives, and therefore may be inappropriate or require adaptations in developing world contexts where residents barely engage in such initiatives. The context of institutional and systematic socio-economic, socio-cultural, and socio-political dynamics of South African low-cost housing areas, including limited social cohesion, crime and education levels, and unemployment and poverty that is deeply entrenched in the day-to-day realities of these areas may greatly influence the probability of success of certain participatory projects or initiatives. While the western models have strengths, their weaknesses need to be carefully examined and considered before modification, adoption

and implementation to see how they can be adapted to a developing country context. Drawing on the emerging conceptual framework of urban forest governance which has mainly been tested and implemented in developed countries, and the Cultural-Historical Activity Theory as an analytical tool to understand a typical process of participatory learning for tree planting in a low-cost housing area context, this study attempts to understand the dynamics of tree planting for poor residential areas and to test means of engaging residents in tree planting.

1.3 Research aim, objectives and key questions

In light of the presented problem statement, the overarching aim of this study was to theoretically and practically investigate the existing or new participatory learning approaches to address barriers to and enhance enablers of tree planting in low-cost housing areas of small to medium-sized South African towns. In addressing this aim, five objectives were instrumental. Each objective was further explored through specific research questions, as outlined below.

1.3.1 *Specific Objectives*

1.3.1.1 Compare and assess the characteristics of tree planting programmes initiated in low-cost housing areas in South Africa within the last 5-10 years:

- a) Who is mandated to plant trees in urban areas of South Africa?
- b) What characterizes a typical tree planting program for low-cost housing areas in South Africa?
- c) What lessons can be learned for successful tree planting in low-cost housing areas during and after planting?

1.3.1.2 Outline the perspectives of residents from old and new low-cost housing areas and municipal officials regarding the distribution and need for trees in their suburbs, and their willingness to change the status quo:

- a) Are there any trees present in the public and private spaces of low-cost housing areas?
- b) Would residents be willing to participate in a tree planting program for their residential areas?
- c) To what extent has urban forestry and tree planting been incorporated in municipal IDPs?

1.3.1.3 Investigate the barriers to, and enablers of tree planting in low-cost housing areas from residents' and municipal officials' perspectives:

- a) What are the barriers to, and enablers of tree planting in low-cost housing areas experienced by tree planting officials and professionals?
- b) What is hindering households from planting trees and what opportunities can they explore to assist them in planting more trees?
- c) How are the barriers to, and enablers of, tree planting similar or different between towns?

1.3.1.4 Design and test means of engaging local residents and other stakeholders in participatory urban tree planting for low-cost housing areas:

- a) What processes, experiences and activities characterize the participatory introduction of trees in a low-cost housing context?
- b) What opportunities exist for innovation in the effective greening of low-cost housing areas?

1.4 Thesis Outline

This thesis follows the structure suggested in the Rhodes University Higher Degrees Guide for Masters and Doctoral Students (2019). Furthermore, I have structured the thesis empirical chapters as papers. Consequently, there may be some small but unavoidable repetition and summarizing in some sections, specifically on methods and study areas across the empirical chapters. The thesis is divided into three parts consisting of eight chapters altogether. In Part I, which consists of two chapters, I set the scene by introducing the study and its theoretical and conceptual grounding. Part II has five empirical chapters associated with urban tree planting in low-cost housing areas. Part III has one chapter where I synthesize the findings of this research, examine its implications and conclude with reflections on my research journey in relation to the findings presented in Part II, and finally provide recommendations related to policy and future research. The details of the outline are as follows:

Part I

Chapter 1 introduces the study and gives the context within which the study is set. Specifically, I provide the research context by introducing and describing the emergence of low-cost housing areas and how these differ from other types of residential areas within the South African urban settings. I proceed by highlighting the current trends in tree distribution between these types of residential areas, resulting in the presentation of the problem statement. Furthermore, I provide the aim, research questions, and the ethical considerations for my study in this chapter.

Chapter 2 provides the theoretical and contextual framing underpinning this study. I introduce the urban forest concept and urban forest governance framing as a lens for understanding the various actors involved in the establishment and management of a typical urban forest. I make a case for the cultural-historical activity theory (CHAT) as a useful theoretical and analytical lens for understanding activities of urban tree planting for low-cost housing areas.

Part II

Chapter 3 is based on Objective 1 of this study and reviews the general urban tree planting landscape of South Africa. In the first part of the chapter I elaborate on the stakeholders typically involved in urban tree planting and the channels through which they are involved. Thereafter, I qualitatively present examples and characteristics of some of the tree planting programs that have been initiated in low-cost housing areas by various entities, including governmental and non-governmental entities, from the perspectives of the personnel who either led those initiatives or were part of the team. This chapter is the first representation of a typical urban forest governance system, which is introduced in Chapter 2.

Chapter 4 is based on Objective 2 and presents an elaborate view of the structure of the urban forest in low-cost housing areas through a qualitative and quantitative analysis. I present findings on the assessment of the distribution of urban trees in both the private and public spaces of selected low-cost housing areas, and this chapter demonstrates the general absence of trees in these residential areas, as alluded to in the problem statement. It also presents residents' willingness to engage in tree planting activities in their suburbs. The results of this chapter foreground the focus of Chapter 5.

In **Chapter 5** I address Objective 3 by conducting an in-depth examination of the barriers to, and enablers of tree planting in low-cost housing areas of selected towns. The results of this chapter inform the subsequent narrative presented in Chapter 6.

Chapter 6 and Chapter 7 are based on Objective 4 and use a case study approach to activity systems across three different cases and test some of the key results emergent in Chapter 5. I use CHAT, described in detail in Chapter 2, as an analytical tool to generate activity systems which may be associated with tree planting specifically for low-cost housing areas. In using CHAT, I focus on the second and third-generations to identify contradictions. In Chapter 7 I identify the four types of contradictions explained in Chapter 2 across all three case studies.

Part III

Chapter 8 is the final chapter of this thesis and draws the thesis to a close by aligning and synthesizing the key messages presented in the empirical chapters, the implications emanating from these findings, and the recommendations for further research and policy, which are foregrounded in Chapter 6 and Chapter 7.

1.5 Ethical considerations and clearance

Ethics are fundamental in conducting research as they are rules of conduct that researchers need to adopt when they act in social contexts (Ransome, 2013). This being social-ecological research involving human participants and to an extent the observation of trees, it was inherent for general ethical standards and those stipulated by Rhodes University Ethics committee to be adhered to. A proposal for this study was presented and accepted in March 2017, and ethical clearance was granted on Application no. ES17/5 in April 2017.

Chapter 2

Conceptual and Theoretical Context: Urban forest development in a multi-level, multi-stakeholder, and multi-disciplinary environment



One of the main streets in a recently developed low-cost housing area in the West Rand region in Gauteng province, showcasing the possibilities for urban tree planting in both private and public spaces, evident by the young trees on the road verge reported to have been donated during an Arbor Week celebration to households (Picture taken by researcher, 2017).

Overview

Much progress has been made in providing homes to millions of urban South Africans who would otherwise be living in informal settlements. However, the strides towards making those homes and residential areas conform to the requirements of urban sustainability and in line with Goal 11 of the SDGs have been gravely slow (Chapter 1). Evidence on the ground, especially for low-cost housing areas in the B4 municipalities (more rural municipalities) suggests that more still needs to be done to create sustainable human settlements. Specifically, urban greening has been and continues to fall behind across most parts of this country. One then wonders, who should be ensuring that trees are planted in these areas? How should they be doing it? Why are they not doing it? How can they do it? These questions point out the gaps in the governance of the urban forest in South Africa, and as it extends to areas on the urban periphery, such as the newly developed low-cost housing areas.

When this study began, it was grounded on the social-ecological framework (SES) developed by McGinnis and Ostrom (2014), and extending to Engeström's (1987) cultural-historical activity theory (CHAT). However, with the progression of the research I began to interrogate the thesis of the research, which shows an emergence of participation and decision-making and upon further engagement with the literature decided against the SES and into a framing that speaks to governance of the urban forest. Therefore, I bring the thesis of this research, which centres on participation and decision-making in the development of the urban forest in low-cost housing areas, to light in this chapter, through the conceptual

framing of urban forestry and social theorization of activities typical of engaging a variety of actors in the development of the urban forest. I do this using a framing for participatory urban forest governance, and a theory of activity in relation to selected actors in urban forest governance. I begin by introducing the urban forest and the concept of urban forestry, with a view of it as a discipline and practice of agency (Perkins, 2014). I proceed to argue for the usefulness of participatory governance in a context where urban forestry was not always a priority, and make a case for the involvement of multiple stakeholders for an effective urban forestry regime. These are emerging themes in Chapter 3, Chapter 4, and Chapter 5. I then propose for an additional theory and framework that could better facilitate an on-the-ground analysis of activities typical of urban forest initiatives in a low-cost housing context by introducing and describing the CHAT, a framing grounding Chapter 6 and Chapter 7. In presenting CHAT, I note the point at which my study does not fully cover all aspects of the theory, and I use this experience for the recommendations presented in Chapter 8.

2.1 Introduction

Following definitions of urban green spaces (UGS) by Fam et al. (2008), Fors et al. (2015), Fratini and Marone (2011), Mensah (2014), Miller (2005), and Schipperijn et al. (2010), I view them as “all areas in the urban space covered with vegetation, whether through natural regeneration or human agency, including trees on any part of the city or town, parks, woodlands, etc.” For the purposes of this study, I therefore contextualize the urban forest as an element of UGS, and my interchangeable use of the urban green spaces concept implies the presence of trees in these spaces.

2.1.1 The urban forest concept

Urban forestry is among the integrative natural resource management approaches to have been developed recently as a means of meeting new urban demands (Konijnendijk et al., 2005). The approach embodies a multi-disciplinary approach to the planning and management of all forest and tree resources in and near urban areas (Konijnendijk et al., 2005). The urban forestry concept is not a straight-forward and simple one to explore (Helms, 2002; Konijnendijk 2000) and define (Konijnendijk et al., 2006), as it requires initial insights into ‘urban’ and ‘forestry’ as independent terms and subsequently bring these together subtly as to not lose their meaning. Reputably, the combination of these two words came about in 1965 at the University of Toronto in response to a request for a name or title to a graduate student’s study of the success and failures of municipal tree planting projects in a borough of metropolitan Toronto (Jorgensen, 1986). No consensus exists on the precise meaning of the terms ‘urban forests’ and ‘urban forestry’ (Randrup et al., 2005), although the most quoted definitions of urban forestry reflect high expectations for the field, encompassing an inclusive perspective of the urban forest as representing various types of green spaces, long term planning, provision of multiple benefits, dialogue between various disciplines and creation of partnerships among stakeholders (Randrup et al., 2005). More normative descriptions of urban forestry have evolved over the years, and they have all stressed its socially-inclusive nature, i.e. the need for urban forestry to involve local residents in policy, planning and management (Konijnendijk et al., 2006; Konijnendijk van den Bosch, 2016).

McFarland (1994) and Strom (2000) define the urban forest as “the land in and around areas of intensive human influence, ranging from small communities to dense urban centres, which is occupied or potentially occupied by trees and associated natural resources, and includes public and private property and street, transportation and utility corridors”. Consequently, urban forestry can be described as the “art, science and technology of managing trees and forest resources in and around urban community ecosystems for the ecological, physiological, sociological, economic and aesthetic benefits that trees provide society” (Miller, 1997). This description strongly suggests that the concept of urban forestry mainly relates to the establishment, promotion, maintenance and management of trees in urban and peri-urban landscapes (Shackleton, 2006). Therefore, the urban forest is not simply street trees and parks, but an ecosystem that includes soil, water, animals, utilities, buildings, transportation systems, people, and vegetation (Strom, 2000). Vegetation includes all plants, woody and herbaceous, regardless of where they are growing (Moll et al., 1995). Urban forestry is a specialist branch of forestry, and is different from the traditional forestry practice in that most forests are considered and managed as a commodity to provide timber resources and other woody biomass products, while in urban forestry however, forests are valued for their aesthetic and environmental qualities; to be “harvested” only when they die or become hazardous (Gerhold, 2007).

The urban forestry term grew “out of a lively counterculture (what Erik Jorgensen recalls as the “happening scene” at the University of Toronto during the sixties), a traumatic environmental disaster (the decimation of urban elm trees by Dutch elm disease), and the intellectual ferment created by media guru Marshall McLuhan” (Dean, 2009), and was then formalized in 1965 by Erik Jorgensen in Toronto, Canada (Randrup et al., 2005). However, the urban forestry practice had long been evident through the care of green spaces, creation of gardens, plantations and planting trees around places of worship as well as buildings as some of the earliest cities such as Egypt, former Persia, Greece, China, and Rome expanded (Grey and Deneke, 1978). Urban tree planting is an old practice historically mentioned in places like Britain in the 1600s–1900s regarding “walks and avenues” (Johnston, 2015), and tree planting in other European cities was traced from boulevard and allée planting in private gardens and, subsequently, in avenues and then public gardens, squares and promenades (Lawrence, 1988). Today, trees in urban areas, which are the focus of this research, are a major component of the urban forest, and tree planting and maintenance are the most dominant practices of urban forestry. Trees can be found anywhere, space permitting, within the urban landscape, including on the street (Strom, 2007) and within domestic gardens (Kaoma and Shackleton, 2014a, 2014b; Kirkpatrick et al., 2011).

2.2 Developing the urban forest: a participatory urban forest governance framework

Many development policies in post-democracy South Africa focus on the democratic and participatory approaches that should be adopted in the planning, development and implementation of programs for communities by local government (or any other governance structure). If we are to develop, expand, and intensify the South African urban forest to reach the most disadvantaged areas within cities, an understanding of the various social, political, and economic conditions at play within all levels of governance is imperative. This is because providing and administering high quality public urban green

spaces, including urban trees, in cities and towns is a practical realm that intertwines issues of planning, design, management and maintenance with governance (Fors et al., 2015). Urban forest governance requires that planning departments have the necessary technical skills and knowledge to include urban forestry in the overall planning process, and the community needs to have the capacity (time, resources, skills and knowledge) to act on the opportunities provided by the governance process (FAO, 2016). Urban forest governance is complicated by a particularly diverse body of legislation and policy – diverse across sectors, and diverse across scales (Lawrence and Dandy, 2012), and there is an emerging body of research which aims to illustrate this on the basis of urban green spaces broadly. Urban forest governance is an emerging framework that has predominantly been tested and implemented in developed world contexts (e.g. Buizer et al., 2015; Fors et al., 2015; Lawrence et al., 2013; Molin and Konijnendijk van den Bosch, 2014; Sanesi et al., 2017), and interrogating their applicability to a developing world context could assist in the establishment of a best-practice approach for advancing tree planting in a context specific to this country.

2.2.1 From government to governance

The most dominant aspect of urban forestry is tree planting and maintenance, and its success or failure is highly dependent on, among other things, its governance structures, including the stakeholders involved, and on how the people who design, implement, and monitor tree planting initiatives implement decisions around planting and management (Pincetl, 2010). The provision of ecosystem services derived from urban trees and green spaces, which also contribute to the quality of life and sense of well-being in towns and cities, is at the cornerstone of urban forestry (Ostoić and Konijnendijk van den Bosch, 2015). This stems from one of the earliest definitions of urban forestry by Jorgensen (1986) states that “urban forestry (...) has as its objectives on the cultivation and management of trees for their present and potential contribution to the physiological, ecological, sociological and economic well-being of urban society.” Before any of this can manifest, there needs to be an effective governance structure in place (Lawrence and Dandy, 2012). Urban forests in many African cities reflect both components of colonial planning as well as governance projects by the post-colonial and contemporary states (Myers, 2016), with strong governance regimes and cultural ideas such as religion or national identity reflected in those trees (Jones and Cloke, 2002). That is why many cities in African countries are populated with alien trees (Gwedla and Shackleton, 2017). This pattern can potentially change with the evolution of governance regimes to ones that are concerned with matching desired ecosystem services and the appropriate trees to deliver those services (Shackleton and Mograbi, 2019). Traditionally, urban forestry has been the domain of the public sector and of municipal authorities in particular (Konijnendijk van den Bosch, 2016), but recent years have seen a shift towards greater involvement of other actors, including businesses, interest groups and local residents, with a range of associated interactions, new institutions and new practices (Konijnendijk van den Bosch, 2014). For example, the Central Park in New York is characterized by co-governance between the Central Park Conservancy and New York’s Parks Department (Konijnendijk van den Bosch, 2014). Urban forest governance is a spatially complex arena of governance because it

involves a range of stakeholders, state and non-state organisations, and this spatial and socio-political complexity is characteristic of urban environmental governance as a whole (Bulkeley and Betsill, 2005).

Urban trees, and by extension the urban forest they comprise, represent a nexus of social, economic, ecological, and political happenings in the city (Heynen et al., 2006), and as evidence “of past and present relationships between actors who occupy different positions within urban society and wield power differentially according to their position”, exist by human design (Perkins, 2014). As a discipline, urban forestry is a multi-level, multi-stakeholder, and multi-disciplinary field (Lawrence et al., 2013). Therefore, urban trees and the urban forest in its entirety are subject to some form of formal and informal governance. Multi-stakeholder governance is an emerging norm in urban forestry practice, reflecting a shift from “governance by government” to “governance with/without government” (Breger et al., 2019; Konijnendijk van den Bosch, 2014). Governance is often used as a term to refer to the involvement of a range of actors in the process of governing, in a decentralised, networked and participatory manner (Buizer et al., 2015). Tacconi (2011) describes governance as “the formal and informal institutions, rules, mechanisms and processes of collective decision-making that enable stakeholders to influence and coordinate their interdependent needs and interests and their interactions with the environment at the relevant scales”. From the context of collaboration, governance can be considered as “a dimension of jointly determined norms and rules designed to regulate individual and group behaviour” (Ostrom, 1990). The concept of governance in urban forestry represents a shift in strategic decision-making and the setting of rules for urban forestry from being the domain of government to encompassing a multi-actor process (Konijnendijk van den Bosch, 2014).

According to Arnouts et al. (2012), there are four ideal modes of governance within various policy domains, namely governmental regulation, closed co-governance, open co-governance, and self-governance (Table 2.1). Governmental regulation is characteristic of hierarchical steering, instrumental vision on policy, and the dominant government, while closed co-governance is typical of a network with limited access and clear borders where authorities are in a role of partner (Buizer et al., 2015). On the other hand, open co-governance typifies a large group of involved actors who engage in mutual learning processes where authorities play a supporting role, and finally, self-governance involves self-regulation, bottom-up decision-making, and authorities play a distant or absent role (Arnouts et al., 2012). These models of governance can be represented in the urban forest, depending on which actor is championing the practice of tree planting and maintenance.

Table 2.1: Comprehensive overview of the four governance arrangements (Source: Arnouts et al., 2012).

Policy domain	Governance arrangements			
	Hierarchical/Governmental regulation	Closed co-governance	Open co-governance	Self-governance
Actors	Mainly governmental actors	Select mixed group of actors	Large mixed group of actors	Mainly non-governmental actors
Power	With government	Pooled	Diffused	With non-government
Rules	Government coercion	Restricted cooperation	Flexible collaboration	Non-governmental forerunning

Urban forest governance can have other governance arrangements based on the objectives and the functions of the various actors involved. The policy arrangement approach originally developed by Arts and Van Tatenhove (2004), and Van Tatenhove et al. (2000) which emphasizes the dynamic and multi-level character of policies (as they represent temporary stabilization of the content and organisation of a policy domain) (Arts and Van Tatenhove, 2004) that may shape the governance of urban forests can also be one of those governance arrangements. An analysis of urban forest governance can focus on one of the four dimensions of the policy arrangement tetrahedron illustrated in Fig. 2.1.

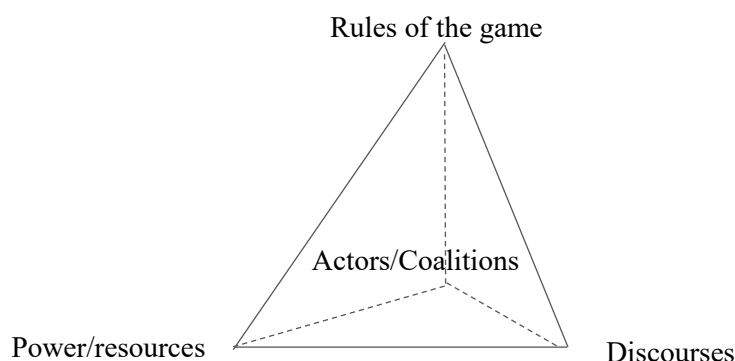


Figure 2.1: A depiction of the typical policy arrangement approach to urban forest governance (Source: Liefferink, 2006).

In the policy arrangements tetrahedron above, actors/coalition relates to governmental and non-governmental actors involved in the policy domain, all operating as governors to some extent, between which coalitions can emerge (Molin and Konijnendijk van den Bosch, 2014). Coalitions refer to a group of at least two actors that work together to achieve a certain goal (Hart and Kurz, 1983; Molin and Konijnendijk van den Bosch, 2014). Rules of the game refer to institutions and the regulations (formal and informal), legislation and procedures relevant to a certain policy domain (Sheppard et al., 2017), and shape the interactions between actors, in terms of formal procedures and informal routines, delineating what actors do and do not do in their dealings with one another (Molin and Konijnendijk van den Bosch, 2014). According to Hajer and Versteeg (2005) discourses can be described as “an ensemble of ideas, concepts and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices”. Finally, the resources dimension relates first of all to power, e.g. in terms of the relative power of governmental and non-governmental actors, referring to the ability that such actors have to achieve a desired outcome through interactions with others, and secondly to their ability to mobilize for example, legal means, property, money, expertise or charisma (Molin and Konijnendijk van den Bosch, 2014). These policy arrangements can be useful in analysing the governance structures of urban forests, and any change in one of its dimensions may affect the other in a negative or positive way (Molin and Konijnendijk van den Bosch, 2014). For example, an introduction of extra resources for tree planting such as subsidies or skills, or their withdrawal, by a government entity may attract new actors who bring those resources, such as businesses, and this may mean an exclusion of some actors and an instigation of new coalitions (Liefferink, 2006).

Taken together, the modes of governance (Table 2.1) and the policy arrangements (Figure 2.1) approach to governance could culminate into an ideal governance arrangement. According to Kooiman (2003), non-governmental actors are able to govern their own affairs in an ideal-type governance arrangement, although governmental actors may be involved as well, but they keep their distance. The open co-governance arrangement presented in Table 2.1 constitutes much more accessible and flexible forms of governing because it involves a large group of governmental and non-governmental actors that engage in stimulating governing activities, and these actors are typically only loosely associated, either organised in several relatively small coalitions that exist beside each other or operating on a more individualistic basis (Arnouts et al., 2012). This mode is deemed by some as ideal, as it is most likely to partially fulfill objectives of all actors involved. However, because of the extensive involvement of all kinds of actors, power is diffused, and resides with the various participants because each of them controls different resources, which are mobilized separately, either by individual actors or by small sub-coalitions that either support or compete with each other (Arnouts et al., 2012).

2.2.2 Actors in urban forest governance

Urban forest governance is complex, and the complexity is largely driven by various discourses, with changing actor constellations, shifting rules of the game, and changing roles and (access to) resources such as knowledge, funding and power (Sheppard et al., 2017). The governance of urban forests entails the arrangement and pattern of actors involved in coordinating and influencing urban forest management activities (Moskell and Allred, 2013). The principal actors and alliances in urban forest governance, and their typical roles, fall into four broad categories (Buizer et al., 2015; Lawrence et al., 2013), namely; government, civil society, businesses, and other third party intervenors such as non-governmental organizations (NGOs) (Sheppard et al., 2017).

2.2.2.1 Government

Government typically represents the top-down or state actors at various levels and scales, with a crucial role for local government. However, in some countries the national governments have also been involved in urban forestry, through policy, funding and research programs (Sheppard et al., 2017). This is similar to South Africa, where one of the national government departments (DEFF) is the custodian of forestry and is responsible for formulating urban greening plans and strategies to be implemented by local municipalities, and supporting various urban greening initiatives (Chapter 3). Modern urban forestry governance is often associated with local government programs for planning and managing trees in parks, streets, and private land (Sheppard et al., 2017). Additionally, local governance structures are well-situated to enhance communication with the public, public participation (Ssekibuule, 2015) and involvement of stakeholders and forest users due to their close links to the local public (Lawrence et al., 2013). However, the role of local government in urban green spaces and urban forestry may be strongly influenced by its internal structure and relationships with other bodies (van der Jagt and Lawrence, 2019).

Because of their statutory functions as service providers and urban planning authorities, and often also as public landowners, local authorities have a central role to play in urban forest governance and are also well-placed to draw up urban forestry strategies and management plans (van der Jagt and Lawrence, 2019). Urban forestry teams in local government have responsibility (and liability) for many direct interventions on the urban forest, including maintenance, tree risk assessment and mitigation, and replanting (Sheppard et al., 2017). These activities typically adhere to practices, standards and norms such as Tree Risk Assessment protocols adopted by many North American cities (Dunster et al., 2013). Unfortunately, there are barely any such standards prescribed specifically for municipalities in South Africa (Chishaleshale et al., 2015), and several of the broader development or housing policies refer to the need for environmental sustainability and to minimize the impacts of development and housing initiatives (Shackleton et al., 2014). Furthermore, most municipalities in the country do not have standalone urban forestry plans, teams or departments, as urban forestry is prevalently incorporated into other broad departments like Waste Management (Chishaleshale et al., 2015; Gwedla and Shackleton, 2015). However, some of the larger municipalities, including the City of Mbombela, City of Cape Town, Steve Tshwete Local Municipality, and eThekweni municipalities, have their own such standards and norms.

2.2.2.2 Civil society

Civil society is characteristic of bottom-up actors such as citizen and stakeholder groups, civic organizations, volunteers, residents, among others (Sheppard et al., 2017). Civic organizations and individual volunteers focused on urban environmental stewardship have organized around efforts to regulate the relationship between the built and natural environments, and are subsequently driving the formation of an emergent governance structure in many cities throughout the world (Connolly et al., 2014). Many a times the roles played by civic organizations and stewardship groups are oppositional, pushing the public and private sectors to adopt policies that protect ecosystem services despite economic or other incentives to do otherwise (Connolly et al., 2013). For example, urban environmental stewardship has become an essential part of ongoing efforts to improve quality of life through direct action, engagement with local government, and oppositional politics in New York City, where a growing set of stewards have worked literally to make the city a greener place by planting, maintaining, and restoring existing green spaces through the provision of labor and resources for planting trees, monitoring water quality, expanding urban agriculture, maintaining parks and gardens, and cleaning waterfronts (Connolly et al., 2014).

Citizens and residents have become an increasingly important actor in the governance of urban green spaces (Rosol, 2010), especially as volunteers (Hauer et al., 2018). Political attention for involving local residents in decision-making about their surroundings, including urban green spaces, has increased, and with proven paybacks from well-designed involvement processes (Molin and Konijnendijk van den Bosch, 2014). For example, positive social interactions and sense of community associated with ownership (Speller and Ravenscroft, 2005). Local residents can have strong opinions about which trees, urban forest structure and urban forest services they prefer (Gundersen and Frivold, 2008). However,

they are not always involved in decision-making regarding which trees or the general structure of the urban forest (Morgenroth et al., 2016). There are various ways this can be overcome, including community engagement in urban forestry that is initiated by third party organizations or by residents themselves (Sheppard et al., 2017). According to Sheppard et al. (2017), true community engagement in urban forestry is characterized by “a two-way process between experts/managers and the public, and should not be confused with the one-way flow of information in public relations exercises which are typically steered from the managers/experts side”. Meaningful engagement of residents can confer legitimacy to final outcomes of programs and initiatives, but it is important that a wide range of voices, interested or affected parties, and public values are integrated into the process (Beierle and Cayford, 2002). The South African IDP process is a good place to begin such engagements in this country, but currently environmental issues receive little attention (Ruwanza and Shackleton, 2016). Within civil society, different groups of people may emerge, including urban environmental stewards. These are individuals, and sometimes groups of individuals, who conserve, manage, monitor, and advocate for the local environment, as well as also educate the public about the local environment (Fischer et al., 2007). Their site-based efforts to sustain urban ecosystem services have increasingly been linked with governance processes concerned with preserving quality of life in cities (Connolly et al., 2013), and they sometimes serve as direct managers of small parks and gardens, street trees, wetlands, and other sites that provide ecosystem services (Barthel et al., 2010).

There is a general assumption of a hierarchical model of government policy, decision-making, and community consultation in governance literature (Sheppard et al., 2017). This is not necessarily the case for urban forestry, because it features another major channel of public involvement through volunteerism, where those who are engaged carry out management activities in the public realm, work that would otherwise be done by government staff, contractors, or not at all (Miller et al., 2015; Molin and Konijnendijk van den Bosch, 2014). Hauer et al. (2018) recently estimated that people volunteered 1.48 million hours in some municipal tree capacity within the USA, which equated to nearly 5% of municipal tree care activities completed by volunteers. This is not particularly prevalent in fields such as urban design or building management (Sheppard et al., 2017). More than many other benefits, volunteering can greatly contribute to financial savings for the delivery of tree planting activities and initiatives (Hauer and Peterson, 2016), which is one of the major constraints experienced by small municipalities in their quest to develop, expand and manage the urban forest (Gwedla and Shackleton, 2015). Considering Arnouts et al. (2012)’s modes of governance discussed above, volunteers can be a key part of any governance models, including co-governance, co-management, and even self-governance (Sheppard et al., 2017). I engage further with volunteerism in Chapter 3 and Chapter 4.

2.2.2.3 Businesses

Businesses, such as water and utility companies, developers, companies investing in tree planting and managing assets for social corporate responsibility, private contractors, landscapers and other parts of the ‘green industry’ are typically involved in urban forestry in various roles. Miller and Bate (1978) highlighted some of these roles, stating that government leaders in Wisconsin felt that more

developmental activities in urban forestry programs would have occurred if assistance from businesses had been provided to their city or town. In South Africa, many businesses are actors in urban forestry governance because of their investments in tree planting initiatives as part of their corporate social responsibility (CSR). For example, Kinoca Minolta South Africa has committed to a CSR project for sustainability with a vision to “participate, educate and conserve our unique country” (Kinoca Minolta, 2018). They do this by investing in trees which they donate for urban greening events (they have partnered with one of the NGOs sampled in Chapter 3), and the conservation and protection of rhino against poaching in South Africa. Corporate funders and regional philanthropy are also prevalent in the USA for funding local tree planting (Roman et al., 2015). For example, funding for post-planting care in the Kingsessing and Powelton tree planting projects in Philadelphia was provided by a variety of local to regional private foundations (Roman et al., 2015), and respondents from two tree distribution programs in New York City and Worcester, USA, commented that corporate sponsorship was particularly important to their programs (Nguyen et al., 2017). Therefore, businesses are able to offer much needed assistance, usually in the form of grants or trees, for tree planting initiatives.

2.2.2.4 Third-party interveners

Interveners are defined as agents or organizations who attempt to catalyze social mobilization within a societal group, and can include third party interveners such as NGOs, professional organizations, and researchers, who often play pivotal roles with governments in tree planting initiatives (Sheppard et al., 2015), and sometimes synergistically with other stakeholders towards a common goal. Foo (2018) acknowledges that NGOs often coordinate tree planting initiatives, and have become essential to the delivery of urban environmental serves. For example, NYC Parks and the highly professionalized, non-profit greening group the New York Restoration Project (NYRP) were the lead entities that began to work together through a formal public-private partnership in the MillionTreesNYC (Campbell et al., 2016). In other instances, university staff is often involved in urban forest resource assessments as well as advising on policy-making and management (Sheppard et al., 2017). This was the case in the MillionTreesNYC campaign where the Research and Evaluation Sub-committee, which was part of the Advisory Committee, included university partners (Campbell et al., 2016). The same can also be said with consultants who may act on an advisory capacity about issues pertaining to the urban forest.

Lawrence et al. (2013) designed, tested, and proposed a systematic approach to researching and understanding urban forest governance frameworks (UFGF) as a means of comparing approaches, using examples from across Europe, including Belgium, Italy, Sweden and the UK. In their examples, Lawrence et al. (2013) incorporated various contexts of urban green spaces, including street trees, urban woodlands, parks, and plantations (Table 2.2). This framework (Table 2.2) consists of a set of overarching dimensions can be used to compare cases in a formal and systematic way (Lawrence et al., 2013). I attempt to use some of these dimensions in Chapter 3 to analyse the various cases of urban forestry for low-cost housing areas. However, the analysis is limited by the lack of available data in each case, wherein I improvise by presenting the available common variables in all cases. This framework demonstrates a move towards engagement, and a more holistic approach to governing urban forests in a

more participatory way that supports a trend towards more ‘governance with government’, where previously ‘governance by government’ was the norm (Lawrence et al., 2013).

Table 2.2: The urban forest governance framework as a research tool (Source: Lawrence et al., 2013) (continued on next page).

Variable		Summary information for comparable table	Further options and details to include in narrative
Case	Examples	Name of the case	Location of the case
Type		A label to distinguish between a single project, a programme, a plan, a network, etc.	The governance model may be described (e.g. community managed woodland; local authority team)
Scale		Neighbourhood, city, region, nation	Reason for classification (e.g.
Context	Forests, Trees	Street trees, woodlands, parks. Area if possible	Description of landscape, quality and history of woodlands
	People	Size of catchment (population)	Ethnic diversity, culture, and demographics
Institutional framework	Policies	National, regional or local policies, plans and programmes that affect urban forestry	Relevant detail about present/past policies, plans and programmes
	Planning and regulations	Planning and legal requirements specific to the case, and which affect the implementation of urban forestry in the area	Wider context e.g. national forestry regulations, and spatial planning systems, can be described if relevant (e.g. if purpose is to compare different national contexts)
	Ownership	Of the land; any changes to ownership required to implement the programme and how that is achieved	e.g. historical change; owner types
	Access and use rights	Rights to walk/cycle and/or make use of products from the urban forest	e.g. historical context; campaigns to change rights
Actors and coalitions	Primary stakeholders	List of those who are active in developing and implementing the work	The roles of the primary actors can be described here
	Other stakeholders	List of additional stakeholders with an interest or influence, or who use the outcomes	Additional information on the stakeholders and their role can be added
	Partnerships	Formal connections between organisations to help deliver the urban forest	Description of the partnership and the roles of the partners
	Power analysis	Amongst the actors and stakeholders, who makes decisions? Who gets what they want, who does not? Is this through influence, democratic processes, campaigning?	Detailed theoretical work not easily summarised in few words in the table. The description of conflict for example may require in-depth qualitative research. Inclusion dependent on aims of the study
Resources	Funding	Grants received, taxes, trading	When appropriate, amount and type of funding can be described
	Knowledge and information	How technical information (such as tree species composition) is provided and accessed, whose knowledge is available and used in making management decisions	References to technical guidelines or design/management types can be added. Discuss balance of expert, lay and local knowledge
	Delivery mechanisms	Policy tools that support implementation, e.g. incentives, grants offered, projects, staff	Details on tools mobilised can be described
Processes	Discourses	The main various relevant narratives, perspectives, conflicts, framing in the media, described concisely	Describe narratives, conflicts and framing relevant to the description of the governance process
	Participation, engagement, conflict management	Ways in which actors and stakeholders are consulted, engaged, involved and empowered, in decisions and delivery. Conflict management processes	Details of processes
	Monitoring and evaluation	Ways in which the work is monitored; contribution to transparency and accountability?	References to online reports

Liefferink (2006)'s typical policy arrangement approach, the four ideal modes of governance within various policy domains proposed by Arnouts et al. (2012), and Lawrence et al. (2013)'s urban forest governance framework are all complementary framings, especially when applied to urban green space and urban forestry management and governance. They all acknowledge that effective governance requires a collaboration of various stakeholders, acting within an institutional framework that outlines policies and regulations, as urban green spaces and urban forests are about place-making and place-keeping for improved quality of life where everyone has some responsibility towards them because they are shared spaces. Finally, all three framings imply that the most successful and effective urban forest governance model should have some form of a participatory process. Following Buizer et al. (2015) and in the context of urban forestry, participatory governance of the urban forest refers to arrangements in which citizens, entrepreneurs, NGOs and other non-governmental parties develop and manage networks of urban forests with urban green spaces at different levels, with or without the involvement of formal authorities. Therefore, I suggest the robust incorporation of participation in any conceptual and analytic framework for urban forest governance. This is particularly important for a context such as in South Africa, where the divide between the rich and the poor is wide and is clearly mirrored in the distribution, quantity, and quality of the urban forest.

2.2.3 Participatory urban forest governance: a South African perspective

Urban forestry and tree planting in South Africa are predominantly perceived as practices for the white or the rich elite who live in affluent areas by the predominantly black poor communities living in townships and low-cost housing areas (not to say that white people do not live in these areas, but the majority of the population is black) (Gwedla, 2016). This ideology has been largely perpetuated by peoples' observance of a system that actively invests in urban green spaces and green infrastructure in most affluent areas but barely doing the same in the less affluent ones. I examine the state of urban forests (which is almost non-existent in some parts) in the poor, low-cost housing areas in greater detail in Chapter 4. Therefore, citizens and residents have to be conceptualized as integral and active participants in the governance system in every aspect, including decision-making, so that they too can begin to normalize the idea of having trees in public spaces. Norms, culture and cultural values are intrinsic to urban communities, and these values inform peoples' desires to have trees or not, or hinder or enable efforts around tree planting (Chapter 5). Therefore, an understanding of these dynamics, expressed in real-time during planning processes where the community actors are present could be paramount in ensuring that the need for urban trees is not only embraced, but it empowers residents to champion tree planting.

Participation is the backbone of democracy globally and in South Africa. Various platforms have been established to ensure that this happens, as evidenced by the extensive legislation supporting public participation in local governance (Ngamlana and Mathoho, 2012). The South African constitution makes citizen participation central to local governance (Ngamlana and Poswayo, 2013), and the White Paper on Local Government (1998) laid a strong foundation for the establishment of pro-poor developmental local government, with strong citizen participation a central tenet (Everatt et al., 2010). While the DEFF is the custodian of forestry in the country, urban forestry and urban greening is a local government issue

(Chapter 3) implemented by municipalities as part of service delivery. The IDP of local governments is the basic platform for public participation in urban planning and management (Ruwanza and Shackleton, 2016).

The IDP process in South Africa was designed to embody participatory governance because it is meant to provide a demand-driven approach to service delivery, where citizens voice and prioritize needs (Everatt et al., 2010). This feeds into local planning and budgeting for the short, medium and long term, attempts to promote a close match between supply and demand, and enables communities to define their goals, needs, and related priorities (Williams, 2006). However, this does not necessarily translate to reality on the ground, because government has been unable to work in partnership with civil society to achieve many of its goals (Fieuw and Mitlin, 2017), coupled with the absence of any organized bodies, whether a community-based or non-governmental organization, in the IDP process in some municipalities (Botha, 2018). Notwithstanding this, it is important to note that full participation is much broader and transcends the IDP-related activities because it “requires a re-thinking of the ways in which state and citizens engage one another, and the transfer of decision-making power and resource allocation decisions from state to citizens” (Everatt et al., 2010).

A critique of the IDP process and limited participation is beyond the scope of this thesis. However, it is imperative to note the way citizens participate in decision-making through this process, and I believe that the current model of participation gives little room for individual residents to express themselves about things that may not necessarily be popular in their communities, including urban greening and tree planting. A closer look into the IDP processes of many municipalities in the country shows that they fit among the lower rungs of Arnstein’s (1969) ladder of participation (Siphuma, 2009), which is best described as consultative or legitimating participation. This is evidenced in some of the IDP processes undertaken by some municipalities in this study, where in almost a year-long process of the IDP; only one week is dedicated to residents’ consultation and participation. This is despite the municipalities’ assertions that “one of the main features about the integrated development planning process is the involvement of community and stakeholder organisations in the process. Participation of affected and interested parties “ensures that the IDP addresses the real issues that are experienced by the citizens of a municipality” (2018/2019 IDP document for one of the sample municipalities.

Participation is crucial in creating spaces for decision-making informed by co-learning and knowledge-sharing between different stakeholders because bridging the existing gaps between different stakeholders is vital for improving collaboration, and in turn facilitating the effective transfer of knowledge, between them (Ugolini et al., 2015). This is particularly important in a setting with various actors with different backgrounds and kinds of knowledge. After all, knowledge is a conglomeration of ideas, beliefs, tacit skills and values that shape what we know (Muñoz-Erickson, 2014), and should therefore never be an “exclusive preserve of any particular domain of society (i.e., science), but rather of different policy cultures (i.e., civic-social, bureaucratic-political, economic, and scientific)” (Jasanoff and Wynne, 1998). Making cities greener by planting, maintaining, and restoring existing green spaces are acts of environmental stewardship and governance, and integrated knowledge and intense coordination among

an array of social actors is required to navigate the complex process of environmental stewardship and governance in urban areas (Connolly et al., 2014). The spaces of co-learning and knowledge-sharing are especially crucial for tree planting as they could provide a platform for residents in low-cost housing areas especially, to understand the need for trees, rather than allowing a municipality to only consider them as an after-thought. However, the majority of these models are western-based, and therefore may be inappropriate or not easily applicable in developing world contexts, especially in the face of the various systemic and institutional dynamics of everyday living in low-cost housing areas, as outlined in Section 1.1.5 of Chapter 1. While Western models have strengths, their weaknesses need to be carefully examined and considered before modification, adoption and implementation. For example, the urban forest governance narrative presented above does not account for weak interests in participatory local governance, which is largely prevalent in the poor South African low-cost housing context, as alluded to in Section 1.1.3 of Chapter 1. Another dimension to the South African context not catered for in the general literature on urban forest governance literature is the livelihood strategy of keeping livestock in urban areas that is prevalent in many low-cost housing areas (Shackleton et al., 2017b), and I report on this further in Chapter 5. Indeed, the inclusion of all actors in the planning and development of the urban forest could mitigate this. However, it would mean an expansion on the duties of some departments, and a mandatory working relationship and collaboration between different departments.

2.3.4 Governing the private urban forest

The private urban forest is another viable hub for expanding the urban forest, and presents potential for future planting (Shakeel and Conway, 2014) as much of the green space in modern cities exists in the private gardens of low-density, suburban residential developments (Pearce et al., 2013), and residential lands constitute a major component of existing and possible tree canopy in many cities (Nguyen et al., 2017). Urban forest campaigns cannot meet their canopy goals without tree planting and conservation on private residential lands (Grove, 2014). It is becoming more pertinent for more investment in the private urban forest, especially for a country where institutional support for long-range urban forest plans is weak (Hungerford and Moussa, 2017; Mensah, 2014; Myers, 2011). After all, tree cover in private land is an important complement to public tree cover (Daniel et al., 2016). The governance of the private urban forest is not as complex as that of the public urban forest because homeowners and residents are largely responsible for the planting and maintenance of the trees in their households, although support from municipalities and NGOs through tree giveaways plays an important role (Nguyen et al., 2017), and their planting endeavours are generally in accordance with by-laws stipulated by local government (Chapter 3). However, private tree cover is not only affected by the attitudes of individual owners or residents (Pearce et al., 2015), but by a range of direct and indirect governance mechanisms, including those regulating the trees themselves and those regulating household and development density (Nasar et al., 2007). Therefore, it is important that local governments, as implementers of urban greening, develop both direct and indirect policies for regulating urban trees on private land for their urban amenity and service value (Daniel et al., 2016), and should consider options such as regulation, tree ordinances, zoning and development planning, and incentives and integration of private land owners and residents

into the process (Pearce et al., 2013). That way, disservices of urban trees, such as those inflicted by alien invasive species, can be minimized. Factors associated with the governance of the private urban forest, and the decision-making associated with it in low-cost housing areas are explored in Chapter 4.

Given these points, the testing of a pilot participatory urban forest governance approach in which residents from low-cost housing areas are involved, from the conceptualization and implementation is needed. To do this, an understanding of the various actors, their roles, as well as the socio-cultural and socio-political or socio-economic dynamics that influence their exercise of power in those roles, is crucial. Therefore, I introduce a social theory that will help me understand and communicate the various activities and associated entities that may be required for tree planting supported by policy to low-cost housing areas.

2.3 Cultural-Historical Activity Theory

2.3.1 Background

Cultural-Historical Activity Theory (CHAT) provides a theory and methodology to examine how groups of people with different experiences and perspectives working on the same object can work on new problems and jointly develop new knowledge or tools to address the problems (Daniels, 2008; Engeström, 1987, 1999). Each word in the CHAT acronym is significant in describing the theory. According to Foot (2014), *cultural* refers to the proposition that humans are enculturated, and everything people do is shaped by and draws upon their cultural values and resources, and *historical* is used together with cultural to indicate that since cultures are grounded in histories and evolve over time, analyses of what people do at any point in time must be viewed in light of the historical trajectories in which their actions take place. The term *activity* refers to what people do together and is modified by both cultural and historical dynamics to convey its situatedness, and *theory* denotes the status as a conceptual framework for understanding and explaining human activity (Foot, 2014; Gretscher et al., 2015).

CHAT is the current and still developing outcome of two related, but different, strands of work: sociocultural psychology and activity theory (Edwards, 2005). Sociocultural psychology is concerned with overcoming “the inherent separation of mind and world, or self and context, to be found in interactionism” (Edwards, 2005). Activity theory is focused on collective consciousness and a Marxist concern for the historical, social and economic foundations of thinking and acting (Chaiklin, 2001). As such, at the junction of these two intellectual traditions, CHAT does not support the separation of mind and world but offers an account of human consciousness in relation to collective, object-oriented, practical activity. CHAT is derived from the works of Kant and Hegel (Jonassen and Rohrer-Murphy, 1999), who provided the foundation for the more contemporary philosophy of Marx and Engels (Engeström and Miettinen, 1999; Nunez, 2014). CHAT is based on the premise that when people are involved in an activity, they want to transform nature, society, or some other object, and in the process of transforming the objects, people become cognitively transformed under existing material conditions (Nunez, 2014).

2.3.2 Principles of CHAT

CHAT is guided by five core principles, and in describing these, Engeström (2001) puts forward that:

1. The prime unit of analysis in activity systems is a “collective, artefact-mediated and object-oriented activity system” seen in its network relation to other activity systems; and any interpretation of “goal-directed individual and group actions” that are subordinate units of analysis must be based on the background of entire activity systems (pg. 136);
2. Activity systems are multi-voiced and are a nexus of many points of different perspectives and views, traditions and interests. Multiple layers and strands of history are embedded in the rules and division of labour. The multi-voicedness of activity systems may be a source of both tension and innovation (pg. 136);
3. Activity systems are characterized by historicity, where they take shape and are developed over long periods of time and should be analysed in terms of their local history, objects, outcomes and genealogy of conceptual tools that have shaped it over time (pg. 136). The historicity of these systems means that they undergo long cycles of change which may influence their composition and nature (Engeström, 2001);
4. Activity systems are characterized by contradictions between and within systems, and these are potential sources of change and development. These contradictions are historically accumulating structural tensions within and between activity systems (pg. 137); and
5. Activity systems have the potential for expansive transformations, which occur through relatively long cycles of qualitative transformations. Expansive transformations can be achieved when the object and motive of the activity are reconceptualized to embrace a radically wider horizon of possibilities than in the previous mode of the activity (pg. 137).

While all these principles are crucial in analysing activity, the last two principles are significant because they point towards the mechanisms through which activity systems transform over time (Avis, 2007). Each of the principles described above guide the process of activity systems analysis, which I discuss in more detail and in relation to urban forestry and tree planting below.

2.3.2.1 Principle 1: The “activity” in CHAT

In presenting the activity concept, it is important to distinguish between the contexts in which the concept can be used, and which of those is relevant for this study. In the English language, “activity in the sense of cultural-historical activity theory, and activity in the sense of doing things, are not distinguished, leading to considerable confusion in the research community because theoretically important distinctions are not made” (Roth, 2007). In light of this, activity as a term should not be equated with relatively brief events with definite beginnings and end points, but an evolving, complex structure of mediated and collective human agency (Roth and Lee, 2007). Accordingly, tree planting, an

aspect of urban forestry advocated in this study, is “a cultural-historical activity with objects and motives that contribute to maintaining human societies, and thus, to maintaining individuals” (Roth and Lee, 2007: 198).

The unity of consciousness and activity is the most fundamental assumption of activity theory (Kaptelinin, 1996). The activity system, which provides a meaningful context to understanding individual action, can be defined as “any ongoing, object-directed, historically conditioned, dialectically structured, tool-mediated human interaction” (Russell, 1997: 510). It is the primary unit of analysis in CHAT, and consists of a group of people pursuing a specific goal in a purposeful way (Peal and Wilson, 2001). This comes from the notion that activity cannot be understood or analysed independently of the context in which it occurs. It is therefore crucial that when one analyses human activity, one examines not only the kinds of activities that people engage in, but also who else is engaging in that activity, what their goals and intentions are, what objects or products result from the activity, the rules and norms that circumscribe that activity, and the larger community in which the activity occurs (Jonassen and Rohrer-Murphy, 1999).

2.3.2.2 Principles 2 and 3: Elements of activity systems and generations of CHAT

According to Engeström (1987), an activity system in CHAT has seven elements which interact together for an optimal result of an activity. These elements are: i) the subject, ii) the object, iii) the tools and mediating artefacts, iv) the community, v) division of labour, vi) the rules, and vii) the outcome. Table 2.3 describes these elements, and provides examples of what they represent in the context of this study, as guided by Chapter 3 and implemented in Chapter 6 and Chapter 7.

Table 2.3: The elements of an activity system (Source: Engeström, 1987) (continues on next page).

Element	Description of element	Example in current study
Subject	An individual or group of actors engaged in an activity (Jonassen and Rohrer-Murphy, 1999), whose viewpoint is adopted (Engeström, 1987). The subject represents the person or people who are directly participating in the activity and provide the point of view for studying an activity	The Department of Agriculture, Forestry and Fisheries (DAFF) as the custodian of forestry.
Object	The object is the physical or mental production that is sought in an activity (Jonassen and Rohrer-Murphy, 1999), and represents the raw material or problem space at which the activity is directed (Engeström, 1993). The object is acted on by the subject and represents the intention that motivates the activity (Jonassen and Rohrer-Murphy, 1999), which is immediate (Kain and Wardle, 2002).	The mandate of the Forestry Regulation and Oversight department of DAFF to design and facilitate greening programs, support implementation of greening plans, and the maintenance of trees in urban and rural settings, together with municipalities.
Tools	The external, internal or symbolic artefacts used in the transformation process of the object into the outcome (Jonassen and Rohrer-Murphy, 1999). Tools mediate the object of activity which could potentially lead to a desired or unexpected outcome, or enable or constrain an activity (Engeström, 1987).	Workshop materials and brochures about tree planting used by DAFF during workshops and demonstrations for residents.
Community	The participants of an activity system who share the same object (Engeström, 1987). The activity is shaped by the interests of the community (Kain and Wardle, 2002).	Food and Trees for Africa as a non-profit partner to DAFF

Rules	Regulations to the subject's actions towards an object, and relations with other participants in the activity (Foot, 2014). Rules can be explicit and implicit, and regulate actions and interactions within the system wholly (Kuuti, 1996). They also represent the norms, conventions and values of the community, and are instrumental in managing or minimizing conflicts or tensions within activity systems (Kain and Wardle, 2002).	DAFF conventions on developing a Greening Plan, and a municipality's guidelines in implementing the Greening Plan
Division of labour	The allocation of responsibilities, tasks and roles among individuals or groups of the community towards the object, and the division of power and status within the system (Engeström, 1987).	Workshop facilitation and the digging of holes for the tree planting demonstration
Outcome	The desired result of working on the object (Engeström, 1987). The outcome of activity systems is a more removed and ongoing motive of the activity (Kain and Wardle, 2002).	Municipality adoption of the Greening Plan and Strategy, implementing the strategy; residents planting trees in their private spaces after workshops.

Generations of CHAT

Activity theory has evolved through three generations of research (Engeström, 1999), and the first-generation, centered on Vygotsky, created the idea of mediation (Engeström, 2001). The second-generation, which centers around Leont'ev, brings the crucial difference between an individual action and a collective activity to light (Engeström, 2001), while the third-generation illuminates the idea of a shared object as a result of interactions between two, or more, second-generation activity systems (Edwards, 2005; Mukute, 2009). In this study, I use the second and third-generations of CHAT to demonstrate the activity systems associated with tree planting in South African low-cost housing areas, which will be discussed in detail in Chapter 6.

2.3.2.2.1 First-generation CHAT

The first generation of CHAT is commonly expressed as a triad of subject, object, and mediating artifact (Engeström, 1987) (Fig. 2.2). In this generation, Vygotsky concentrated on the symbolic mediation of culture and on the relationship between human actions (object), human subjects (individuals), and cultural artefacts (tools) (Elhammoumi, 2002; Engeström, 1987). The introduction of cultural artefacts into human actions rendered that an individual could no longer be understood without his or her cultural means; and that society could no longer be understood without the agency of individuals who use and produce artefacts (Engeström, 2001). Thus, "objects became cultural entities and the object-orientedness of action became the key to understanding human psyche" (Engeström, 2001:134).

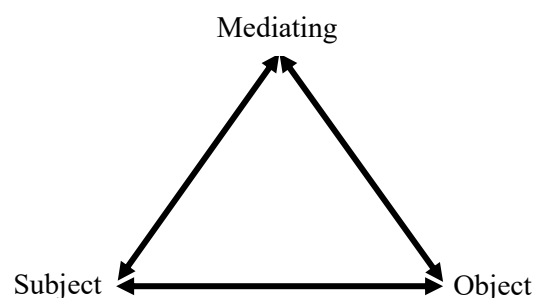


Figure 2.2: Vygotsky's first-generation activity theory model of mediated act (Source: Engeström, 1987).

The first-generation alone was limited because the unit of analysis remained individually focused (Engeström, 2001). Subsequently, Leonti'ev's example of the 'primeval collective hunt', which "explicated the crucial difference between an individual action and a collective activity" (Engeström, 2001), built on this and shifted the focus from mediation tools to the object in the triad, arguing that activities are motivated by their object (Edwards, 2005). However, Leont'ev did not graphically expand Vygotsky's original model into a model of a collective activity system (Engeström, 2001), and it was Engeström (1987) who subsequently developed the second-generation activity theory on the basis of Leont'ev work.

2.3.2.2.2 Second-generation CHAT

Prior to the formal development of this generation by Engeström (1987), Leont'ev had argued that individual action is not only culturally mediated, but also always situated in a context of a historically developed collective praxis (Virkkunen and Kuutti, 2000). Consequently, Engeström's expanded second-generation of CHAT examines systems of activity at the macro level of the collective and the community in preference to a micro level concentration on the individual actor or agent operating with tools (Cole and Engeström, 1993). It distinguishes between "action" and "activity", where an action is conducted by an individual or group to fulfill some "goal", while an activity, in contrast, is undertaken by a community and it has an "object" and a "motive" (Fig. 2.3) (Bakhurst, 2009).

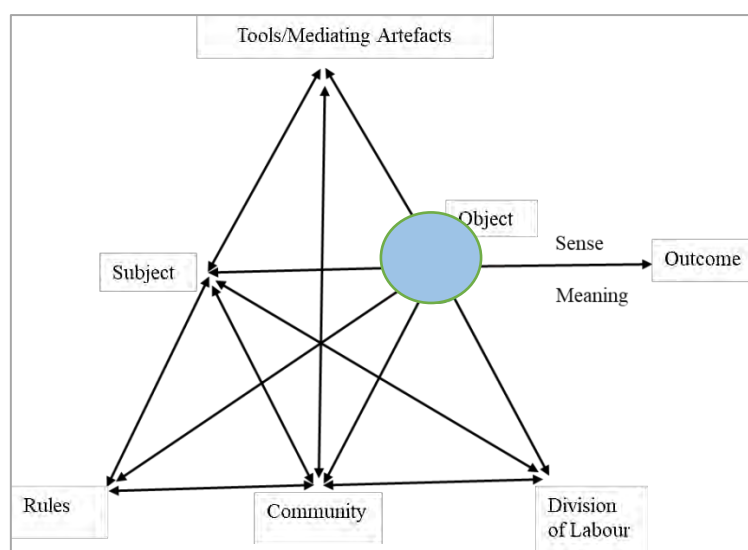


Figure 2.3: The structure of the second-generation activity system (Source: Engeström, 2001).

In this generation, the unit of analysis is defined as object-oriented, collective and culturally mediated human activity (Kaptelinin, 2005), and focuses on interrelations between the individual and their community by integrating social or collective elements of community, rules, and division of labour with various means of production (Fig. 2.3). I explore these interrelations in the context of tree planting for low-cost housing areas in Chapter 6 of this study. In the graphical representation of the second-generation (Fig. 2.3), the uppermost sub-triangle may be seen as the 'tip of the iceberg' representing individual and group actions embedded in a collective activity system (Engeström, 2001). The oval depicts an object, and "indicates that object-oriented actions are always, explicitly or implicitly,

characterized by ambiguity, surprise, interpretation, sense making, and potential for change” (Engeström, 2001: 134). Activity systems in the second-generation are generally open systems, and are therefore susceptible to interact with other neighbouring activity systems.

2.3.2.2.3 Third-generation CHAT

Building on second-generation CHAT, third-generation CHAT takes joint activity as the unit of analysis (Engeström, 1999; 2001), and is a result of the interaction between two or more activity systems that share an object (Fig. 2.4) (Edwards, 2005). This generation supports the notion that all activity systems are part of a network of activity systems that in their totality constitute human society (Daniels, 2008). Furthermore, third-generation CHAT intends to develop conceptual tools to understand dialogues, multiple perspectives, and networks of interacting activity systems (Engeström, 2001). I demonstrate this network of activity systems in Chapter 6 of this study.

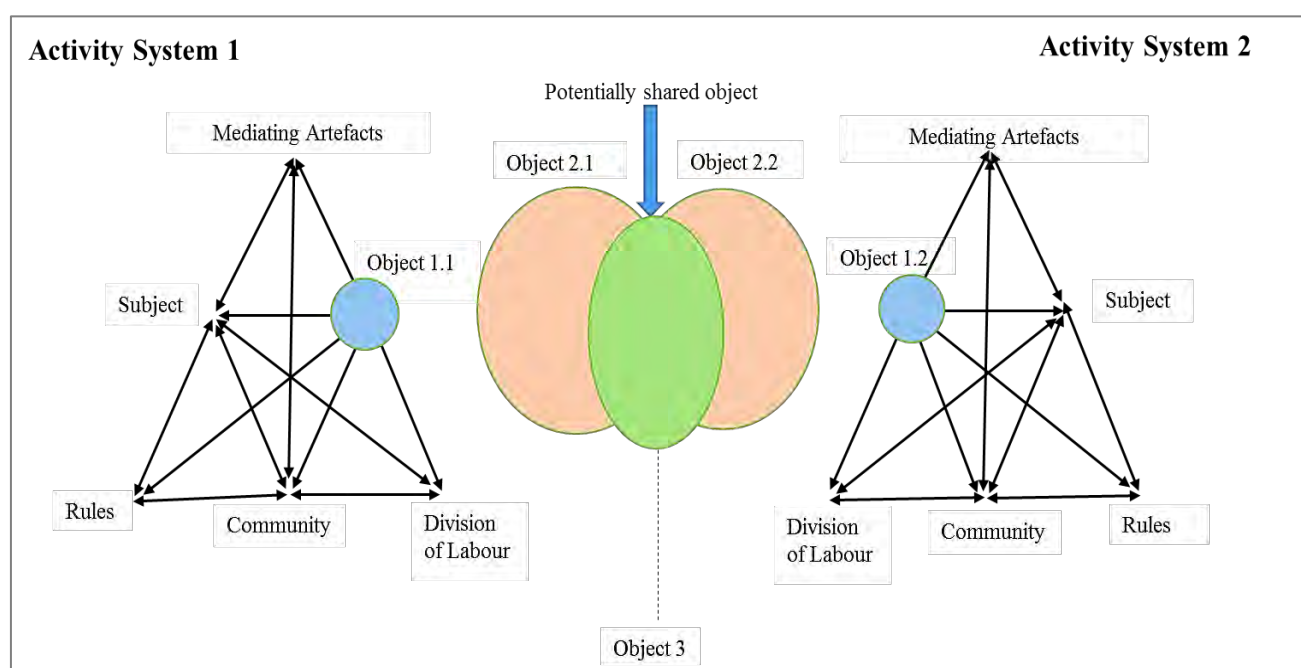


Figure 2.4: Interacting activity systems representative of the minimal model for the third-generation activity system (Source: Engeström, 2001).

The third-generation of CHAT probes the process of social transformation and includes the structure of the social world in analysis, taking into account the conflictual nature of social practice (Daniels, 2016). Here, instability (internal tensions) and contradictions (See 2.4.5) are seen as the “motive force of change and development” (Engeström, 1999), and the transitions and reorganizations within and between activity systems as part of evolution (Daniels, 2016). Engeström (1999) further asserts that in this generation, both the subject and the environment are modified through mediated activity, and the “reflective appropriation of advanced models and tools” are “ways out of internal contradictions” that result in new activity systems (Cole and Engeström 1993: 40).

2.3.2.3 Principle 4: Contradictions in CHAT

Contradictions were first identified as “a historically accumulated dynamic tension between opposing forces in an activity system” (Ilyenkov, 1974), and Engeström (1987) further developed the concept in the third generation activity theory as a source for change and development, which open up opportunities and call for novel solutions that can lead to transformations in activities. Activity systems evolve through contradictions, and these represent sources of conflict, dilemmas, disturbances, and discoordination (Roth, 2004), which can potentially create transformative changes in activity patterns in the form of learning and development (Engeström, 1987). The most fundamental contradiction is that of the dual existence of human activity both as total societal production and as one particular production among other particular productions (Engeström, 1987), which emphasizes that “the general (i.e., societal production) is as concrete as the particular (i.e., specific production) in a specific activity system” (Roth, 2004: 5). There are often multiple points of contradiction in an activity system, and these can be social, organizational and political in nature (Jones, 2014). Within the context of tree planting, these contradictions may also be ecological or biophysical in nature, especially in relation to natural phenomena such as climatic conditions or weather events. Figure 2.5 depicts the various positions where contradictions can occur within a network of third-generation activity systems (where the zig-zag arrow and red lightning arrow vector indicate a contradiction).

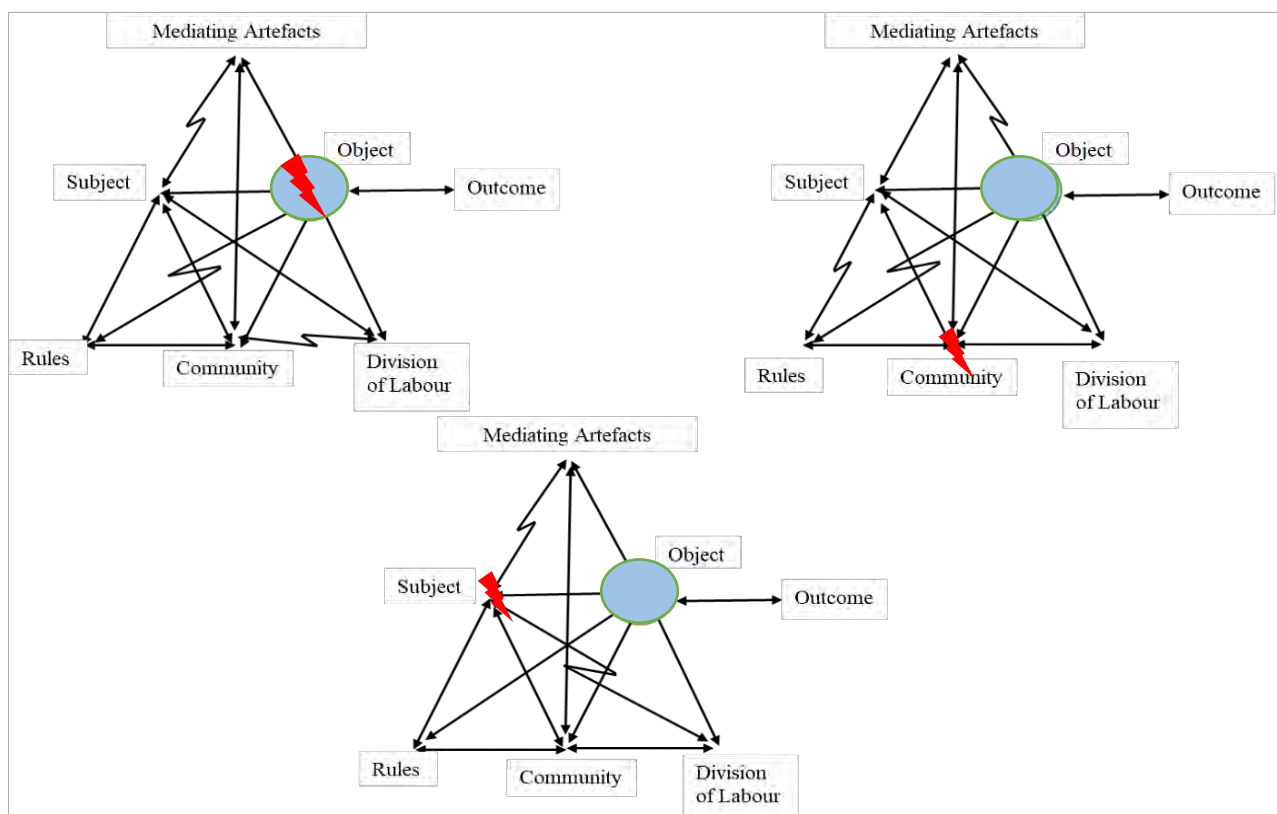


Figure 2.5: Potential contradictions within and between third-generation activity systems (Source: Engeström, 2001).

The human activity system has four levels of contradictions depending on their positions in the network of activities (Virkkunen and Kuutti, 2000), namely: i) primary, ii) secondary, iii) tertiary, and iv) quaternary contradictions (Engeström, 1987; Roth and Lee, 2007). Actors often try to remove these

disturbances by changing and developing the cultural mediators of the activity (Virkkunen and Kuutti, 2000). Engeström's (1987) articulation of CHAT suggests that "the different layers of contradictions in each cycle of development in an activity system is contingent upon, and somewhat overlapping of the previous cycle" (Foot, 2011), which means the contradictions may be related; primary contradictions may develop into secondary contradictions, which may also shape and influence tertiary and quaternary contradictions (Kachilonda, 2015). I explain these contradictions in detail in Chapter 7. Contradictions are historically emergent and systemic phenomena, and should therefore be approached through their manifestations, especially in empirical studies where we have no direct access to them (Engeström and Sannino, 2011). These manifestations may be treated as constructions or articulations of contradictions, but taking note that contradictions cannot be constructed arbitrarily (Engeström and Sannino, 2011).

2.3.2.3.1 Manifestations of contradictions

In change efforts and interventions in particular, contradictions are manifested and constructed in patterns of talk and discursive action with the help of which actors try to make sense of, deal with and transform or resolve their contradictions (Engeström and Sannino, 2011). The contradictions described above can manifest in various ways (Table 2.4), and have come to be known as discursive manifestations. Engeström and Sannino (2011) suggest that discursive manifestations of contradictions can be in the form of i) double binds, ii) critical conflicts, iii) conflicts, and iv) dilemmas.

Table 2.4: Types of discursive manifestations of contradictions (Source: Engeström and Sannino, 2011).

Manifestation	Features	Linguistic cues
Double bind	Facing pressing and equally unacceptable alternatives in an activity system. Resolution: practical transformation (going beyond words)	"we", "us", "we must", "we have to", pressing rhetorical questions, expressions of helplessness, "let us do that", "we will make it"
Critical conflict	Facing contradictory motives in social interaction, feeling violated or guilty. Resolution: finding new personal sense and negotiating a new meaning	Personal, emotional, moral accounts narrative structure, vivid metaphors "I now realize that [. . .]"
Conflict	Arguing, criticizing. Resolution: finding a compromise, submitting to authority or majority	"no", "I disagree", "this is not true" "yes", "this I can accept"
Dilemma	Expression or exchange of incompatible Evaluations. Resolution: denial, reformulation	"on the one hand [. . .] on the other hand"; "yes, but" "I didn't mean that", "I actually meant"

Bateson (1976: 206) as quoted by Engeström and Sannino (2011) defines double binds as "processes in which actors repeatedly face pressing and equally unacceptable alternatives in their activity system, with seemingly no way out", and they typically represent a situation which cannot be resolved by an individual alone, a situation that makes it difficult for the system to progress unless those contradictions are addressed. Accordingly, a discursive elaboration of a double bind typically involves an attempt at a transition from the individual "I" to the collective "we", such as "we must", "we have to," loaded with a

sense of urgency, and “the resolution of a double bind requires practical transformative and collective action that goes beyond words but is often accompanied with expressions such as “let us do that”, “we will make it” (Engeström and Sannino, 2011) (Table 2.4). Critical conflicts, on the other hand, relate to situations where people face inner doubts that paralyze them in front of contradictory motives unsolvable by the subject alone (Engeström and Sannino, 2011), and typically involve feelings of being violated or guilty, often silenced (Sannino, 2008). Conflicts relate to forms of resistance, disagreement, argument and criticism (Engeström and Sannino, 2011) resulting when an individual or a group feels negatively affected by another individual or group, for example because of a perceived divergence of interests, or because of another’s incompatible behaviour (De Dreu and Van de Vliert, 1997). Finally, dilemmas refer to expressions or exchanges of incompatible evaluations, either between people or within the discourse of a single person, and are commonly expressed through hedges and hesitations, such as “on the one hand [. . .] on the other hand” and “yes, but” (Engeström and Sannino, 2011). In analysing and identifying the types of discursive manifestations that surface in an activity system, Engeström and Sannino (2011) recommend the use of linguistic cues (Table 2.4). I use these discursive manifestations to identify the contradictions in the activity systems that emerged in this study, as presented in Chapter 7.

The discursive manifestations described above are typical of contradictions in activity systems, and can be sources of development and change (Morselli, 2019). Contradictions of activity systems at times become aggravated (Engeström, 2001), a point where some members start questioning and diverging from established norms, leading them to engage in a collective and purposeful effort to innovate and change (Morselli, 2019). Contradictions of this nature present possibilities for expansive transformation (Engeström, 2001), which is achieved in the successful reconceptualization of the motive and object of their activity, for a larger array of possibilities than in the previous activity systems (Morselli, 2019). In essence, contradictions act as driving forces for expansive learning when new or changed objects of activity are recognized and the need of the new object turns into a motive for meeting that need (Jóhannsdóttir and Roth, 2014).

2.3.2.4 Principle 5: Expansive transformations of CHAT

When participants in an activity system identify or recognize and resolve the contradictions that ensue in the system, the activity system transforms and change, learning and development occur (Murphy and Rodriguez-Manzanares, 2008) and the system moves beyond its previous form to become something new (Avis, 2007). Expansive learning represents a transformative and pragmatist theory in which cultural-historically emerging and evolving change and the creation of the new are essential (Toiviainen and Kerosuo, 2013). A full cycle of expansive transformation (Fig. 2.6) may be understood as a collective journey through the zone of proximal development of the activity (Engeström, 2001). This zone of proximal development of the activity represents a point where an analysis of tensions in activity systems and identification of their underlying contradictions enables a foreseeable or possible development in collective human activities (Engeström, 1987: 174).

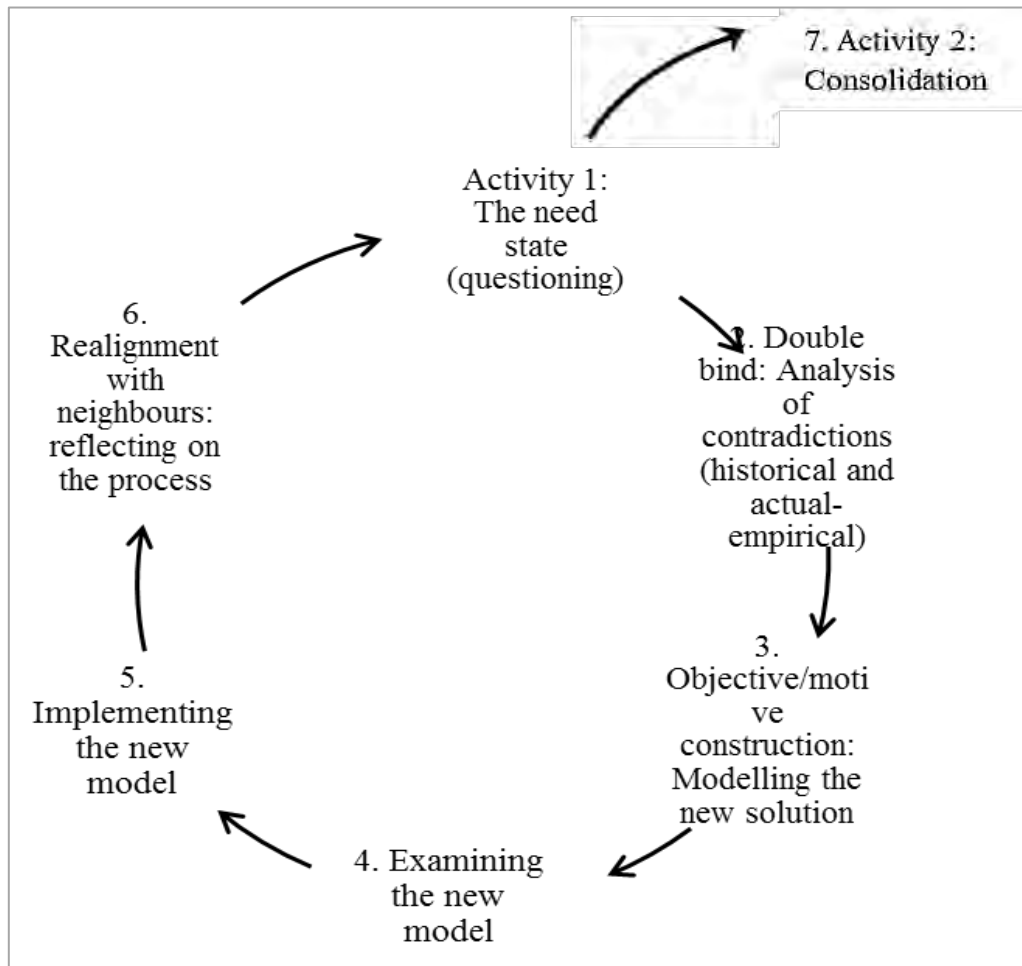


Figure 2.6: The phases and strategic learning actions of the cycle of expansive learning and transformation (Source: Engeström, 1999).

The cycle begins with an identified misalignment within elements of the initial activity where participants begin to question and interrogate current practices (Engeström, 2001; Avis, 2007). This stage of the cycle corresponds to primary contradictions embedded with conflicts or tensions within one element of the activity (Fig. 2.6), and these questions and contradictions potentially generate new practices. For example, a question on the responsibility for tree planting may arise within a tree planting activity system, followed by a variety of suggestions. The consequence of this would be an identification of other potential stakeholders who were initially not perceived as role-players in tree planting, potentially transforming the activity of tree planting. The pressure to identify and develop a new practice is then usually initiated by secondary contradictions which manifest themselves in disturbances between two elements in the activity as double binds (secondary contradictions) (Jóhannsdóttir, 2014). For example, a new actor for tree planting in the form of a non-profit organization (community) could come with more funding and skills (tools) and this will impact the budgetary restrictions currently in place (rules) and enable a more comprehensive tree planting initiative where more people will benefit (transformed activity). This transformed activity is representative of “the formation of a new model for enhanced practice based on re-thinking the object

and motive of the activity” (Jóhannsdóttir, 2014). Here, the new model of activity may be put in practice as a future-oriented innovative solution to the problematic situation (Jóhannsdóttir, 2014), and is susceptible to numerous modifications during modelling. In the context of tree planting and urban forest governance, this may very well be the transition from tree planting and urban forest governance solely by government to one that involves a multitude of actors who all have some form of power or influence to the activity system. Implementing the new model is the next step in the expansive cycle, and is characteristic of tertiary contradictions that surface between the initial activity system, which in my example would be the government tree planting activity system, and the new one that involves other stakeholders.

There is a possibility for government actors to not want to relinquish their power in the new activity and therefore want to continue governing the urban forest the same way they did before other actors came on board, and this causes imbalances in the system. This then calls for the “reconceptualization of the object of the new activity system to embrace a radically wider horizon of possibilities than in the previous mode to the activity” (Jóhannsdóttir, 2014). Success in this comes when the new form of practice (division of power) is realigned, evaluated and consolidated, and may potentially cause disturbances to other neighbouring activity systems, causing quaternary contradictions. In the example of new actors to the tree planting and urban forest governance activity system, this new form of activity could now mean that the municipality would have to change some of its by-laws to align with accommodating the emergent practice of urban tree planting.

2.3.3 Applying CHAT in the context of participatory urban greening

While CHAT is a relatively old theory and field of study, not many disciplines and contexts have applied its robust methodology, especially in the environmental and/or natural resource management realm. CHAT in natural resource management has been applied as an analytical tool in education and learning research, including environmental learning as social and organizational learning processes that may aid in natural resource management. For example, Mukute and Lotz-Sisitka (2012) used the theoretical and methodological tools of CHAT and critical realism to examine the introduction and expansion of sustainable agricultural practices in southern Africa with the aim of bridging the gap between top-down knowledge transfer and bottom-up participatory approaches to learning. In another instance, Lindley and Lotz-Sisitka (2019) explored factors inhibiting improved wetland management within a corporate plantation forestry context to determine if, and how, expansive social learning processes could strengthen organizational learning and development to overcome these factors. In both instances, the focus was centered on some form of learning and intervention as they were set to address a particular challenge within a natural resource management space.

There are barely any studies in urban forestry that seek to explain learning and development processes through CHAT methodology, especially in relation to participatory processes. This may be because

CHAT is more of a methodological framework rather than a theoretical one. As such, it may be understandable that its application is mainly prevalent in studies geared towards an intervention or innovative ways of solving problems rather than those reporting on current trends.

CHAT as a methodological and analytical tool has widely been used in the education, and healthcare sectors. Some of Engeström's early scholarly work uses healthcare as a demonstration for how activity systems are conceptualized. Within the same sector, Gretscher et al. (2015) used CHAT as a theoretical lens for understanding how occupational therapists design interventions for persons living in low-income conditions in South Africa, while Carm (2018) converged the health and education sectors by developing and implementing a learner-centered interactive HIV/AIDS education program to develop a localized and relevant HIV/AIDS prevention strategy in Zambia using CHAT. Within the education sector, Olvitt (2010) used CHAT to understand the nature of ethics-oriented workplace learning by exploring the activity systems of two young environmental education learner-practitioners struggling to engage with the ethical dimensions of their professional work and the professional development course they are studying, while Yamagata-Lynch and Haudenschild (2009) explored teacher perspectives on the situational factors that influence their professional development using activity systems and identifying contradictions in these systems.

CHAT has three components, namely the system, learning, and development (Dick and Williams, 2004), and it uses systems-based thinking to gain insights about the real world (Mukute and Lotz-Sisitka, 2012). Its expansion into Expansive Learning means it is geared towards application which involves the social relevance and embeddedness of knowledge, community involvement, and guided practice (Engeström, 2005). This is especially relevant in a context that seeks development, change and innovation, which is the very essence of the application of CHAT in this study. Urban greening is a practice, and is thus reliant on learning and innovation to advance.

The utility of activity system analysis in the last two empirical chapters of this thesis will allow me to reflect on the interaction of various factors, which I introduce in this chapter, including the role players and actors interested and involved in tree planting, the various roles they play, the resources they use in their varied roles and the implications of that in the success or failure of a tree planting initiative, coupled with the dynamics that characterize a typical low-cost housing area in South Africa (Chapter 1). When CHAT is used as a tool for analysing participatory urban greening initiatives, it is important to understand the context and motive of the initiative. For example, CHAT may be used to understand or analyse how volunteers in a tree planting initiative learn, or how their agency develops. It may also be used to understand how urban forestry practitioners introduce and expand sustainable urban greening practices. Mukute and Lotz-Sisitka (2012) used CHAT to investigate and expand farmer learning in southern Africa. Their research foregrounded knowledge transfer and the types of learning environments necessary for sustainable agriculture practice. Consequently, the use of an activity systems analysis can be optimally achieved when actors interested in urban forest

establishment and governance seek innovative ways to get trees planted. The South African housing area context requires innovative ways, and an interventionist approach to ensure that trees are not only planted, but their sustainability is seen to as well. This goes for programs and initiatives for tree planting too. The interventionist approach to the planting of trees speaks to the various limitations (Chapter 5) currently faced by small towns and municipalities in rolling out service delivery, part of which is the planting of trees.

While I present CHAT to a point of expansive learning and transformation, I acknowledge that my study did not reach an expansive process because I used the theory as a tool of analysis rather than as a formative intervention and expansive learning process. However, the entire study serves as a starting point for potential exploration of an expansive learning approach to tree planting in low-cost housing areas, which I describe in more detail in the recommendations made in Chapter 8.

PART II: EMPIRICAL INSIGHTS

Chapter 3

Urban Tree Planting Landscapes in South Africa: Lessons from Tree planting Initiatives for Low-Cost Housing Areas

Urban greening refers to organized or semi-organized efforts to introduce, conserve, or maintain outdoor vegetation in urban areas, including a range of policies, incentives, and initiatives to vegetate the urban landscape (Eisenman et al., 2019). “Urban greening in South Africa includes townships and informal settlements specifically because in the past these areas were disadvantaged in terms of planning for parks as well as tree planting in streets and open spaces” (DAFF Urban Greening Strategy, 2013).



Some of the trees delivered to the Rosedale low-cost housing area for open space planting as part of the 2019 Arbor Month celebrations (Researcher present; picture used with permission from IERM).

Overview

This chapter reviews the general urban tree planting landscape of South Africa. This review fulfills Objective 1 of this study, which sought to compare and assess the characteristics of tree planting programs initiated in low-cost housing areas in South Africa within the last 5-10 years, part of which was to ascertain the governance structures of these programs. In fulfilling this objective, I asked the following key questions:

- a) Who is mandated to plant trees in urban areas of South Africa?
- b) What characterizes a typical tree planting program for low-cost housing areas in South Africa?
- c) What lessons can be learned for successful tree planting in low-income housing areas during and after planting?

3.1 Introduction

Effective governance is an important ingredient for sustainable urban forest management (Lawrence et al., 2013). Governance can be defined as efforts ‘to direct human action toward common goals, and more formally as the setting, application, and enforcement of generally agreed rules’ (Kjaer, 2004). In the context of this study, the common goal is tree planting in public and private spaces of the low-cost housing areas developed since 1994 within the rules set, applied, and enforced by a governing entity in the country. Within this context, urban planners and managers play central roles in shaping the structure and appearance of urban areas at multiple scales (Broussard et al., 2008; Gulsrud et al., 2013), from macro-scale zonation of city functional elements, to micro-scale designation and management of individual trees and green spaces (Gwedla and Shackleton, 2015). At household level, homeowners or occupants implement decisions associated with the designation of trees and green spaces (Conway, 2016), while municipal managers largely take such decisions for tree planting in the public realm (Lawrence et al., 2013). However, urban residents cannot be absolved from participating in decision-making associated with public space greening, as they too are beneficiaries of the ecosystem services offered by these spaces, directly or indirectly (Shackleton et al., 2014). Many tree planting initiatives are implemented in cities as tree distribution/giveaway initiatives for private spaces (Nguyen et al., 2017) or trees planted by entities for public space planting through public-private partnerships between local government and non-profit organizations, as demonstrated by Young (2011) in his review of best practices in planning green infrastructure in eight major cities in the U.S. According to McPherson and Young (2010), municipal governments and environmental non-profit organizations in many cities across the United States have undertaken tree planting programs to increase urban tree canopy cover. Non-profit organizations have emerged to fill the void in tree planting and stewardship services on public lands and easements (Perkins et al., 2004; Svendsen and Campbell 2008), and many cities now prioritize efforts to improve urban tree canopies, including through “million trees” campaigns, and rely on partnerships with non-profit organizations to design and implement these programs (Battaglia et al. 2014; Donovan and Mills 2014). Other civil society actors such as community groups are also progressively getting involved in urban forest establishment and management activities, as well as urban tree stewardship activities on public land (Svendsen and Campbell, 2008). Indeed, municipal agencies are increasingly reliant on the civil society sector and private property owners for managing trees planted on public land (Pincetl, 2010). For example, Roman et al. (2015) concluded that stewardship by staff and volunteers in planting and maintenance contributed to the high survival rates of urban trees two planting initiatives in East Palo Alto, California and West Philadelphia, Pennsylvania.

Tree planting initiatives can operate and be implemented at varying spatial scales, such as at the scale of the neighbourhood, at city-scale, and at national scale. The institutional arrangements and modes of governance in these programs usually vary by the scale at which the initiative is implemented and the type of program it is (tree distribution/giveaway initiative or trees being planted by the program staff itself). For example, tree distribution/giveaway initiatives may target a particular neighbourhood or city, and the

distributing entity may make the decisions on the acquisition of trees and the species of trees to be distributed while the recipients only decide where to plant the trees in their private spaces and how to go about maintaining them. The scale and popularity of tree planting initiatives intended to maximize and sustain the ecosystem services associated with urban forests has increased over the years (Koeser et al., 2014). Urban forest expansion on both public and private land has been achieved through either small and medium-scale afforestation or reforestation (which are typical of large-scale urban greening projects over a long period of time (Yao et al., 2019). While projects at all three scales vary widely in their process and organizations, they are generally aimed at the same broad goals such as urban afforestation, improved canopy for enhanced benefits, and improving the distribution of trees across neighbourhoods.

3.1.1 Neighbourhood and city-scale urban tree planting

Tree planting initiatives implemented at the neighbourhood and city-scale are usually small and are typical of single cities in selected sites where municipalities or organizations embark on tree planting initiatives for a particular community over a relatively small area of land (Yao et al., 2019), although they may be multiple small areas within a single municipality. An example of such initiatives is one championed by Canopy, a non-profit organization based in Palo Alto, California, whose mission is to “grow urban tree canopy in Mid-Peninsula communities for the benefit of all” (Canopy, 2019) and “to bring the life-giving benefits of trees to the schools, neighbourhoods, and public spaces of the San Francisco Mid-Peninsula” (Roman et al., 2015). This initiative was created in 1996 as a spin-off from Palo Alto’s Tree Task Force, and became an independent non-profit in 2002 (Roman et al., 2015), and they “prioritize tree planting, stewardship, education and advocacy in communities where people do not have a thriving urban forest due to limited resources, competing priorities, and historical development and urbanization patterns” (Canopy, 2019). Their strategies include 1) to *engage* by planting trees in partnership with residents, volunteers, school communities, municipalities, and grassroots partners, 2) to *educate* by creating life-long environmental stewards through exploration and education about trees and tree care, 3) using *stewardship* as a rigorous approach to tree care and maintenance by always engaging the community towards high rates of tree survival and longevity, and 4) to *advocate* by upholding and promoting policies and funding that protect trees and promote a healthy urban forest (Canopy, 2019). In 2018, the organization planted 323 trees and 784 landscape plants across 12 community sites, and tended 844 young trees in the ‘working class’ municipality of East Palo Alto (Canopy, 2019).

The Massachusetts Greening the Gateway Cities Program (GGCP), which was initiated in 2014 by the state of Massachusetts (Breger et al., 2019) is an example of a city-scale urban tree planting initiative. It is a state-managed urban tree planting initiative that runs urban tree planting programs in 26 municipalities (Breger et al., 2019) with populations ranging between 35 000 and 250 000 people, and average household income and a bachelor’s degree attainment both rating below the state’s average (Commonwealth of Massachusetts, 2016). Furthermore, the program targets parts of cities that have low tree canopy, old housing stock, high wind speeds, and a large renter population, with an environmental justice lens of ensuring benefits to the neighbourhoods most in need (Breger et al., 2019). Environmental justice in urban

forestry involves both the equitable distribution of environmental benefits for all city residents and the equitable involvement in decision-making processes regarding the natural environment (i.e. procedural justice) (Carmichael and McDonough, 2019), and Jennings et al. (2012) state that promoting participatory landscape development is a key element of promoting environmental justice. The goal of the program is to reduce household heating and cooling energy use by increasing tree canopy cover by 5 %-10 % in selected urban residential areas (Breger et al., 2019; Commonwealth of Massachusetts, 2017). While the program is managed by the Massachusetts DCR, it is implemented with the cooperation of local program partners, such as municipal agencies and local NGOs (Breger et al., 2019). The program is funded and managed by state-level staff, who simultaneously conduct tree acquisition, siting, planting, and maintenance at the municipal level (Breger et al., 2019).

3.1.2 National-scale urban tree planting

National-scale urban tree planting projects and initiatives extend across multiple cities over a long period of time (Yao et al., 2019) and can include a diffuse set of often loosely related tree planting events hosted by various organizations with huge variation in scale and partnerships. As such, they may have varying institutional arrangements and governance structures with flexible collaborations between stakeholders and diffused power, which is typical of Arnouts et al. (2012)'s open co-governance arrangement. National-scale projects and initiatives are typically based on pre-existing forest resources, but there has been a surge of progressive urban and peri-urban afforestation programs over the last century globally. An example of a national-scale urban tree planting project would be the Million Trees Initiative (MTI) which has extended over various cities globally.

The MTI, initiated in 2007, is a partnership between city governments and non-profit organisations, although residents, property owners, business and community organisations are often invited to be involved in the planting and care of urban trees (Pincetl, 2010). Furthermore, the MTI encompassed a series of initiatives across various large cities across the United States (USA) and other countries, including Los Angeles, New York City, Shanghai, Denver, London, and Ontario, where each had their own governance and partnership arrangements. For example, the success of the NYC MTI, which is by far the only one which managed to plant the millionth tree, can be attributed to the financial investment provided by both the city and a very well-funded non-profit organization. The Million Trees Los Angeles (MTLA), one of the mayoral tree planting initiatives embedded within municipal climate protection plans (McPherson and Kendall, 2014), was launched in September 2006, and pledged to plant one million urban trees over a few years, which had translated to ~400 000 trees planted by 2013 (McPherson, 2014). The initiative is administered by the Department of Public Works and led by employees of the Million Trees LA Foundation which is a non-profit organization, with a number of corporate sponsors through donations and grants (McPherson, 2014). MTLA relies heavily on its internal city departments and non-profit partners, including Fuego Tech Rangers, Hollywood/ Los Angeles Beautification Team, Koreatown Youth & Community Center, Los Angeles Conservation Corps (LACC), North East Trees, and TreePeople, to deliver the program to neighborhood residents (McPherson, 2014; Pincetl, 2010). In the initiative, street

and yard tree planting projects occur in residential areas when trees are adopted by locals who agree to maintain those planted on their property or along the street, and tree adoption requests are parcelled out by MTLA staff to the non-profit responsible for activities in the area (McPherson and Kendall, 2014).

The Arbor Day initiatives also fall within the national-scale urban tree planting initiatives, and are an example of the diffuse set of often loosely related tree planting initiatives that are popular across the globe (Parkin et al., 2006). Tree planting done under the banner of Arbor Day/Week/Month are not necessarily centrally coordinated and they take place on varying dates, by country and the best planting weather. For example, celebrations in the U.S. take place in April, while July is the official Arbor Day month in Australia (Jones, 2010a). Arbor Day celebrations date back to 1872 in the USA, when a Nebraskan newspaper editor, J. Sterling Morton, persuaded authorities that planting trees would play an important role in greening and enriching what was then known as the ‘great American desert’ (Eisenman, 2015), a message which resonated with the broader Nebraskan community. This day is largely associated with tree planting in schools and public institutions, and characterized by educational activities. A member of the Lanesborough Tree & Forest Committee in Lanesborough, Massachusetts relayed this, saying: “...we have a very nice Arbor Day celebration which we happen to celebrate in May because April in the Berkshires is way too cold. We work with the third-grade class up at the Lanesborough Elementary...they do tree art, they write tree poems, and we go up and have a day of tree education with them” (Harper et al., 2018).

Several countries in southern Africa, including Lesotho, Malawi, Namibia, South Africa, and Zimbabwe, also have annual tree planting days, or weeks (Guthri and Shackleton, 2006). Zimbabwe has a national policy that requires every household to plant a tree on the designated day, each year (Campbell et al., 2002). Niger has a National Tree Day that is celebrated annually on 03 August (Hungerford and Moussa, 2017). Arbor Day was celebrated for the first time in South Africa in 1983 (Parkin et al., 2006). Each year an indigenous tree is nominated, the first of which was South Africa’s national tree, the yellowwood (*Podocarpus* species), and in 1996 two species were nominated, and the celebration of Arbor Day extended to an Arbor Week, from 1 to 7 September (Parkin et al., 2006). This was also recently extended to a month, and the month-long campaign is managed by the national DEFF. Its aim is to “promote a better understanding of trees, especially indigenous trees, highlight the important role trees play in sustainable development, the livelihoods of people and their environment, encourage communities to participate in various greening activities within their own surroundings, and to raise awareness of South Africa’s urban greening initiatives” (Parkin et al., 2006).

The colonial and apartheid histories of South Africa and their lasting ill-effects are testament to much of the uneven and unequal distribution structure and composition of the urban forest. In terms of the structure, there is a stark juxtaposition of relatively rich, developed areas (Chishaleshale et al., 2015) of leafy, low density suburbs and adequate infrastructure (Kuruner-Chitepo and Shackleton, 2011), against very poor and underdeveloped ones with high density suburbs still experiencing backlogs in infrastructure development (Shackleton et al., 2014). Specifically, affluent areas have a larger and more diverse urban forest than the poorer township and low-cost housing areas (Kuruner-Chitepo and Shackleton, 2011;

Gwedla and Shackleton, 2017), patterns that are replicated between the poor and wealthy towns and municipalities too (Gwedla and Shackleton, 2015). Such patterns are present elsewhere in the world, with legacies of white privilege and inherited landscapes also present in the current distribution of urban tree canopy in cities like Baltimore, USA (Grove et al., 2018).

Echoing the recommendation by Shackleton (2006) that urban forestry research in South Africa should focus on a description of the current extent and nature of urban forestry in various parts of the country, across a range of municipalities, and a range of communities within municipalities, one of the starting points would be to evaluate and understand the current landscape of urban tree planting in South Africa to identify where it is done, who does it, and how they do it. Lessons of successes and failures from such programs are potentially valuable in ensuring any efforts to overcome the barriers to tree planting discussed in Chapter 5 are not in vain. This is particularly crucial and needed in a country like South Africa where urban forestry is still afforded very little to no priority in local budgets (Gwedla and Shackleton, 2015).

3.2 Methods

3.2.1 Study area

This study was conducted in various low-cost housing areas across South Africa with respondents from respective entities between March 2017 and March 2019. The locations of the ten tree planting programs implemented by various entities in low-income housing areas across South Africa are represented in Fig. 3.1.

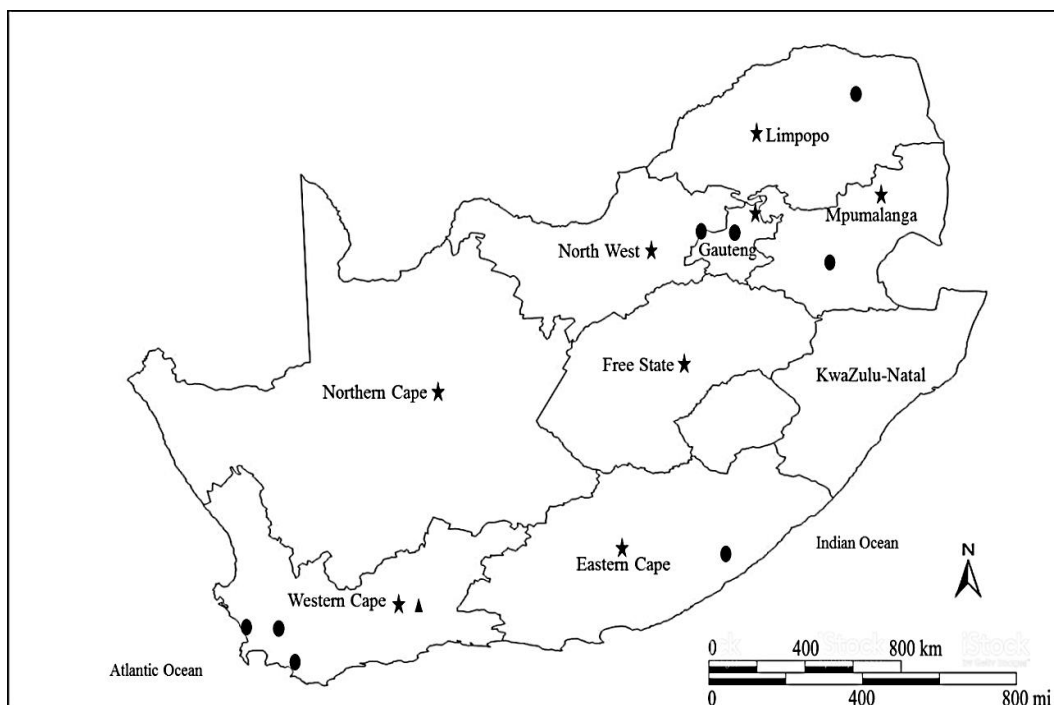


Figure 3.1: The distribution of reviewed tree planting initiatives across South Africa (★= tree planting across the country; ▲= planting across a province; ●= planting in individual regions or towns).

Most South African urban areas display at least three spatially discrete and visually distinctive residential areas (Kaoma and Shackleton, 2014b), namely (1) relatively new, low-income RDP housing areas

occupied by poor black South Africans, (2) townships with a mix of old and new housing occupied mostly by poor, and less poor, black South Africans and (3) suburbs ranging from middle to high income areas, occupied mostly by white South Africans, but with increasing presence of other racial groups over time (Shackleton et al., 2018). According to Stas SA (2015), Free State province had more households in low-cost housing areas (34 % of total formal dwellings) in 2014 than other provinces, followed by the Western Cape (26 %), while Limpopo province had the least (15 %). Patterns of urban tree distribution vary between these types of suburbs, from abundant in the more affluent areas to relatively scarce in the poorer low-income housing (Gwedla and Shackleton, 2017; Kuruner-Chitepo and Shackleton, 2011; Shackleton et al., 2014).

3.2.2 Data collection

Data collection took place between March and December 2017. I identified examples of tree planting programs in low-income housing areas around the country using snowball sampling. Initially, I approached branch chairs of the Institute for Environment and Recreation Management (IERM) to introduce the study and enquire about tree planting initiatives taking place in their respective branches. The IERM is “a non-profit, common-law association owned and governed by the municipalities who are its members, which serves as a platform for networking opportunities for municipal managers who are responsible for the management of public parks, open space and recreation facilities” (IERM, 2019). The branch chairs are distributed over nine branches across the country, representing all provinces. I communicated with the branch chairs via telephone and email. This inquiry yielded 87 results. The response rate for these programs and initiatives was 38 %. However, only 10 respondents could provide relevant data on the initiatives they had been part of for this review.

I subsequently conducted face-to-face interviews with the personnel who were responsible and directly involved in each of the initiatives. I sought signed consent for their participation (Appendix 5). The professions of these respondents varied, from program managers in NGOs and parastatals, to forestry development officers in national government, and urban foresters, horticulturists and municipal parks managers in municipalities. In these interviews, I used a semi-structured approach (Appendix 6) to facilitate open and free flowing discussion on the nature of tree planting in the program, and I put emphasis on i) the urban tree planting initiatives that have been undertaken by the entity in the last 5-10 years, ii) the spatial focus of those initiatives, iii) tree planting initiatives in low-income housing areas, iii) the location of planted trees, iv) residents’ participation in those initiatives, and v) the general outcomes of the initiatives. All respondents consented to the recording of the interviews via a tape recorder to ensure that full details were available for later analysis. The interviews were 0.75–1.00 h long and conducted either in isiXhosa or English according to the respondent’s preference. I sought permission to access documentation related to the respective projects, which I used to supplement the interviews, and visited the sites where the programs had been implemented. Some respondents could not provide documentation of the programs, but advised me to visit the websites of their organizations or departments for more information. In these

documents and websites, I sought to verify data such as the number and types of trees planted, the project duration, stakeholders involved and their roles, and project limitations and successes. During site visits I was able to speak to some people in households where trees had been planted. During these conversations, I requested permission to take pictures and briefly asked them about where they got the trees and how they were taking care of them, and what having those trees meant to them. Finally, I attended one of the Arbor Month tree planting events as both a participant and an observer, to get first-hand experience of a typical Arbor Day tree planting event. I sought permission to take pictures during the event from all the different groups of participants.

3.2.3 Data analysis

The taped recordings were transcribed, and content analysis used to understand and summarize the characteristics of each project. I noted the common themes amongst all interviews to present data characteristic of all projects. While the common themes had been pre-determined as were part of the discussion prompt sheet (Appendix 6), other projects had missing information and thus the common these were in relation to the information that was available for all 10 programs. Interviews were replayed up to four times, and the respondents were directly quoted during the interpretation and presentation of data. I studied the documentation and websites supplied and extracted all the relevant information related to the reviewed projects to verify some of the information that was shared in the interviews. Based on the transcripts and documents studied, I used Lawrence et al. (2013)'s proposed the UFGF as a research tool (Chapter 2) to analyze and present the characteristics of various tree planting initiatives. In this regard, the analysis and presentation were only limited to available data across all sampled initiatives.

3.3 Results

3.3.1 Respondent profile

There was an equal distribution of female (50 %) and male respondents in the study, and distributed between the government and NGO sectors (Table 3.1). Five of the respondents were aged 40-50 years, while one was nearing retirement and had been in the job for more than 30 years. The youngest respondent was <30 years, and had been in the job for a shorter period than the rest (Table 3.1). Within government, four were from municipalities, three were from a national department, and one was a parastatal. Mahlangu (2001) describes parastatals as organizations which operate with the public sector, on the basis of promoting public interests and development rather than profit motive and they are largely funded by the treasury, created by legal statute but not formally part of the organization of government. Examples of such institutions in South Africa include the Housing Development Agency (HAD), South African National Biodiversity Institute (SANBI), and South African National Parks (SANParks). Forestry and horticulture were the most common professional backgrounds, and the respondents from the NGO entity reported some form of development work as their professional background. All respondents had been involved in a tree planting program as part of their job in the last 5-10 years, and were one of the most senior personnel in those programs.

Table 3.1: Profile of respondents at the forefront of urban tree planting programs in various entities across the country.

Entity		Gender	Age group (years)	Official designation	Professional background	Years of experience	Job profile
Government	Municipality	F	40-50	Manager: Parks, Sports, Arts and Culture	Horticulture	16	Parks and recreation development and management; Cemeteries development and management; Sport coordination and hosting
		M	40-50	Senior Manager: City Parks and Zoo	Business Management	8	To oversee the development and maintenance of parks; main arterials; public open spaces road verges and cemeteries. Urban tree planting and tree maintenance
		F	40-50	Head: Urban Greening	Horticulture	12	Parks and recreation management; Environmental education and awareness
		F	40-50	Horticulturist	Horticulture	9	Advisory to operational service regarding gardens, parks, open spaces, streets and anything horticultural
	National Department	M	30-40	Senior Forestry Development Officer	Forestry	4	Greening: urban and rural tree planting in RDPs, streets, parks and schools Provide technical advice and support in terms of greening programs or initiatives for institutional development; Conduct awareness campaigns on forestry greening initiatives. Promote partnerships between government, NGO's and private individuals and communities to ensure long term commitment to land under forestry programs. Forestry enterprise development: involving community projects in making money out of forestry-related products such as supporting them develop fruit orchards
		M	60-65	Chief Forester	Forestry	>30	Technical support to small forestry projects; Assisting municipalities with tree planting; Pairing stakeholders; Organizing Arbor Month events and urban greening
		M	50-60	Forestry Development Officer	Forestry	32	Ensure conducive environment for sector to grow; Assist communities with forestry-related projects; Encourage key stakeholders to assist municipalities
		M	40-50	Deputy Director: Forestry Development	Forestry	24	Manage budgets and human resources, training staff, asset management for the department, administration work and procurement, oversee the implementation of urban greening programs and do monitoring and evaluation of the programs. Head and coordinate urban greening campaigns like the Arbor week in the province Report to national head office on behalf of the province
	Parastatal	M	40-50	Outreach Greening coordinator	Short Courses (more equipped with experience)	15	Do reports; Work with people; Visit schools; Deal with challenges in schools; Prepare and organize trees planting for major celebrations like Mandela Day, Environment Day, Biodiversity Day, Arbor Day
NGO	Non-profit Organization	F	30-40	Head of Programs	Development (Masters in Development)	5	Oversee all greening programs; Manage the team; Set goals and priorities for each program
		F	20-30	Trees and Carbon Program Manager	Economic Development & Social Impact	3	Project implementation; Train facilitators; Report on projects; Seek sponsorships

3.3.2 Urban tree planting programs in South Africa

In South Africa, tree planting in public spaces (roadside verges, boulevards, along streets, parks) primarily takes place through two different entities, namely the government (national and provincial departments, parastatals, and municipalities) and civic society (residents, CBOs, NGOs). Private businesses usually collaborate with any one of these entities to contribute to tree planting as part of their Corporate Social Responsibility (CSR). These entities sometimes work independently of each other, although collaboration also occurs. Therefore, tree planting initiatives in the country are characterized by varying governance arrangements where actors are sometimes mainly governmental, non-governmental or a mixture depending on the lead entity and power distributed as per actors and governed by the rules of the respective entity.

The Department of Environment, Forestry and Fisheries (DEFF) (formerly the Department of Agriculture, Forestry and Fisheries (DAFF) before 29 May 2019) is the nationally designated custodian of forestry and forests in South Africa (Fig. 3.2). Formal urban forestry and/or urban tree planting are one of the Key Performance Areas (KPAs) in the Forestry Regulation and Oversight directorate of this department. Key sector departments, including the national and provincial departments of Education (DoE); Health (DoH); Human Settlements (DHS); and the former Department of Environmental Affairs (DEA) play supporting roles and collaborate with DAFF (Fig. 3.2) in various tree planting initiatives.

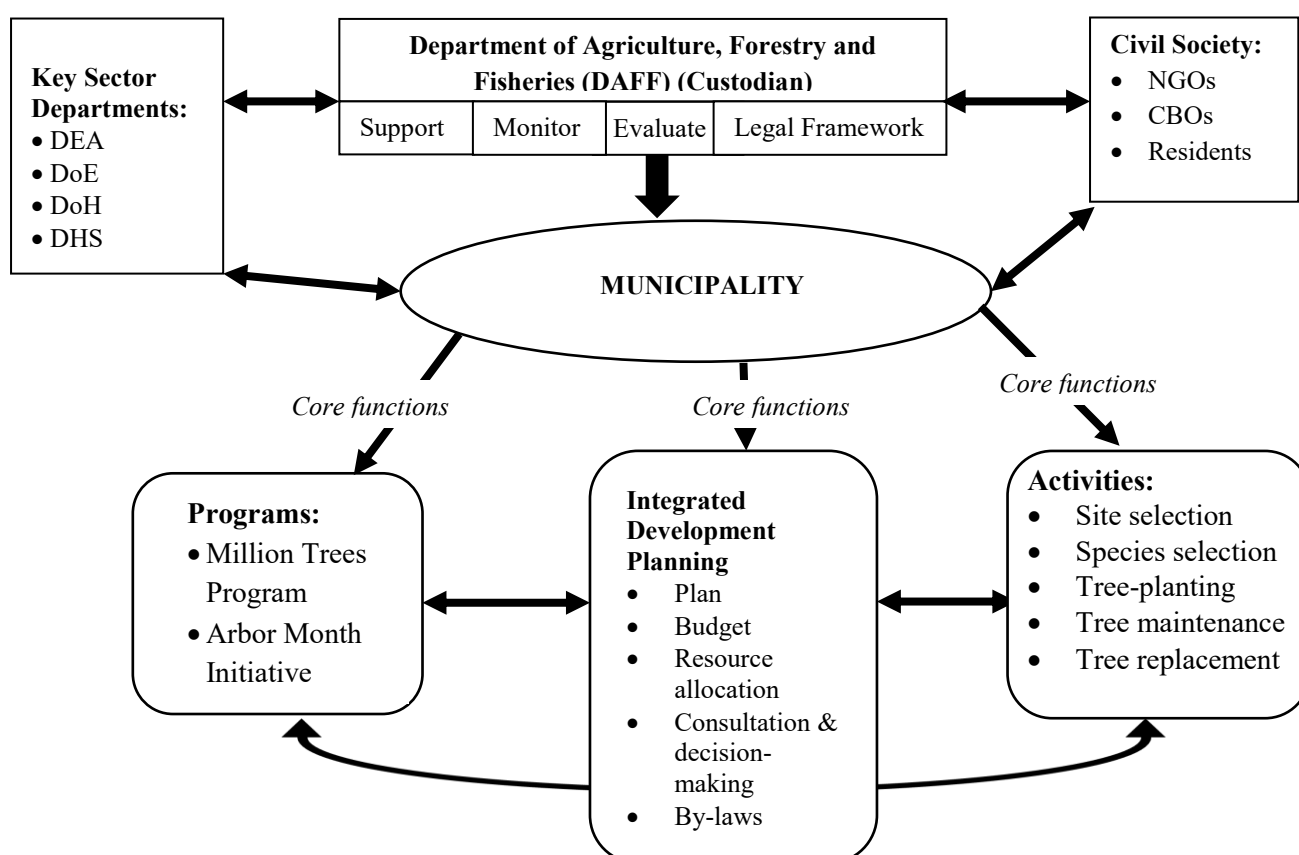


Figure 3.2: The institutional arrangements and activities for general and long-term urban tree planting in public spaces in South Africa (developed through discussions with key informants and insights from the DAFF's 'Greening Strategy').

While urban forestry is one of the KPAs for DAFF, DEA also has an independent urban greening plan. Their approach to implement urban greening emphasizes the “greening and open space management as a response to environmental degradation, and a contribution to environmental conservation and protection” (DEA, 2018). Within this framework, the department supports initiatives aimed at encouraging municipalities to prioritize cleanliness, waste and green space management, through the Greenest Municipality Competition (DEA, 2018). The department was also instrumental in the planting of trees in urban areas in preparation for the FIFA International Soccer World Cup hosted by South Africa in 2010. Their strategy was to promote a “Green 2010 FIFA World Cup event”, which involved implementing initiatives, programs and practices, which have a minimum or neutral impact on the natural resource base (DEA, 2018).

On the other hand, DAFF’s approach to urban greening is “to take the lead in terms of designing greening plans and facilitating greening programs, supporting implementation of greening plans, and the maintenance of trees in urban and rural settings, together with municipalities” (GOV 5). In this framework, DAFF works with municipalities to facilitate workshops and create awareness on urban tree planting, formulate urban greening plans, ensure the incorporation of such plans into municipal IDPs, and support their implementation (Fig. 3.2). They also provide municipalities with technical and specialized support regarding tree planting and forestry in general, and assist in conducting community education and awareness by providing educational material and resources on trees and tree planting (Fig. 3.2). Finally, the department is mandated to monitor progress in the implementation of the greening plans to address shortfalls and report to the national legislature. To do all this, DAFF assigns extension officers responsible for regions in all nine provinces of the country. These officers are the key liaison conduit between the department and municipalities. In partnership with Total South Africa (a petrochemical company) and the Institute for Environment and Recreation Management (IERM), DAFF runs an annual Arbor City Awards competition, which was introduced in 2002. The IERM describes the competition as “an idea aimed at encouraging South African municipalities to green their areas of jurisdiction and promote environmental conservation and development...by providing incentives to municipalities who are doing their best in terms of greening and landscape development and management, especially in townships and new settlement areas” (IERM, 2018).

According to the deputy Minister of DEFF, “Greening interventions that include planting of fruit trees into home gardens can make a contribution towards alleviating household food insecurity in both urban and rural settlements. The Arbor City Awards competition also presents an opportunity for corporates across the country to participate in the enhancement of awareness on the value of greening in our towns and cities” (Speech at the 2019 Arbor City Awards). The awards are allocated for different categories, including youth in greening; metropolitan municipality category; local municipality category; rural Municipality category; and the most improved municipality category (IERM, 2019).

The amalgamation of DAFF and DEA after the May 2019 national elections to form DEFF means that the functions described above will now be performed in one department. Changes in structures within the new ministry, and how these changes might affect the distribution of key functions of various directorates, is yet to be seen. However, there has been no indication of drastic shifts from the previous organogram of functions up to now. Currently, through considerable guidance and support from DAFF, local municipalities are the major implementers of greening plans, and are responsible for the planting and maintenance of urban trees, particularly in public spaces (Fig. 3.2). Much of this implementation occurs through programs like the Million Trees and Arbor Month initiatives. Most local and metropolitan municipalities in the country have departments or sections that oversee the planting and maintenance of urban trees on streets, public parks, cemeteries, and sports fields. The Parks, Cemeteries and Recreation section of Community Services departments is largely responsible for all services associated with urban greening in most municipalities. District municipalities also play supporting roles to local municipalities because their powers and functions are shared. For example, the O.R. Tambo District Municipality (ORTDM) in the Eastern Cape province leads the One-Tree-One-Child program in the Good Governance and Public Participation wing of the office of the executive mayor, aimed at making valuable contributions to the improvement of global climate challenges for improved food and livelihood security for future generations in the district by engaging children and communities in tree planting activities in urban and rural areas.

The DAFF also collaborates and supports broader civil society in tree planting initiatives (Fig. 3.2). Notably, the collaboration and support are directed towards private space tree planting. Individual homeowners (residents) mainly drive private space tree planting, generally in accordance with municipal rules and by-laws. Observations and interactions with residents from various towns across the country show that residents either buy trees, transplant them from elsewhere, or receive donations from neighbours or any of the entities previously mentioned. Tree giveaways and donations occur predominantly during the Arbor Month (September, annually) celebrations, although municipalities also embark on tree distribution drives in towns throughout the year. In some municipalities, residents have the option to request a tree or to buy from the municipality at discounted rates, sometimes with conditions. For example, in the Overstrand Municipality they state that “the municipality welcomes requests from residents wanting to plant on their property, on condition that owners or occupiers accept full responsibility to water and maintain the trees until they are fully established” (MUN 1).

3.3.3 Arbor Month celebrations

Arbor Month celebrations have become the long-term highlight of urban tree planting throughout the country. While these celebrations were initially aimed at tree planting in schools and other public institutions, they have become the primary national program for promoting planting in urban areas. During this time, resources are allocated for the planting of trees in both private and public spaces, specifically in

parks, community gardens, schools and any other institutions that may be interested. However, there are normally conditions attached to the dispensing and planting of the trees, specifically by the DAFF. According to an official in this department:

“We always have to apply the criteria that speak to the readiness of the institution or community, as well as its interest for having trees planted in their area before we even decide to embark on a tree planting initiative. This is to ensure the safety of the trees. Fencing is then a key consideration, and the safety elements is about the security of the trees once they have been planted. We apply these criteria rigorously in situations where the department has to plant trees on a large scale, and in instances where the planting is targeted at public spaces” (GOV 5).

During these events, urban residents (independently or with affiliated entities) are encouraged to participate in tree planting and to learn more about trees. It is also the period where homeowners receive trees as donations from government departments, parastatals, NGOs, municipalities and private businesses, to plant in their private spaces. Other aspects associated with these celebrations include the promotion of two indigenous tree species to increase public awareness of South African trees. One of the trees selected is normally a relatively common tree, and the other a relatively rare species. The common tree selected for 2018 was the *Podocarpus* genus and included all Yellowwood species (Umkhomba/Umsonti), i.e., *Podocarpus elongatus*, *P. falcatius*, *P. latifolius*, and *P. henkelii* (DAFF, 2018). All these species are neat, decorative trees, suitable for both home gardens and large landscapes or streets (PlantzAfrica, 2018). The rare species selected in 2018 was *Boscia albitrunca* (Shepherd's tree; Mohlôpi; Witgat), and is native throughout the country except the Western and Eastern Cape provinces ((PlantzAfrica, 2018). In 2019, the theme for Arbor Month was “*Forests and Sustainable Cities*”, and the 2019 common tree was *Sclerocarya birrea* (Marula), and the rare species *Philenoptera violacea* (Apple-leaf; Appelblaar, IsiHomohomo) (JCPZ, 2019).

Each municipality is expected to organize and host its own celebratory events, but the national launch for the celebrations is hosted by the national DAFF office and is held in a different province each year. Over the last four years, the celebrations were held in Tzaneen local municipality (Limpopo province), Matatiele local municipality (Eastern Cape province), Mbombela local municipality (Mpumalanga province), and the Nelson Mandela Bay Metropolitan Municipality (Eastern Cape province), respectively. In 2019, the IERM, in collaboration with the George municipality and the new DEFF, held a tree planting event as part of Arbor Month in the Rosedale Township in George, which has areas characteristic of low-cost housing. A key feature of this event was the planting of trees, arranged by the George Municipality Community Services Department (Fig. 3.3a), in one of the open spaces in the township (Fig. 3.3b), and in collaboration with the Neighbourhood Watch (NHW) (Fig. 3.3c) who had volunteered to not only be part of the tree planting event, but to look after the trees thereafter. The NHW is an initiative of the Western Cape government, whose model “is a whole-of-society approach to prevent crime and violence by encouraging

and empowering citizens to participate in preventing and responding to crime and violence in their communities” (Western Cape Government, 2019). The members of the Rosedale NHW all reside in Rosedale, and some are unemployed.



Figure 3.3: (a) George Municipality Community Services Department, and DEFF official; (b) open space in Rosedale Township where trees were planted; (c) members of the Rosedale Neighbourhood Watch (Picture (a) taken and used with permission by researcher, 2019, pictures (b) and (c) used with permission from the IERM and neighbourhood watch members, 2019).

3.3.4 Tree planting in low-cost housing areas

Formal tree planting in low-income housing areas is not widespread. Evidence of this was the general lack of programs and projects dedicated to tree planting in public spaces of low-income housing areas in most municipalities across the country, and the absence of trees in public spaces in these suburbs (Chapter 4). Details of factors contributing to this pattern are presented in Chapter 5. The analysis and overview of 10 tree planting programs in low-cost housing areas subsequently referred to as programs, revealed five broad themes, including 1) the general overview of programs, 2) the locations for tree planting, 3) the community engagement and decision-making process before and during the programs, 4) the nature of residents’ participation and involvement, and 5) the general outcomes (Table 3.2).

Table 3.2: Selected examples of urban tree planting programs in low-cost housing areas across South Africa (continues on next page).

Project Characteristics	Entity									
	Government								NGO	
	National Department			Municipality				Parastatal		
Description	Greening New Rest	Msholozhi RDP Project (MTP)	West Rand RDP Greening	Township Greening	Klapmats Greening (MTP)	Greater Tzaneen Arbor Week	Greening Soweto & Kliprivier/Klipspruit	KNBG Outreach Greening	Trees for Homes	Cape Town Urban Greening Program
Lead-entity & Region	DAFF Amathole Region; Eastern Cape	DAFF Ermelo; Mpumalanga	DAFF West Rand; Gauteng	Overstrand Municipality Hermanus; Western Cape	Stellenbosch Municipality Stellenbosch; Western Cape	Greater Tzaneen Municipality Tzaneen; Limpopo	City of Johannesburg Gauteng	KNBG Western Cape	FTFA All provinces	GreenPop Western Cape
Scale	Suburb	Suburb	Suburb	City	City	City	City	City	National	City
Duration	Short-term	Long-term	Short-term	Long-term	Long-term	Short-term	Long-term	Long-term	Long-term	Long-term
Stakeholders	DAFF Municipality Residents Community employees	DAFF DEA DRDLR Ward councilor & committee Municipality CWP/EPWP members Residents	DAFF Municipality DPME Residents	Municipality DAFF FTFA Residents Learners	Municipality DAFF NGOs Private local businesses	Municipality DAFF DRDLR DoE Ward councilor & committee Learners & educators	Municipality NGOs DAFF DoE (teachers & learners) Residents	KNBG DAFF Donors BSSA (NPO) Community groups Local nurseries	FTFA Konica Minolta DoE (teachers & learners) DAFF Municipality Residents	GreenPop CBOs DoE (teachers & learners) Donors
Trees planted per year (project-specific)	225 once-off	800 once-off	>500 once-off	660 over a year	1 000	1 500 once-off	9 121 once-off	>20 000 over a period of 10 years	>100 000 over a period of 10 years	15 223 over a year
Planting location	Private	Private Public	Private Public	Private Public	Private Public	Private Public	Private Public	Public	Private Public	Public
Source of Funding & Trees	DAFF funding & trees provision	DAFF funding & trees provision under the MTP	Tree donation by DAFF & local municipality Other resources & funding by DAFF	DAFF trees donation Municipal funding for maintenance & greening	Municipality through the MTP Spier Wine Estate & WCT donated trees	Everything provided by DAFF, municipality just hosted the event	JCPZ FTFA Trees donated by partners & other stakeholders	DAFF provides trees Individuals & corporates in SA & abroad donate funds BSSA	Corporates-Konica Minolta Trees bought through these funds	Corporates donate funds In-kind donations for materials, other resources & trees
Community engagement & decision-making	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No

Table 3.2 (continued from previous page)

Project Characteristics	Entity									
	Government								NGO	
	National Department			Municipality				Parastatal		
Description	Greening New Rest	Msholozzi RDP Project (MTP)	West Rand RDP Greening	Township Greening	Klapmats Greening (MTP)	Greater Tzaneen Arbor Week	Greening Soweto & Kliprivier/Klipspruit	KNBG Outreach Greening	Trees for Homes	Cape Town Urban Greening Program
Residents' participation/ involvement	Each person to dig three holes, plant three trees, water, mulch & maintain them Each person paid for this	Initially, residents distributed trees & recorded Later, residents involved as recipients & participants in tree planting workshops	Residents hands-on in park and garden development and planting	Homeowners & learners dig holes Community developed & maintain public park & garden Residents with farming background assisted during workshops	Not very involved Some residents are Eco-warriors Made use of EPWP in public spaces	Residents who received trees identified by ward councilor Residents dug their own holes Residents participated in workshops	Assisted with digging holes Actively participated in all other phases of the project Participated in awareness building activities	Do the physical work of planting trees & vegetables (and upkeep) Attend workshops on gardening & tree planting	People indicate their interest to our community environmental educators during the door-to-door stage, then they are invited to collect. Residents' participation is mainly driven by the educators	Not much involvement from community in general, only CBOs active
General Outcomes	Job creation Settlement Greening Food security Improved quality of life	40% survival (subsequent replacement of damaged trees) Park established Awareness & education	60% survival Park & Community garden Government-municipality partnership Vandalized trees replaced	High tree survival compared to previous instances (>90 %) Public garden establishment Program expansion	Low survival rate (<50 %) Smart Park Program expansion Eco-warriors	85 % tree survival Workshops & awareness	90% tree survival rate Improved canopy cover Parks & food gardens developed & adequately used by community Job creation	Workshops Environmental clubs & policy establishment Local nurseries support Skills transfer Community gardens	Responsiveness to community needs-> impact Community Environmental Educators trained Job creation	70% survival Parallel programs Cross-border partnerships Gardens in CBOs Environmental education

3.3.4.1 Tree planting program overview, scale, and duration

The extent of reviewed programs ranged from the neighbourhood to the national-scale. Three of the programs, which are all government entities, were implemented at the neighbourhood scale because they focused their tree planting on specific suburbs (Table 3.2), while six others implemented their plans in multiple suburbs across specific cities and municipalities. This was particularly the case in all the municipality-led programs. The parastatal-led program, which focused on various towns and suburbs, is based in the Western Cape. Explaining the rationale behind this scale and describing the program, its leader said:

“...our outreach greening program is more than just planting trees; hence we are focused on the entire province. We work mostly with schools and CBOs, as long as there is a group of people to work with, and we do workshops into the establishment of gardens and their designs, then we assist them in establishing those gardens. It speaks to food security and empowers people and learners to be able to sustainably establish gardens. Our core function is teaching, more than the actual planting of food and trees” (GOV 4).

This long-term program has been running for more than 20 years since its inception in 1997. On the other hand, the four programs in municipalities (Table 3.2) are only focused on cities governed by the municipality. In three instances (Overstrand, Stellenbosch and the City of Johannesburg), the programs were targeted at various suburbs within the municipality, especially those that had been developed in the last 15 years, while the Greater Tzaneen Arbor Week initiative was aimed at just one low-income housing development and the schools around the suburb. There was no evidence of long-term practice or expansion of the program to other areas of the municipality. In the Stellenbosch Municipality, it was indicated that as much as the tree planting in Klapmats had been done in a short space of time, there was a long-term plan that the municipality has in place for urban greening in low-income housing areas throughout the municipality. The leading municipal official in the broader project indicated that:

“...because of the tree-athon we hosted as part of the Million Trees project, we decided to establish an urban forestry strategy that focuses specifically on the RDP areas. While there is no synergy between the different departments within the municipality, we are trying, and the Klapmats project is an example of our efforts. The strategy is already in place as we are currently busy with tree planting in another low-income housing development. That project is still in the very early stages” (MUN 2).

The Msholozzi RDP project was classified as long-term because the department in the region has a strategy of targeting at least one suburb for planting each year. Furthermore, the replacement of trees in one suburb pushed for the project to continue long-term, after which the department devised a more practical strategy that would be implemented in other suburbs within the region. In the case of Msholozzi, planting began in 2015. However, most trees did not survive because of the way the entire process was conducted. Initially, residents were given trees to plant with not much guidance on how to do it, and the community members

who had been tasked to record where each tree had been distributed did not do a thorough job. As a result, there was no way of tracking the distribution of those trees. According to the project leader, they subsequently had to replace 300 trees out of the 500 that had initially been planted.

The number of trees planted in a single initiative ranged from 225 to more than 100 000. The least number of trees had been planted in a single suburb by the DAFF in the Eastern Cape, while FTFA planted the most trees across multiple residential areas and towns in a single initiative. While 500 trees had initially been planted in the Msholozhi RDP project, 300 more were added for replacement, bringing the number of planted trees to 800 (Table 3.2).

3.3.4.2 Partnerships, sources of trees and funding

The partnerships in the programs suggest that there was flexible collaboration within the various initiatives and entities. DAFF was listed as a key stakeholder in nine programs (Table 3.2), which meant that much of the power in these initiatives lay with the government. One NGO has a long-term partnership with the department, as mentioned by its representative and GOV 5. The other NGO explicitly mentioned that they do not collaborate with the government in anyway, stating that:

“We have a very limited relationship with the City of Cape Town or the government. In all our programs we bypassed the government and went straight to a community-based organization. We have not had problems with that” (NGO 2).

Six programs reported that the trees planted were provided by the DAFF (Table 3.2). This was the case in all national department-led and parastatal programs, and two municipal programs. In all these case, the DAFF also provided the funds for other resources associated with organizing events for the programs. According to GOV 3:

“Because we are the national department, everything was budgeted for in-house because we have a budget dedicated to urban greening and supporting municipalities in that, but the municipality also contributed with some trees and the venue. In terms of the trees, we currently buy them from those big commercial nurseries, but now the department is moving towards supporting those other people who just propagate or plant trees because they love them and sometimes sell within the community so that they are the ones who supply in the communities they live in. There was some food on the day of that event and the department sponsored that too”.

On the other hand, the NGOs indicated that their programs are funded by corporate business and/or in-kind donations from individuals. These funds are mainly used to purchase trees and other resources and materials needed for the planting. Two municipalities indicated that they contributed to the purchase of the trees for their respective programs, and both of these indicated that the municipalities have nurseries to propagate the trees. In one instance, the respondent mentioned that the FTFA NGO sponsors their trees

from time to time, and the organization had played an active role during the FIFA 2010 World Cup urban greening.

3.3.4.3 Location of planted trees

Two of the sampled programs were dedicated only to tree planting in public spaces except on streets (Table 3.2). Street tree planting was excluded because the consensus in both programs was that there would be no one to care for the trees after planting, and that the trees were therefore unlikely to survive.

The KNBG Outreach Greening program is focused on planting at public-owned institutions such as schools, clinics and old-age homes that are in close proximity or within low-income housing areas. According to their representative:

“What happens is that we do not like to go among the houses because then we need permission from the council, so they are the ones who should be planting on the street or something like that. Also, we try to plant in areas that are closed off like a park, schools, or day hospitals where the trees can be maintained so that they do not die” (GOV 4).

The GreenPop NGO applied a similar strategy, focusing on tree planting only in community-based institutions such as schools and churches around low-income housing areas. While they had attempted to extend their initiative to fenced parks, *“the trees disappeared, so the project did not work”* (NGO 2). In this instance, the organisation then opted to focus their tree planting initiative on planting in community centres around the Cape Flats.

The barriers to tree planting in public spaces have at times prompted entities to concentrate on tree planting in private spaces. Consequently, DAFF directed most of its efforts in greening low-income housing areas towards private space planting through tree distribution programs. Explaining this, a respondent from one of the programs said:

“...because of the situation in our RDP locations as you might be aware, we are unable to plant outside of people’s yards because we will not be there to look after those trees. As a result, we are trying very hard to ensure that all households in these locations have at least one tree. This is what we did last year during our greening initiative” (GOV 1).

Municipalities also noted challenges to public space tree planting. Highlighting the impracticality of street tree planting in low-income housing areas, a respondent from the Overstrand Municipality noted with concern that:

“low-income housing developments have spatial development problems and we have discovered that planting trees on the sidewalks is impractical due to lack of space, and underground services has forced us to rethink planting in townships” (MUN 1).

To compensate for this, the respondent further explained that the municipality “is in favour of planting of trees inside private property in townships” and their tree distribution programs in this regard are tailored as such. However, they attached a condition to this:

“Residents could only plant trees that had been donated to them by the municipality (or which they had requested from the municipality), or they had to disclose to the municipality if they had acquired a tree elsewhere, so that the suitability of the tree can be assessed. Additionally, the property owners are expected to take full responsibility for the maintenance of the trees concerned” (MUN 1).

While the immediate focus of tree planting in these suburbs has been on private spaces where the availability of all other resources associated with tree planting are the responsibility of the home-owner, there are resources dedicated to tree planting in public spaces such as parks and community gardens. The Overstrand municipality extended their program to not only focus on tree distribution for homes but to plant in community centers, schools, creches and old age homes, and an aesthetic garden was established. The Greater Tzaneen Municipality followed a similar strategy in their distribution of trees during the Arbor Month celebration. In this strategy:

“All the trees that were received from DAFF on the day we distributed between schools, residents, and the city stadium. We planted a few in the stadium during the event as a demonstration, and the schools and residents got their own to plant in their homes and in the schools where there is fencing” (MUN 3).

Similarly, the West Rand RDP Greening Program was specific in this regard, and their strategy was to distribute two trees to each interested household (Fig. 3.4a), a fruit tree and an indigenous tree. Negotiations with the local municipality enabled residents to plant a tree in their yard, and another on the street but very close to their yards, provided they committed to taking care of those trees. The department also ensured that trees are planted along the major access road into the low-cost housing area, and a few in the park that had recently been established (Fig. 3.4b). These trees were planted by the staff from the departments, with assistance from some residents. Unfortunately, during the visit, most trees reported to have been planted in the park were no longer there, which the official who led the project attributed to vandalism. Elaborating on this, he explained that:

“When we did our assessments after a short period since planting took place, we realised that trees are not growing in public spaces mainly because these areas are not fenced and there is no one to take care of them. Vandalism is a big issue in these low-income housing areas, so it would be a waste of money and resources for us to plant street trees in the public spaces” (GOV 3).



Figure 3.4: (a) resident who received two trees having them planted in front of their yard but closer to the street; (b) trees planted along major road of residential area; (c) DAFF official demonstrating the watering technique used by residents; (d) the only surviving evidence of tree planting encountered around the park area. (Pictures taken by researcher, 2017)

Notwithstanding this, the trees that had been planted on the street by a few residents were doing well, being well taken care of, and with evidence of watering using different techniques (Fig. 3.4c). The common technique for watering was drip irrigation so that the tree could be watered over time, and there were remnant of the trees that had been planted in the park (Fig. 3.4d)

The sentiments regarding the strategy to not plant trees on streets or any other public spaces that are not fenced in low-income housing areas were shared by respondents from four other projects. Particularly, the idea behind the planting technique used by FTFA in their Trees for Homes initiative, and in the Msholozzi RDP Project was one that not only spoke to minimizing the risks of vandalism, but to enhance urban greening and food security. In this regard, the representative explained that:

“...generally what we do is that for the public parks established by the municipality we plant indigenous trees for aesthetics and shade, but for the homes we are planting fruit trees because people need to be able to eat fruit in the near future. We cannot really plant fruit trees on the streets, and the ones inside the park will be better taken care of because the parks are fenced” (GOV 2).

Inquiries into the relationship with local municipalities, which would facilitate a plan of maintenance by the municipality revealed that while the government and some NGOs might have relationships with municipalities, it does not guarantee the maintenance of the trees once the agencies have left. Highlighting this, GOV 1 expressed that:

“We have a relationship with the municipality, but the challenge currently is that municipalities are not taking urban greening seriously, at least not for township and RDP areas. Their focus is on other aspects of service delivery, which seem to be taking priority more than greening. I am serious. You will find that in their IDPs, greening is reflected, but there is no budget or action attached to it” (GOV 1).

The GreenPop NGO indicated that they do not have a relationship with the government, and the relationship with the municipality is limited. This was stated as one of the reasons why the organisation has focused its tree planting initiatives on CBOs.

A different perspective to the distribution of tree planting locations was aired by a respondent from an NGO. This perspective was centred on jurisdiction and the capacity of NGOs to single-handedly implement programs across entire residential areas, explaining that:

“We do not particularly plant in public spaces and streets because that tends to be in the jurisdiction of the municipality. But, we are starting to look at how we can cooperate with the municipality. Furthermore, another issue is that we do not have the capacity to care and maintain the trees if they are planted in public spaces, whereas homeowners can easily do that in their private spaces without our intervention” (NGO 1).

In line with tree distribution for planting in private spaces:

“the most successful strategy employed by this organization to distribute trees has been the Trees for Homes program, which was initially designed to address South Africa’s history of inequitable settlement policies. Its focus is on tree planting in low-income houses and new RDP developments, and each household receives one fruit tree and one shade tree” (NGO 1).

Under the broader program, there are currently (as of 2019) 13 projects that are running concurrently over a year. In these projects, the plan is always to plant 750 or 1 000 trees at a time, through donations to members of the community (Fig. 3.5) and physical planting by CBOs, which translates to 375 or 500 households receiving trees at a time (NGO 1). Consequently, the organisation recognises this program as the “country’s benchmark of innovation in urban forestry” (FTFA, 2019).



Figure 3.5: Resident from a low-cost housing area collecting two trees donated by FTFA (Picture from <https://trees.org.za/trees-carbon/community-tree-planting/> with permission from FTFA).

All the municipality-led projects were characterized by tree planting in both the private and public spaces (Table 3.2). In all instances, tree planting in private spaces involved homeowners being given trees as

donations to plant themselves. In the Stellenbosch Municipality, this was done as part of the ongoing Million Trees Program, where:

“The municipality got more than 1 000 trees which were planted in public spaces beginning on the main road with Celtis africana, and then donated the remaining to residents” (MUN 2).

During the Arbor Month celebrations in the Greater Tzaneen Municipality project, trees were planted in the stadium where the event was held, some were distributed to schools, and the remainder were given to residents in one of the low-income housing areas within the municipality. On the other hand, the JCPZ program is more extensive, and its long-term strategy has been to:

“plant trees in parks around low-income housing areas across Johannesburg, along the main streets of these residential areas, and to ensure that residents who would like to have trees in these areas get at least one fruit tree” (MUN 4).

With this strategy, the municipality’s goal is:

“...to change the dust bowl landscape of townships and new settlement areas to become green and beautiful, while also contributing towards the fight to mitigate climate change and increase food security. In brief, the aim is to create sustainable and liveable human settlements, where townships around Soweto and surrounding areas are greened so as to achieve the same urban tree canopy cover as seen in the northern parts of Johannesburg, and to create green lungs in the south of urban Johannesburg” (MUN 4).

This strategy is similar to one implemented in the Overstrand Municipality’s Township Greening program, with a deliberate plan to plant trees in all low-income housing areas around the municipality. Part of this plan is to maximize tree planting in private spaces through tree distribution initiatives, as mentioned earlier.

3.3.4.4 Community engagement and decision-making processes

Community engagement was reported to have taken place in seven of the ten reviewed projects, while respondents from all projects indicated that the decision-making with regards to the planting, where to plant, and species to plant were taken by the personnel in the implementing entities. This is characteristic of the closed co-governance arrangement. All respondents from the government entity indicated that in implementing programs, they followed guidelines set by the DAFF. Respondents from NGOs and the parastatal indicated that they had not undertaken any community engagement or consultation processes when implementing projects (Table 3.2). The consensus in these projects was that the lead entities made the decisions associated with tree planting, without inputs from any other stakeholder. Another underlying theme for the lack of consultation and community engagement in these projects was that the entities planted trees either by invitation or application, as explained by one of the respondents that:

“We are well-known in the province, we wait for institutions and communities to approach us, so we basically come by invitation after an application to be part of our Greening Program is made. That is when we, as an organization, scope the readiness of an area by checking if they meet some criteria which we have set up in order for us to begin any form of planting or garden establishment” (GOV 4).

The NGO-led entities also shared similar sentiments, with one highlighting that:

“Although our focus of urban greening has been to plant trees in under-greened areas and those lacking trees, we mostly only start planting in those areas after institutions or community-based organizations apply to get trees themselves. This is mostly because of our general focus of tree planting in public rather than private spaces” (NGO 2).

Furthermore, the respondent elaborated that:

“...many times our programs are driven by the corporates who fund us. These companies usually approach us to say they would like to plant trees in a particular area, we then partner with them and they provide most of the necessary resources” (NGO 2).

The consultation and decision-making process followed by the FTFA NGO revolved around the preferences of the organization or those of their sponsors. In other instances, they are approached to undertake the programs. In such instances:

“When a sponsor approaches us to assist them with tree planting as part of their corporate social responsibility, we first have to establish where they want the trees planted. If the tree planting will in a way affect residents, we approach the relevant ward councilor to work with because we know that we cannot go and work in an area without speaking to the councilor first. This is also critical to the success of the project to have their support. We then set up a meeting with them and local leaders, and even the local school closest to the area which would be a good point to distribute the trees from, and even plant trees in (NGO 1).

In the instances where community engagement and consultation was reported to have taken place, the process was entity-specific. However, a common theme related to this process, which was emphasized by all three respondents from government-led projects, suggested that the entities identify areas they think need trees, then they approach the municipality about their plan or desire to plant trees in that area. All respondents from the national government entity and two from the municipality-led programs suggested that the process of community engagement and consultation with stakeholders is supposed to be carried out by municipalities through ward councilors and their committees as it is part of implementation (Fig. 3.2). The lead entity then takes over again towards the commencement of tree planting to conduct workshops with the interested parties, and implements decisions related to issues like species to plant and where to plant them. Residents are also expected to dig their own holes, and the expectation is that they only receive

the trees once they have dug, afterwhich they plant the trees themselves. Such a strategy was implemented in Greening New Rest project as follows:

“We were asked by the department to identify areas where trees can be planted because there was a budget that was set aside for that. My team and I then developed a proposal in that regard, in order to be given the go-ahead to begin the consultation process. During the consultation, our first stop was the municipality, which was represented by the ward councilor. We arranged a meeting with the councilor and his committee and presented our plan to them. They are the ones who took the plan to the broader community. When we got the report that the community was welcoming of the idea, we then began with the engagements. We asked the councilor to provide us with the number of households in our area of interest, then we applied our criteria in deciding which households to choose. Our most important criteria were that a household should be fenced for us to consider it to receive trees” (GOV 1).

A similar strategy was followed in the Msholozzi RDP Project. The respondent in this project explained the process, highlighting that:

“The decision-making lay with DAFF and the provincial department (DARDLEA). The Community Works Program (CWP) executes what we have told them. We do not do consultation; it is the other stakeholders who do that because we are understaffed. What we do is that we impart our know-how to the other stakeholders, and they are the ones that mobilize the community, telling them what needs to be done and how it should be done. For this project, community members were told, through the ward councilors, that the department wants to plant trees in their community. We then gave a directive that all the members of the community who would like to have trees planted in their private spaces should dig two holes, one for the fruit tree, and the other for the indigenous tree. On the day of planting, we demonstrated in a few homes, and we then monitor to make sure that the trees are planted according to our specifications” (GOV 2).

In light of the above, there are possibilities of community members rejecting the plans for tree planting in their area, considering that they do not play much of a role in the planning, even though this response had not been experienced in the sampled projects. In such cases, the leading entity would not try to convince them or attempt any other means to get trees planted in the area. Instead, they just walked away. In highlighting this, GOV 3 stated that:

“...in cases of community members rejecting a tree planting plan, we walk away and leave things as they are because our understanding is that if they are not keen for this project then it will be a waste of resources because the trees will not be cared for, since we depend on the community members to take care of the trees when we leave” (GOV 3).

An evaluation of community engagement and consultation process implemented in the four sampled municipalities suggests that there is heavy reliance on the ward councilors and their committees to inform the broader members of the community about tree planting plans. This is despite the finding that the lead entities commonly make decisions about tree planting and identify areas of implementation even before the communities are made aware of the plan. While the process undertaken in the Stellenbosch Municipality's Klapmats program was a little different to that of other entities, it was still consistent with the general and long-term urban tree planting model illustrated in Fig. 3.2 above. A respondent at the forefront in this program narrated that:

"We actually consulted with the community before we started doing anything, even though we had already identified a new housing development in the area. The new development had some lovely open spaces especially the main road getting into the suburb area. We spoke to the ward councilor and the community in order to get their buy-in. We did this via a public meeting where we brought our plans and showed the residents on screens using a projector. We explained to them our entire plan, including what trees we want to plant and where we will plant them, as well the phases in which we will do so" (MUN 2).

While this strategy does not seem to have incorporated any contributions or objections from the residents, it served as an attractive example to neighbouring low-income housing areas. This was evidenced when the municipality was subsequently approached by a ward councilor from another ward requesting them to "do something about the bareness of their area and also plant trees for them like they did in Klapmats because they are a community that is struggling with resources". As per that request, the project is currently under way. In the City of Johannesburg project, the consultation process was mostly targeted for tree planting in private spaces. In this instance:

"...in addition to street tree planting, planting also took place on people's private property, and the only way we could achieve this was to engage in close consultation with those beneficiaries, even though there were some who did not want to have trees. We also engaged the communities in broader consultation about the parks that we built around Soweto, and the ward committees were key in helping achieve that" (MUN 4).

Regardless of the perception, most respondents in this study placed emphasis on the importance of "consulting community members and having them participate in tree planting" for the success of a tree planting initiative. One respondent emphasized that:

"....the voice of the community, in terms of whether they want trees or not is very loud. If the municipality tells us that the community does not want trees, then we back off immediately, we do not force because we know that they will not be willing to even take care of those trees after we plant them. There was once an incident, I think in 2012, where members of the community disrupted an Arbor Day celebration and wanted to

burn the tents because during the consultation process they were not made aware that trees were to be planted, and the planting was taking place in a particular section of the suburb. The residents did not understand why other places were getting trees while others were not. But at the same time, the situation was volatile in that area at the time, so residents were just mad at the government altogether” (GOV 3).

This quote captures the sentiments shared by most respondents in this study, and illustrates the shared recognition of the perceived importance of having community members as key stakeholders and decision-makers in tree planting initiatives. However, the involvement of community members in the sampled programs, specifically at the decision-making level, appears to have not been prioritized in any of the programs.

3.3.4.5 Residents’ participation

The predominant finding around the involvement and participation of residents in the sampled program was that they dug holes and were present at the workshops organized to raise awareness and educate them about the importance of trees, which species to plant, how to plant, and how to maintain them. The Stellenbosch Municipality Klapmats project had a little more involvement from the community beyond the digging of holes and participating in workshops. In this project, the municipality employed Eco-warriors, who are members of the community whose role is to look after the trees. As part of the project and in line with tree planting across Stellenbosch, the municipality also continually urged community members to actively look after the trees by watering them, especially considering the drought experienced in the Western Cape in the last five years (Fig. 3.6). Additionally, the municipality conducted an outreach drive after tree planting around the community, recruiting children to be part of the long-term project by each adopting a tree that is closest to their homes and helping the tree survive. Subsequently, the municipality organized a competition to reward the children for a “job well done”.



Figure 3.6: An advert placed in the local newspaper requesting assistance from community members to use grey water to water the trees outside their premises (Image extracted with permission from documentation supplied by respondent).

Similarly, the FTFA NGO has developed an inclusive program where they train local residents as community educators. These community educators are taught about the importance of planting trees, how to plant and maintain trees, and how to support other members of the community in growing trees. Highlighting the extent of this strategy, the respondent from the NGO explained that:

“...the community environmental educators are also supported by the NGO in convincing their neighbours and broader community to plant and care for trees. We are slowly noticing that people do not need as much convincing now than they did before, but our strategy seems to be working and people are slowly recognizing the inherent value of planting trees. We train these community environmental leaders to go door-to-door asking people if they would like to have a fruit and a shade tree for their yards, and why it is important to have both. If people respond positively, they receive an invitation to come to a communal place where we run some workshops and people collect their trees. The educators then check up on those trees at certain intervals from the day of distribution. The community environmental educators are paid a little stipend for that work, and they get a certificate” (NGO 1).

In the West Rand RDP Greening project, residents are reported to have been extensively involved, especially in the development and planting in the park. In this regard, the lead official in the project reported that:

“The residents were hands-on, especially in the in the park. Through the ward councilors, we urged the learners and their parents to be present so that they could have that element that it is their park, and not that of the department. This is important because it also reduces the incidence of vandalism when communities do not care about something they had no part in to begin with” (GOV 3).

In the Greater Tzaneen Arbor Week project, the partnering entity, which was the provincial DAFF, involved the community leaders by engaging with them in workshops, which happened a few weeks before the actual event. The official who conducted these workshops explained that:

“I conducted the workshops with the community leaders because I know that many people do not know how to plant trees, from digging the holes. The workshops were about 1-2 hours each, and we wanted to make sure that after those workshops they are bale to plant and maintain trees. We chose community leaders because many people are at work during the week, and the expectation is that they will train the other community members” (MUN 3).

In support of involving communities in tree planting in their suburbs, residents in the Overstrand Municipality were given ample opportunity to participate by requesting the municipality for trees and for the municipality to go into the community and assist some members with the planting. The requests were made through the ward councilor, who had the details of each household that demonstrated interest. In turn, the municipality did physical visits to demonstrate planting techniques to the residents by planting in those households where there was nobody available to do it. This proved a successful strategy because the municipality has since received subsequent requests for trees from residents in low-cost housing areas, and evidence on the ground suggests that these residents are committed because they also plant in the public spaces close to them (Fig. 3.7), with permission and assistance from the municipality. In this regard, a respondent from the Overstrand Municipality summarized the stance of their municipality regarding the involvement of residents in tree planting initiatives, stating that:

“The municipality realizes that community involvement needs to be part and parcel of local government, and the municipality welcomes and encourages the willingness of the community to get involved in the development and maintenance of public green spaces and their private yards. We already have a good example of a member of the community who maintains a memorial garden in Voëlklip” (MUN 1).



Figure 3.7: A tree received from the municipality and planted by a homeowner from a low-cost housing area, in front of their yard in the public space (Picture taken by researcher, 2017).

3.3.4.6 General outcomes of projects

The survival of planted trees was highlighted as an important outcome in seven of the sampled projects, ranging from 40-90% survival rate between the time they were planted and the year 2017 (Table 3.2). The high survival rates (>85 %) reported in three initiatives were reported to have been established over more one year of monitoring post-distribution and planting. In the projects where tree survival was low, such as in the Msholozzi RDP and Klapmats Greening Projects, the trees had been planted in 2015 and the lead entity of one project subsequently replaced those trees, while the other is looking closely at

strategies to avoid high mortality rates in other areas as the project is currently undergoing expansion. Despite the low survival rates of trees in these two projects, one of the officials regarded the project as having been a success, stating that:

“It was a success because the trees have been planted and some of them are growing. The community members were very much thankful for receiving the trees, and the local municipality has already expressed their gratitude, and have shown us that they are happy with the trees and what we did” (GOV 2).

Verification of mortality/survival was done by physical visits to areas where the trees were reported to have been planted, both in the private and public spaces. Survival was higher for the trees planted in private spaces (Fig. 3.8a), although many appeared to be dry (Fig. 3.8b), and some had been replaced in the park (Fig. 3.8c).



Figure 3.8: Field observations from the Msholozhi RDP Project (with verbal consent from homeowners and DAFF) showing the survival of private space trees (a), those that seemed dry but still growing (b) and those were a replacement in the private place (c). (Pictures taken by researcher, 2017).

Another general outcome in at least one program in each entity was the creation of employment opportunities for the members of the community (Table 3.2), which meant that some residents were remunerated for their efforts in assisting with tree planting. In fulfilling this, the Greening New Rest program recruited some unemployed members of the community, as per the recommendations from the ward councilor, to assist with planting. The lead official in this project explained:

“Basically, there were funds that were set aside by the department in petty cash, which is controlled by the national office. The funds were then distributed to regions. We used this money in remunerating people who participated in the greening project. They had to demonstrate their participation by digging three holes, planting three trees, and doing mulching in those trees. Such as person would then get paid. These three trees were for three households because there was not enough money to pay every single household” (GOV 1).

The successful involvement and commitment from residents was one of the recognized outcomes in the Overstrand Township Greening initiative. This was particularly in reference to the survival rate of trees in the private space because residents had been an integral part of the project. To achieve this, the

municipality targeted residents who displayed interest in tree planting before the distribution of the trees and ensured that only the households who had requested trees had been given. Another outcome was the skills transfer, training and workshops that were offered to the residents prior to tree planting which are aimed at ensuring the sustainability of the trees planted, in terms of both their survival and health. Other outcomes of these programs include the establishment of parks and community gardens (aesthetic and vegetable gardens), which contribute to food security and improved quality of life.

3.4 Discussion

This chapter provides insights into the urban tree planting landscape of South Africa, with a focus on tree planting initiatives in greening low-cost housing areas. While many municipalities globally have been applauded for their efforts to increase canopy covers and maximize ecosystem services of trees, it is not particularly the case in many South African municipalities. This is not surprising, given the relatively few policies that deal specifically with, and promote tree planting and maintenance in towns and cities in the country (Chishaleshale et al., 2015; Shackleton et al., 2014), as well as limited visions by municipal officials in this regard (Gwedla and Shackleton, 2015). According to Locke and Grove (2014), planting activity is positively related to existing canopy cover in Baltimore and Washington, D.C., and Donovan and Mills (2014) reported a similar pattern in Portland. According to Locke and Grove (2014), planting activity is positively related to existing canopy cover in Baltimore and Washington, D.C., and Donovan and Mills (2014) reported a similar pattern in Portland. It is worth noting that in both instances the observations are based on a background of areas that already have high tree cover where tree planting had already been a common practice.

This study represents a very small portion of tree planting initiatives for a country with a population of 58 million people. This in part speaks to the general lack of formal urban tree planting initiatives targeted for low-cost housing areas, and the limited accountability in the instances where tree planting was done. By limited accountability I refer to the absence of records detailing what was done, how it was done, where it was done, when it was done, etc. This was a common trend amongst all the programs and initiatives that were initially identified which meant that there were not enough data to profile or understand how the initiative was carried out. This speaks to the broader issue regarding the lack of policies and management plans that are specific to tree planting as entities now do not have a reporting structure to record some of their work, most of which happens on an ad hoc basis. While the programs that have subsequently been profiled in this study may seem to represent the “best” cases, it may be that there are other instances where trees had been planted but not through formal initiatives by municipalities, or residents may have just decided to plant their own trees as individual households, in which case the reporting of such would follow a different format to the one used in this study. Therefore, that there are very few profiled initiatives does in no way suggest that other stakeholders like residents are not planting in their private spaces, but speaks to the non-formalization of tree planting distribution and giveaway programs by various entities, including municipalities.

The relative lack of municipalities engaged in formal urban tree planting programs, as evidenced by the few available to sample in this study, is not unique to South Africa. The practice of urban forestry is also still limited in Nigeria, and there have been a number of incidences of failure in the several efforts made at cultivating tree planting habits among residents in certain parts of the country (Kayode, 2010). Conway and Urbani (2007) found that upper-tier municipalities (those responsible for land-use planning and major physical infrastructure), with the exception of York Region, in southern Ontario, Canada, were not involved in street tree planting, maintenance, or protection altogether. However, it is worth noting that urban forestry is still an emerging discipline and its relationship to planning is still evolving, and this phenomenon extends to both the developing and developed countries because many of them do not have the economic capability to support urban forestry programs (Carreiro and Zipperer, 2008; Gwedla and Shackleton, 2015). Additionally, there is sometimes lack of coordination and communication between partners (Ordóñez et al., 2020) and municipal departments (Gwedla and Shackleton, 2015) that are supposed to work together in fulfilling urban forestry goals.

3.4.1 Urban tree planting in South Africa

South Africa's landscape of urban tree planting is characterized by a governance network that includes public, private, and civic society actors, as is the case in other contemporary tree planting and urban forestry initiatives elsewhere (Konijnendijk van den Bosch, 2014). In this network, the national DEFF (previously DAFF) is the custodian of forestry and therefore at the forefront of designing urban greening plans and facilitating greening programs with the support of cognate sector departments. Local municipalities are responsible for implementing these plans by planting and maintaining urban trees in public spaces (Gwedla and Shackleton, 2015). The government entity as custodians of forestry and by extension urban forestry, and implementers of urban greening policies, plans and strategies is typical of other countries across the globe. For example, the Department of Public Works was the original home of the now defunct (morphed into another program) MTLA program in Los Angeles, USA, and greater control was exercised by the Mayor's Office (Pincetl, 2010). In Canada, local governments, or municipal governments, are the principal agents of urban forest management, and provincial governments vary in their roles in urban forests within their respective jurisdictions (Duinker et al., 2014).

The recent UFGF in Niger is more decentralized, with new and overlapping jurisdictions such as the Ministry of Environment, Urban Health, and Sustainable Development in the Office of Green Spaces, the Ministry of Urbanism and Housing and the Office of the Environment at city-level. Together, these departments and organizations engage with green spaces and urban trees in cities, either in their development, maintenance or destruction (Hungerford and Moussa, 2017). Zimbabwe's urban forestry governance network is more complex than that of South Africa. However, at the forefront of this network are the Forestry Commission (in the Ministry of Forestry) and the Environmental Management Agency (a statutory body responsible for ensuring the sustainable management of natural resources and

protection of the environment, the prevention of pollution and environmental degradation, the preparation of Environmental Plans for the management and protection of the environment) (EMA, 2019). Municipalities are then also responsible for urban greening and the maintenance of urban trees in public spaces. Therefore, like in many other countries, the mandate for urban tree planting in South Africa, particularly in the public space, falls to the national and provincial governments, and implementation on municipalities.

A typical urban greening and tree planting initiative in South Africa is characterized by various actors and stakeholders such as government sector departments, NGOs, parastatals, community members, public institutions, and corporate businesses who all make varying and valuable contributions. According to Chishaleshale et al. (2015), the successful management of urban trees and green spaces requires the involvement of other stakeholders who also have an interest or play a role in urban trees and green spaces management, both within and outside the local authority. Non-profit organizations have become nature's services amenity providers, and are key actors in urban and community forestry initiatives (Carmichael and McDonough, 2018), as the fiscal ability to provide infrastructure, including parks and the new green infrastructure, has shrunk in many cities as a result of the decline of revenues (Pincetl, 2003; Svendsen and Campbell, 2008). They play varied roles, from the design and implementation of these initiatives (Battaglia et al., 2014), and here this was evidenced by the presence of NGOs like FTFA, and GreenPop, committed to implementing tree planting initiatives in various communities. NGOs have taken on prominent roles in delivering environmental services in cities through operationalizing environmental campaigns like tree planting (Foo, 2018).

Despite the presence of these NGOs, they unfortunately do not have a wide reach across the country, and capacity within the NGOs themselves is one of the contributing factors. In a country of just over 58 million people, 66 % of whom live in urban areas, the expectation would be that there would be significantly more NGOs that are actively involved in urban forestry and urban greening. Therefore, regardless of the work done by these key role players and considering their limitations, green spaces and biophysical infrastructure should be given a greater collective priority by green space managers, urban planners and citizens alike (Gulsrud et al., 2013).

3.4.2 Program scale and duration

Scale and duration are related variables because the scale of a program usually determines its duration, albeit with some exceptions (especially when projects are planned to target a single area over a long-term period). Scale is an important element of consideration in the planning, development and management of urban forests, and tree planting initiatives. Most contemporary urban greening and green infrastructure efforts are “small, piecemeal patches created by individual developers rather than an integrated effort by the whole community” (Young, 2011). The majority of programs in this study were implemented in individual cities at neighbourhood and city-scale because they were either targeting just one city, or an individual suburb. While the program run by FTA may be rolled out at a

national scale, it does not reach every province and it focuses on metropolitan cities such as Port Elizabeth or Durban. Admittedly, implementing national-scale urban forestry projects is not a simple task, especially considering the constraints faced by implementing entities (detailed in Chapter 5), the biggest of which involves the availability of resources, as emphasized by Lamichhane and Thapa (2012). The representative from FTA also alluded to this, specifying that the organization just does not have the capacity to roll out tree planting across the whole country. The duration of the reviewed programs varied, but the majority were regarded as long-term. The short-term programs were all associated with Arbor Month celebrations, with no record of further programs implemented in the same area afterwards. This is typical of many other tree planting initiatives targeting other types of suburbs all over the country, and across the globe, and the focus in South Africa is still heavily on schools. Harper et al. (2018) reported a similar pattern of tree planting activities associated with Arbor Day celebrations in the Commonwealth of Massachusetts, stating that Tree Committees in this region engage the community with Arbor Day get-togethers yearly, with instances of tree planting in children's museums or elementary schools. On the other hand, the long-term programs were typical of ongoing tree planting in different parts of cities across single municipalities. This was demonstrated in five of the programs.

3.4.3 Partnerships, sources of trees and funding

Partnerships are considered to be effective democratic tools which can ensure that relevant stakeholders are represented (Burton and Mathers, 2014). They provide opportunities for the empowerment of communities, and result in an association of two or more partners with shared responsibility for the long-term management of a project, operating at very different levels of policy-making or service delivery (Barnes et al., 2008). Partnerships are related to governance, which supposes that government does not work in isolation but through relations with other entities such as civil society and non-governmental sectors, including the community (Mathers et al., 2015). Urban forest governance encompasses and encourages partnerships and collaboration (Chapter 2). Urban tree planting is often a coproduction by government in collaboration with private individuals, businesses, and nonprofit organizations (Pincetl, 2010). In this regard, one of the more successful MTI (MillionTreesNYC) was characterized by an institutional arrangement of governance which was a partnership between NYC Parks and the New York Restoration Project (NYRP) through a formal public-private partnership (Campbell et al., 2016). This partnership and the resources it availed may be behind the success of this initiative compared to others that had been implemented in other cities. The DAFF was the most common partner and stakeholder, and source of funding for trees and other resources, as reported in eight and six programs, respectively. In turn, the FTFA NGO partnered extensively with the DAFF by donating trees and supporting their program related to tree planting. This corroborates Kronenberg et al. (2016)'s findings that public institutions have a much more central and influential role in the network of urban green space governance compared to NGOs. Reporting on the models and characteristics of five urban tree planting programs across selected cities in the USA, Nguyen et al. (2017) found that four of

them partnered with government bodies where they received financial support, while the one program sourced funding through a grant from a local foundation and through fees from tree recipients.

3.4.4 Location of planted trees

Growing trees in urban environments is particularly challenging, and a mix of planting on public and privately-owned and managed lands could be the only solution to the achievement of a broad range of urban tree canopy cover goals (Grove et al. 2006; Nguyen et al., 2017). Across the examples presented in this study, the trajectory for urban tree planting leaned towards incorporating a variety of tenure types. For example, some initiatives were committed to tree planting in private spaces or public space only, while others focused on both in single initiatives. Typically, focus on public spaces was for public areas like parks rather than streets. In these instances, the trees were planted by the personnel from the various entities and in some cases with the assistance of residents. Furthermore, some projects distributed two trees per household to residents, one a fruit tree and the other an indigenous one which they could either plant in their yards or both in the yard and on the street close to their homes. Tree distribution and tree giveaway initiatives are popular for private space greening, although residents sometimes do not follow through with the planting (Roman et al., 2014). None of the respondents in this study alluded to this, and the assumption was that all households given trees had planted them. Nguyen et al. (2017) reported that one of the five tree distributions in the USA estimated in 2012 that ~70–80% of trees they had distributed in 2009 had been planted.

The challenges to public space planting, specifically street tree planting, in a low-cost housing context cannot be ignored. These can be more pronounced in the South African context than in others, as presented in detail in Chapter 5. Pincetl (2010) acknowledges some of these challenges, stating that neighborhoods with multiple family dwellings tend not only to have narrower planting strips (and thus less room for street trees), but also many less, and much smaller, yards, and so less room for trees on the parcels. This is typical of low-cost housing areas in South Africa where the design and density of households leaves little room for anything else besides accommodation (McConnachie and Shackleton, 2010). This constraint was apparent in one of the programs.

Another major contributing factor to the preference for private space planting is the lack of stewardship potential for those trees, where entities acknowledge jurisdictional, behavioural, and infrastructural limitations. This was particularly pronounced in one of the NGO-led programs where previous experience showed that public space tree planting could not be done because there would be no one to look after the trees and they would be vandalized, a perception that was reiterated by a government official. Vandalism of urban trees in general is a worldwide phenomenon (Richardson and Shackleton, 2014), but can sometimes be more prevalent in areas with high unemployment and low private ownership of property (Nowak et al., 1990). Black (1978) suggests that allowing the community to “seize the planting from the beginning with pride as its own”, not as something that comes to them as a decree from a higher power, could make a considerable difference in reducing incidences of vandalism.

This goes back to the need for consultation and involvement of local communities in decision-making processes regarding tree planting, as it has the potential.

Apart from the challenges to public space tree planting, private residential lands possess extensive potential for planting (Nguyen et al., 2017) because they account for the largest portion of urban land cover. Eight of the sampled projects were characterized by tree distribution initiatives to households as part of the general program, where these were distributed during an event. For example, a portion of the trees available during the West Rand RDP Greening, Greater Tzaneen Arbor Week, and the Msholozzi RDP Greening Project was distributed to households using a system in collaboration with ward councillors. This approach has been extensively used as a means to expand the urban forest on private residential lands, and a number of municipalities and NPOs worldwide offer free or reduced-cost trees to residents for planting on private properties (Nguyen et al., 2017). A program coordinated by the Arbor Day Foundation across the USA recently distributed over 135 000 free yard trees to over 76 000 homeowners over a five-year period (Nguyen et al., 2017). Notwithstanding the viability of private spaces as potential sites for tree planting, it is also important to recognize that trees in these spaces may not fare well either as a result of factors such as poor maintenance or vandalism and general site characteristics like soil and microclimate characteristics (Hilbert et al., 2019). Roman et al. (2014) found that one of the leading causes of residential tree losses in Sacramento, under the Shade Tree Program, were associated with stewardship actions, specifically the sense of responsibility for trees as it manifests in maintenance actions.

The mixture of land tenure types for tree planting initiatives in this study contrasts the implementation of initiatives in other developing countries like Zimbabwe. Most urban tree planting activities in Zimbabwe are focused on public spaces, such as parks and schools (Thondhlana and Ruwanza, 2019). However, the persistent economic meltdown in the past two decades has vastly impacted the initiation and sustenance of urban greening programs in the country (Thondhlana and Ruwanza, 2019).

3.4.5 Community engagement, consultation and decision-making processes

According to Richardson and Shackleton (2014), consultation with residents regarding tree planting is an important exercise aimed at ensuring that service providers are aware of the needs and wants of the public, rather than making decisions for them, and to encourage residents to participate in tree planting activities. Consultation was reported to have been undertaken in most programs reviewed in this study. However, a closer look at these claims shows that the ultimate decisions for planting were taken by the implementing entity, especially when it came to the types of species and where to plant. This is consistent with Gwedla and Shackleton (2015)'s findings that although managers from the Eastern Cape province of South Africa stated that they consult all the affected parties before making any decision regarding where and when to plant trees and what type of species should be planted, a closer look into the practices revealed a general lack of consultation.

Decision-making power is important to some residents, a lack of which can prompt them to refuse association with urban tree planting initiatives. According to Carmichael and McDonough (2019), concerns about a lack of decision-making power in species selection and maintenance responsibility were some of the leading reasons for residents' dissatisfaction or their refusal of a free street tree from a non-profit organization in Detroit, USA. Unfortunately, there was no evidence of incorporating residents in the decision-making process regarding trees to be planted or the general logistics of the initiatives in this study, as indicated by respondents from all programs. The inclusion of residents in the decision-making process is a procedural justice issue (Jennings and Hall, 2012), one that speaks to the recognition of community needs in urban planning and is an important aspect of urban greening, which could contribute significantly to the success or failure of any urban greening program.

3.4.6 Residents' participation and involvement

Reed (2008) interprets participation as the process that embraces equal involvement of all stakeholders in the decision-making, design, implementation, monitoring, and evaluation of development discourses that affect them. Participation is strongly linked to sustainable development and rights-based approaches to development (Everatt et al., 2010). The lack of community participation and involvement in tree planting, which can affect maintenance practices (Boyce, 2010) has long been identified as one of the threats to urban forests sustainability and tree survival, especially in public spaces (Austin, 2002; Boyce, 2010; Roman et al., 2014; Sklar and Ames, 1985). According to Austin (2002), planting projects that have the benefit of local neighborhood representation at the planning, planting, and maintenance stages have more opportunities for continued local involvement in the weeks and years after planting day. There was a general trend of asserting the participation of residents in all programs in this study. This resonates with Chishaleshale et al. (2015)'s findings that 78 % of respondents from selected municipalities in the Eastern Cape and Limpopo provinces of South Africa claimed to involve local people in urban trees and green spaces management, even though further analysis revealed that much of this engagement was from local citizens' reports about fallen branches or hazardous trees.

Participation, particularly of communities, refers to everything that signifies lay people's involvement (Cornwall, 2008), and is a process where individuals, groups, and organizations choose to take an active role in making decisions that affect them (Reed, 2008). Based on this description, only one program embraced some of the ethos of participation. This was demonstrated by residents actively approaching the municipality to ask for trees they could plant in their private spaces, and others opted to plant just outside their yards, which happened after the municipality started involving some residents with a farming background in the engagement of other residents, and the visibility of the municipality in the community. With respect to participation, most programs referenced residents digging own holes in their private spaces and attending workshops organized to raise awareness about trees. These workshops and meetings had an element of residents being told what will happen, and this was subsequently characterized as consultation and participation. Arnstein (1969) describes this as tokenism and includes

informing, consultation and placation, where the aim is to create a platform where stakeholders can listen and express their own opinions, although they lack the power to ensure that their views will be taken into consideration by those perceived to have more power to implement these suggestions within the group (Ng'ombe et al., 2012). Additionally, this level of participation does not guarantee a follow-through on what has been discussed, hence no assurance of changing the status quo, and stakeholders can be coerced into accepting certain proposals because they are not given the platform to challenge the contents of those proposals (Arnstein, 1969). While efforts to contribute to greener low-cost housing areas are commendable, consideration of the impacts and consequences of not involving residents in the decision-making processes need to be considered and more effort put into ensuring the presence and visibility of residents in programs and initiatives to be implemented in their communities. The involvement of residents and collaboration with them may also contribute to the equitable distribution of the trees across neighbourhoods. Nguyen et al. (2017) show that the close neighbourhood collaborations and mini grants may have contributed to the more equitable distribution of trees in the municipal yard tree giveaway initiatives in Philadelphia.

Carmichael and McDonough (2018) suggest that providing opportunities for residents to be more involved in selecting the species of trees planted in front of their houses, rather than the ad-hoc method of giving residents a choice of an ornamental tree for example if they refused a shade tree, could encourage them to be more supportive and involved in tree planting programs. Conway (2016) states that there is a need for municipalities to better consult with residents when establishing urban forestry goals and identify actions residents can take to help meet the agreed goals. This is not limited to just the municipalities and government departments. Non-profit organizations also tend to exercise sole decision-making power regarding species selection and approaches to tree maintenance, although there is still an expectation for residents to take an active role in tree care (Carmichael and McDonough, 2018). This pattern was apparent in this study. Although one organization mentioned actively avoiding public space tree planting with consideration of their limitations to care for those trees, they still take sole decisions about which species to distribute and where to distribute them, with barely any input from the residents the trees are meant for.

3.4.7 General program outcomes

The success or failure of tree planting programs and initiatives is subjective and dependent on, among other things, how success is defined in the context of that particular project, the expected outcomes of the project, and the practices that lead to success, all of which are essential for adaptive management for sustainable urban forest systems (Clarke et al., 1997). The monitoring of tree planting initiatives through evaluating tree survival rates as an indicator of program performance over a certain period of time is becoming common amongst urban forestry practitioners (Roman et al, 2013). In other instances, projects set targets relating to the number of trees to be planted and gauge the success of those programs by the actual number of planted trees, among other expected outcomes of program resilience (Koeser et

al., 2014). For example, the success of programs led by the New York Restoration Project (NYRP) in New York; Baltimore City Department of Recreation & Parks (BCRP) in Baltimore (Tree Baltimore program); Philadelphia Parks & Recreation (PPR) in Philadelphia (Tree Philly program); Groundwork Providence in Providence (Trees2020 program); and the Worcester Tree Initiative (WTI) in Worcester was aligned to the targeted number of trees to plant and the number actually planted after a certain period (Nguyen et al., 2017). Yet, just the number of trees does not reflect survival, or stewardship or changing perceptions by urban households and constituencies.

Roman et al. (2014) assert that the success of urban forest planting initiatives critically depends on tree survival. However, it is important the factors associated with the survival and/or mortality of the trees are characterized into categories according to biophysical versus human influences, and predisposing, inciting, and contributing factors, as this may be helpful to understanding the urban tree decline spiral (Hilbert et al., 2019) so that the most appropriate interventions are employed. The survival rate of planted trees was regarded as an outcome and success indicator of initiatives in most programs assessed in this study, in line with Widney et al. (2016)'s tree success in many tree planting programs, and projections on future benefits of trees. Survival rate as an outcome of tree planting initiatives also resonates with Roman et al. (2015) who reported that one of the outcomes for the tree establishment success in East Palo Alto and Philadelphia planting projects was the 99.4 % survival rates of planted trees. Although assessments of tree survival are predominantly done as a requirement from funders and donors, only one respondent alluded to that in this study, possibly because that question was not directly asked and there was therefore no inclination from other respondents to address it. The respondent who mentioned it did so in relation to the extensive role played by corporates in supporting their urban greening initiatives. According to Silva and Krasny (2014), programs cannot accurately assess their impact or fulfillment of their goals, report back to funders, or adaptively adjust management with new lessons learned, without monitoring. While most programs could report on the survival rate of the trees they planted and the lack of mechanisms to track the figures in those who reported survival, the rate was between 40 % to >90 % in those that volunteered the information, with two specifying that there had been tree replacement after the low survival rate in the first instance. According to Koeser et al. (2014), urban tree mortality is generally greatest among the youngest trees, especially in the first two to three years following transplanting. Thompson et al. (2004) reported a survival rate of 91 % over the first 3 or 4 years after planting on a tree planting program largely led by community volunteers in Iowa, USA. Similarly, Mincey and Vogt (2014) found that 89 % of trees planted in the NeighborWoods tree planting program by Keep Indianapolis Beautiful (KIB) in Indiana, between 2006 and 2009. Here, emphasis was put on the importance of watering strategies for the survival and growth of neighborhood-planted trees within the first few years of planting. Therefore, a >90 % survival rate of trees monitored over one year, as reported in this study, cannot necessarily be commended or lauded as a success story because mortality usually peaks within the first three years.

Three projects in this study reported job creation as one of the outcomes in their projects. These can be categorized as green-collar jobs (Pinderhughes, 2007). Green-collar jobs, which Falxa-Raymond et al., 2013 describe as jobs that contribute to preserving or enhancing environmental quality, are prevalent in urban natural resource management and often range from low-skill, entry-level positions to high-skill, higher-paid jobs (Apollo Alliance, 2008). The jobs described by the respondents in this study resonate with green-collar jobs. At face-value, this may be a commendable outcome. However, it was not sustainable, especially considering the duration and scale of these projects. In the first instance, the projects were short-term and implemented in just one residential area, which means that the people regarded as having been given jobs only received once-off payments. An alternative to this would be to focus on skills development as an outcome where participants in projects will have learned certain skills by the end of the project which they can use as a contribution to their livelihoods. Various government departments in South Africa host programs of this nature, such as the Working for Water (through removal of invasive alien species), Working on Fire (to prevent and fight wild fires), Working for Wetlands (to restore degraded wetlands) and allied programmes, with approaches that are specifically pro-poor and labour intensive (King and Shackleton, 2020). These programs have created around 180 000 permanent job opportunities, of which roughly 52 % are held by women (King and Shackleton, 2020), and they target those with low formal skills and work experience to help build skills and alleviate poverty (Mohapi, 2016).

Indeed, the context of these suburbs is poor low-cost housing areas populated by a predominantly unemployed population. This means that implementing entities need to think beyond the day of tree planting when they plan their projects so as to work towards an outcome of skills development concurrent with job creation. However, the informal or household sector should also be considered in the provision of green-collar jobs, as they have been found to provide the most work opportunities in this sector (King and Shackleton, 2020; Kingdon and Knight, 2004; La Porta and Shleifer, 2014; Meagher, 2016; Neves and du Toit, 2012). Some programs in this study also reported on the establishment of environmental clubs or training of selected residents as community environmental educators or Eco-warriors. This means that these projects have the potential to expand beyond the presence of the implementing entity in the areas as members of these groups could work independently with residents from neighbouring communities to advance the agenda of tree planting.

3.5 Lessons for urban tree planting in low-cost housing areas

As indicated in Chapter 1, low-cost housing areas are characterized by low education levels, indigence, unemployment, and high density housing. Given these contexts, partnerships and collaborative governance could be the most important systems needed to promote the successful implementation of urban greening strategies and therefore the planting of trees in these areas. Previous research has indicated that many residents in these areas appreciate urban trees and would also, like residents in the more affluent areas, like to have them planted in both the private and public spaces of their suburbs

(Gwedla and Shackleton, 2019; Shackleton et al., 2014). The projects reviewed showed that this is possible and may very well be a reality in some parts of the country through the mobilization and involvement of entities outside of the government. Tree planting in single suburbs could be a good way to start, with gradual expansion being dependent on the meeting of community determined goals and objectives. These objectives need not be superficial or ambitious, but be aimed at encouraging the inclusion of all stakeholders. Implementing entities need to make efficient use of the municipal-structures of governance but also facilitate for information to actually filter down to the residents.

There was an assumption in many projects that informing just the ward councillors about plans was the green-light and would translate to the participation of residents. That was generally not the case. Resident engagement and participation should go beyond informing, but aim to reach an empowered level where residents are able to intuitively make decisions about urban greening in their private spaces and those public spaces in close proximity. In the absence of formal and larger programs of urban greening, household ability to pay for trees and their associated inputs is the key driver in urban forest expansion (Hungerford and Moussa, 2017). Urban greening programs should also be designed to meet community needs by understanding citizen's attitudes, expectations and perceptions (Jim and Chan, 2016; Jim and Chen, 2008; Lo and Jim, 2010, 2012; Shackleton and Mograbi, 2019). This requires close relationships between the planning and implementing entities, and residents, where residents are directly involved in decision-making and governance, and local projects. NGOs are also hubs of capacity for successful urban greening (Watkins et al., 2018). There are already a number of them involved with various communities, and incorporating tree planting in those already existing programs could mean a step towards bridging the heterogeneity in urban tree distribution gap between the predominantly affluent areas and the predominantly black-populated poor low-cost housing areas.

3.6 Conclusion

The urban forest governance network demonstrates the importance of multiple stakeholders and partnerships for the successful implementation and sustenance of tree planting initiatives. The DEFF as the national custodian of forestry plays a critical role in formulating urban greening plans and strategies with the expectation of implementation by municipalities. However, other actors and stakeholders need to be part of those plans from conception to implementation. Tree planting is more than just the day of planting, because trees need protection and maintenance. The current challenges that implementing entities face make it virtually impossible for the continued maintenance of trees without the involvement of local residents. Small to medium-scale, long-term projects are the most common and have the potential to be more successful as they are characterized by more opportunities for community engagement than the small to medium, short-term or large-scale and short-term projects where there is limited opportunity or non-existent consultation. Given the numerous challenges to public space tree planting, possibilities and opportunities for private space planting need to be sought and effectively utilized, and mechanisms advanced to support residents willing to engage in private space planting,

especially in locations with no existing tree planting programs. Community involvement and participation in the planning and implementation of projects could contribute to the protection of public space green infrastructure. A low-cost housing context requires a holistic and inclusive approach to urban tree planting, one that recognizes the context and attempts to mitigate it by providing residents with opportunities of learning and empowerment, where tree planting is one of the vehicles to livelihood support.

Chapter 4

Perspectives on the Distribution of Urban Trees in Public and Private Spaces of Low-Cost Housing Areas

“Yes, we are poor. We know that, everybody knows that, and you can also see it. But, I am one of the very few fortunate people here because I can make a few cents from selling the bananas I get from my trees at the back. This is one of the beautiful thoughts I have when I think of my time working in white people’s homes. I came home with a banana tree” (Mama Gladys’, personal communication (2017)).



Harvest from trees in mama Gladys’ garden in the Vukani low-cost housing area in Grahamstown, Eastern Cape. She received the trees when she worked as a domestic worker from her employer as a donation many years ago (Image taken with permission by the researcher, 2017).

Overview

The previous chapter presents a review of the urban tree planting landscape in South Africa and provides selected examples in that regard. Findings reveal that some municipalities are actively planting trees in some low-cost housing areas, and the DEFF has demonstrated its commitment to urban forestry through tree planting initiatives implemented in low-cost housing areas in a few provinces. Given such initiatives, an investigation into the distribution of urban trees in public and private spaces of low-cost housing areas ensues. Consequently, this chapter presents findings in relation to Objective 2 of this study, which sought to investigate the distribution of trees in selected low-cost housing areas, and outline the perspectives of residents from old and new low-cost housing areas and municipal officials regarding the distribution and need for trees in their suburbs. I asked the following questions:

- a) Are there any trees in the public and private spaces of low-cost housing areas?

- b) Would residents be willing to participate in a tree planting program for their residential areas?
- c) To what extent has urban forestry been incorporated in municipal IDPs?

4.1 Introduction

4.1.1 Distribution of trees in urban areas

Much of the green space in modern cities exists in private gardens of low-density, affluent residential neighbourhoods (McConnachie and Shackleton, 2010; Pearce et al., 2013; Shackleton et al., 2018). However, the space available to fit trees in private gardens varies with varying lot size and urban form (Nguyen et al., 2017). Urban tree cover is a particularly important environmental amenity that is often spatially heterogeneous within and between urban areas (Cadenasso et al., 2006; Grove et al., 2006; Gwedla and Shackleton, 2017; Kendal et al., 2012; Kuruneri-Chitepo and Shackleton, 2011; Landry and Chakraborty, 2009; Perkins et al., 2004; Seburanga et al., 2014;), both at neighbourhood and household scales (Shakeel and Conway, 2014). This is because most urban forests are located in highly altered and extremely complex ecosystems where humans are the main drivers of their species, abundance, and distribution (Escobedo et al., 2011). Furthermore, at city and neighbourhood scales, the spatial heterogeneity of urban trees is influenced by a number of exogenous factors largely dictated by the urban forest governance structures of cities, often associated with municipalities (Ordóñez et al., 2019). On the other hand, the variation in private spaces is attributed to individual decision-making, which is largely influenced by individual households' varied knowledge, attitudes, experiences and resources, leading to different management actions and vegetation characteristics (Conway, 2016; Daniel et al., 2016; Nassauer et al., 2009). Consequently, management decisions by officials in public areas and preferences of private homeowners, driven by human and biophysical legacies (Roman et al., 2018) contribute vastly to current urban forest patterns and composition. The human legacies, a result of past decision-making based on spatial planning by both local governments or tree planting initiatives (specifically in public space tree planting) and residents (in private space tree planting) have influenced the distribution of urban trees currently and has resulted in the heterogeneity prevalent today (Roman et al., 2018). The results of these human legacies based on past decisions by local governments are especially pronounced in South Africa (Gwedla and Shackleton, 2017; Venter et al., 2020).

4.1.2 Drivers of the distribution of trees at various scales

The heterogeneous distribution of urban trees and vegetation often disproportionately favours certain socio-demographic groups (Danford et al., 2014), thus raising environmental equity concerns (Tooke et al., 2010). Consequently, unequal access to green amenities and spaces represents environmental disparities when some urban residents are deprived of the benefits provided by green spaces (Li et al., 2015). Ideally, one of the goals in urban tree establishment and management would be for a more equal distribution of trees within the urban matrix, between and within towns. Unfortunately, low income and typically high density urban areas are usually the most susceptible to the uneven distribution of green

infrastructure, evidenced by the general lack of trees (Gwedla and Shackleton, 2017; Lee et al., 2019; Li et al., 2015) and green spaces (Kabisch and Haase, 2014; McConnachie and Shackleton, 2010; Thaiutsa et al., 2008). Numerous factors, including but not limited to, the built environment, and socio-demographic drivers at household, and neighbourhood and jurisdictional scales (Pham et al., 2013) influence the distribution of urban trees in towns. In some instances, low abundance of trees within parts of cities are typically most strongly correlated with low levels of household income and individual educational attainment (Heynen and Lindsey, 2003; Iverson and Cook, 2000; Kirkpatrick et al., 2007; Kirkpatrick et al., 2011; Landry and Chakraborty, 2009; Martin et al., 2004; Mennis, 2006). For example, Heynen and Lindsey (2003) found that income and education were positively correlated with the urban canopy cover in Central Indiana.

Other socio-economic factors such as ethnicity (Heynen et al., 2006) and housing tenure (Perkins et al., 2004) can also be influential. Zhou and Kim (2013) found significantly less tree canopy cover in blocks that have higher populations of African Americans in four mid-sized cities in Illinois, and Heynen et al. (2006) indicated that census tracts predominantly populated with non-Hispanic whites in Milwaukee were strongly correlated with higher rates of tree cover and Hispanics areas the opposite. On the other hand, Kirkpatrick et al. (2013) concluded that renters have less interest in private space beautification or investment, but once houses are owner or mortgage-occupied, tree planting follows. Mennis (2006) noted that the age of a neighbourhood and the availability of space are correlated to the extent of vegetation and tree cover, reporting that older neighbourhoods tend to have higher vegetation intensity, likely because the managed vegetation is more mature, although this is only the case when accompanied by indicators of a large residential development or socio-economic advantage. Older residential areas accumulate more trees over time, increasing both canopy cover and diversity (Anderson, 2007), as explained by (Jim and Zhang, 2015), citing that the age of urban communities could influence the urban forest structure and composition in Hong Kong, China. The space available for tree planting also directly affects the distribution of trees both in the public and private space (Landry and Pu, 2010; Troy et al., 2007). While some cities are better endowed with adequate and high quality “plantable” spaces to permit greening, others, especially in the developing world, often have inadequate space for tree planting (Jim and Chan, 2016). Indeed, high housing density can negatively affect the amount of green space, particularly the area of private gardens (Luck et al., 2009) purely because of the need for more people to be accommodated despite space limitations.

Another driver of urban tree distribution in private spaces relates to household decisions to remove or plant trees (Conway, 2016), which is likely to be influenced by the meanings they attach to trees (Ives and Kendal, 2014). Some of these decisions may be associated with plans for redevelopment (Morgenroth et al., 2017) and renovation (Steenberg et al., 2018), or individuals’ internalized sense of what neighbors find to be acceptable for landscape appearance (Nassauer et al., 2009). Guo et al. (2019) revealed that most landowners in Christchurch, New Zealand, removed trees in their property because they “were in the way of demolition or construction vehicles or equipment”, and they “were removed to

make space for the new development”. In this instance, the demolition followed an earthquake that damaged thousands of dwellings and rendered them uninhabitable (Guo et al., 2019). As such, the redevelopment, which is still ongoing, was targeted at those damaged properties. On the other hand, homeowners retain or plant trees for the tangible and intangible benefits they derive from them (Kirkpatrick et al., 2012; Lohr et al., 2004).

4.1.3 Urban tree distribution in South African low-income areas

The socio-economic drivers of uneven distribution of urban green spaces and trees is particularly mirrored in South Africa, both between and within towns (Gwedla and Shackleton, 2015; Kuruneri-Chitepo and Shackleton, 2011; McConnachie et al., 2008; McConnachie and Shackleton, 2010;), and at both the city and household scales. The area of public green space and urban forests are less in poorer towns and cities of the developing world (McConnachie et al., 2008; Thaiutsa et al., 2008). Poorer communities in several small South African towns also exhibit low areas of public green space relative to more affluent areas (McConnachie and Shackleton, 2010). Gwedla and Shackleton (2015) showed that larger and wealthier towns (which are correlated attributes) in the Eastern Cape province had a higher street tree density than smaller and poorer towns. Furthermore, Gwedla and Shackleton (2017) and Kuruneri-Chitepo and Shackleton (2011) reported that the low-cost housing and township suburbs have much lower street tree densities than the affluent suburbs. Johannesburg exhibits similar patterns of urban green space distribution, as evidenced by a highly unequal distribution in the extent of tree cover and formal green spaces between the north and south of the city. For example, the forest covers approximately 24 % of the total area of Johannesburg's historically wealthy northern suburbs, while tree cover in the poorer southern region is approximately 7 % (Schäffler and Swilling, 2013), hence the city's current efforts to commit resources for urban greening in the southern suburbs mentioned by one of the municipal officials in Chapter 3. These disparities clearly show that wealthier neighbourhoods are contrasted by poorer ones (Lee et al., 2019) which may also coincide with ethnic (Zhou and Kim, 2013) and other socio-economic differences (Li et al., 2015), which is often the case in South Africa (Kuruneri-Chitepo and Shackleton, 2011).

South African low-cost housing areas are characterized by low income households (Shackleton et al., 2018). Households in these areas are usually faced with several obstacles like limited financial means, power, and lack of space in their efforts to foster the greening of their residential areas (Talarchek, 1990). As such, they may be more inclined to get trees from sources that will not require them to. Additionally, municipalities also need to prioritize other service delivery issues in these suburbs, rendering the delivery of urban greening in public spaces amongst the least of their priorities (Gwedla and Shackleton, 2015). Regardless of these challenges, it seems that many municipalities and planning processes are ignoring opportunities for the newest and centrally planned suburbs to be designed according to best international practice, despite the ample evidence that South Africa's general policy

environment echoes such international sentiments regarding the environmental sustainability of human settlements (Schäffler and Swilling, 2013; Shackleton et al., 2014).

4.1.4 Towards greener low-cost housing areas

There are active efforts to provide urban residents access to urban trees and green spaces, and a growing number of municipalities globally are engaged in urban forestry working towards ambitious canopy cover targets or tree planting goals (Conway and Bang, 2014; Pincetl et al., 2013; Young, 2011), accelerated by climate change concerns (Byrne et al., 2015). Within these activities, an emphasis on planting trees in both public and private lands (Conway, 2016), and the outreach to and active participation of residents and non-profit organizations through a variety of programs (Chapter 3), including volunteerism, is increasingly encouraged, albeit far from universal, especially in the global South (Daniels et al., 2014). In wealthier areas, residents play active and diverse roles in enhancing and protecting the urban forest, acting as stewards by identifying available planting locations, requesting new trees for the street and their yards, and physically participating in the planting (Locke and Grove, 2016; Locke et al., 2015; Rae et al., 2010; Turner and Mitchell, 2013).

The emphasis on residents' participation builds on a long discourse that situates tree planting as part of residents' civic duty (Cohen, 2004). Urban tree establishment and management programs also create positive opportunities for urban forest professionals to work closely with residents (Austin, 2002), and there is wide recognition that the participation of different groups of people is crucial to urban forest management (Ordóñez and Duinker, 2013; Zare et al., 2015). This is because urban forest management is not just about improving the abiotic and biotic visage of residential areas but is also about the social aspects of city life, including people's satisfaction, experiences and perceptions of the quality of their everyday environments (Chiesura, 2004; Zare et al., 2015). At household level, Kaoma and Shackleton (2014b) found that most urban residents of poorer suburbs in small towns of a developing country actively plant and manage trees in their homesteads, even though this practice is frequently ignored by researchers, governments and international forestry organisations. Planting activities may offer residents an opportunity to voice their opinions and express their knowledge, especially when it comes to their needs and preferences, as well as participate in decision-making regarding the selection, planting and care of trees. Rae et al. (2010) suggested that involving residents in tree planting and maintenance could help "to transfer a citizen's sense of ownership over the sidewalk through giving them more investment in new trees", thus fostering a sense of responsibility for the trees. Additionally, the involvement of urban residents in tree planting leads to outcomes that respect the local culture, religion or history of the community (Matsuoka and Kaplan, 2008).

There is plenty of international literature which explores the distribution of urban trees and their canopy cover, and green spaces (including access to these spaces) between (e.g. Clarke et al., 2013; Greene et al., 2018; Kabisch and Haase, 2014; Krafft and Fryd, 2016) and within different suburbs (Astell-Burt et al., 2014; Conway and Bournier, 2013), but opportunity still exists to explore such dynamics within

single types of suburbs and in a developing country context, paired with residents' willingness to change the status quo. Accordingly, this part of the study aimed at examining the distribution of trees in the public and private spaces of low-cost housing areas, and to ascertain the self-motivated participation of residents in planting trees. In line with Mennis (2006)'s and Conway and Bourne (2013)'s assertions that older households and neighborhoods tend to have higher vegetation intensity, I hypothesized that the older suburbs would have more households with trees than the new ones, and that the residents would be willing to participate in programs aimed at planting trees in their respective suburbs.

4.2 Methods

4.2.1 Study sites

This study was conducted in eight small to medium-sized towns (based on population and area) in the Eastern Cape province of South Africa (Fig 4.1) (Table 4.1), the second-largest province which accounts for approximately 14 % of the total land area of the country (Stats SA, 2015). The province borders Kwa Zulu-Natal in the north-east, Free State and Lesotho in the north, and the Western and Northern Cape in the west (Gwedla and Shackleton, 2019), and is characterized by arid areas of the Great Karoo in the northern and north-western parts, and the Drakensberg Mountains in the north-eastern parts (Mucina and Rutherford, 2006).

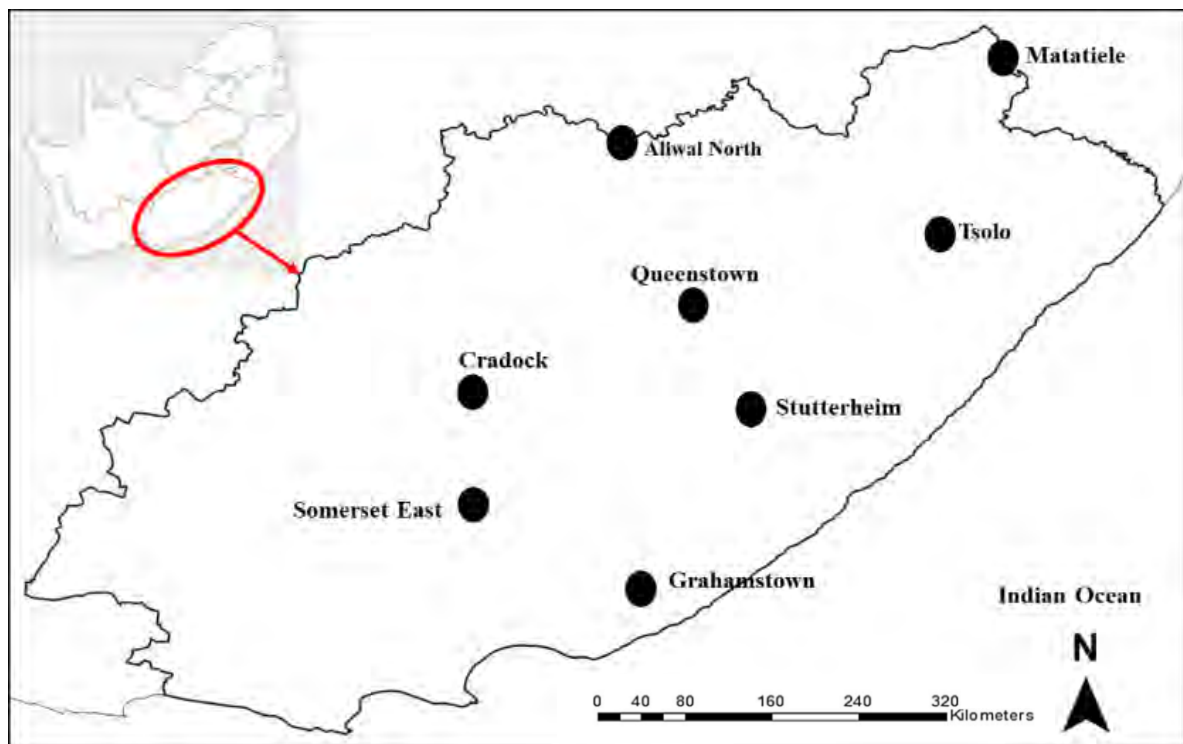


Figure 4.1: The location of study towns within the Eastern Cape province of South Africa.

The eight study towns range between 11.2 km² and 121.4 km² in size, and with populations ranging between 7 794 and 67 264 people (Table 4.1), hence their classification as small-medium sized towns. Most of the study towns are situated in vegetation biomes that have few trees, such as grasslands, and Cradock receives the least rainfall (248 mm) while Tsolo receives the most (629 mm) (Table 4.1).

Table 4.1: Physical characteristics of study towns (biome: FYN =fynbos; G= grassland; NK = nama karoo; T= thicket).

Town	Size (km²)^a	Population^b	MAR (mm)^c	Biome^c
Aliwal North	34.6	35 153	418	G
Cradock	25.9	36 671	248	NK
Grahamstown	65.1	67 264	466	T/FYN
Matatiele	11.2	12 466	609	G
Queenstown	71.3	43 971	400	G
Somerset East	72.8	18 825	348	T/G
Stutterheim	121.4	24 673	600	G
Tsolo	46.7	7 794	629	G

^a From Gwedla and Shackleton (2017)

^b From StatsSA (2015)

^c From Mucina and Rutherford (2006)

The 2016 Community Survey indicates that the province has a population of 6.9 million people, comprised of 53% females and 86% black Africans, and represents 12.6 % of the country's population. According to Stats SA (2015), about 40 % of households in the province receive some form of government social grant. Approximately 22 % of households in the province live in low-income homes provided by the government through the Reconstruction and Development Programme (RDP), which is below the national average of 23.3 % (Stats SA, 2015), across two metropolitan municipalities, six district municipalities, and 31 local municipalities (Stats SA, 2018a). The sizes of these municipalities range from 1 291 km² to 11 668 km², with the smallest having 36 002 people and the largest 1.15 million people (Stats SA, 2018a). The dominant languages spoken in the province are isiXhosa (83 %), Afrikaans (10.3 %), English (4.0 %) and SeSotho (2.3 %) (Stats SA, 2015). The economy of the province is driven by the manufacturing sector, centred on the automotive industry (Stats SA, 2018a). However, the province remains the poorest in the country, with low adult education levels, high unemployment (>35 %) and poverty (Westaway, 2012), and these are higher in the more rural municipalities and lower in the larger towns and cities (Gwedla and Shackleton, 2015).

4.2.2 Data collection

Data collection occurred between April and November 2017. The sample towns (Fig. 4.1) were randomly selected on Microsoft Excel from the 24 previously sampled by Gwedla and Shackleton (2015), then stratified to balance population size (below 100 000 people), and the presence of the post-1994 low-cost housing areas (RDP areas). In each of these towns, two RDP suburbs, one more recent (developed post-2004) and the other older (developed between 1994 and 2004), wherein 100 (50 per suburb) household surveys (Appendix 2) regarding residents' perspectives on trees and tree planting were conducted. If a town only had one or two RDP suburbs, for example Tsolo, then all the surveys were conducted in those suburbs. Household surveys are a form of structured questionnaire consisting

of specific questions from which quantifiable data can be derived (Newing, 2011). The surveys were conducted with any available adult member (>18 years old) of the family, who consented to the interview (Appendix 1). Without disregarding the head of the family, I chose to interview any adult member to eliminate any bias towards a male-dominated sample because males are regarded as heads of households in many families. Initial access into the towns and suburbs was negotiated with the municipality, and ward councilors of the respective suburbs were visited to explain the nature of the research, and general awareness with regards to my desire to work with members of the community. Previous research (Gwedla and Shackleton, 2015; 2017) informed the design of the questionnaire and the format of questions. The open-ended questions were included to give respondents the freedom to express themselves as much as possible without the confines of needing to be right or wrong. The interviewers also communicated this to the respondents, encouraging them to be as open as possible with no fear of judgement.

Maps of the randomly selected towns were obtained, then a 100 m × 100 m grid was overlaid across each town and grid squares were randomly selected. The grid was manipulated further to only cover the two residential areas already selected (the towns had previously been visited, so there was clarity on the locations of the residential areas). The randomly selected grids were labelled and visited, and sampling took place along a 200 m transect on either side of the road. Ten transects were visited in each town, five in each low-cost housing area, respectively. Within each transect, I observed the presence or absence of trees along the street, and visited the five randomly selected households (if the selected household was not occupied, the next occupied household was sampled). Each randomly selected household was approached with a greeting and an introduction of the visit was made. Informed consent (both verbal and written) was sought prior to the commencement of the survey. The surveys included questions on trees planted or removed on the property since occupation and the reasons for removal, residents' decisions and motivations to have/not have trees in their property, the sources of planted trees, and residents' prior exposure to tree planting and their participation in that regard. The questions were predominantly closed-ended, requiring yes/no answers while some had statements and options for respondents to choose the most applicable to them. Notes were taken regarding any statements respondents made which were not part of the survey but were relevant. Demographic data such as gender, age, occupation, and how long respondents had stayed in suburb, etc., were recorded during the surveys. The surveys were conducted in respondents' preferred language (between isiXhosa, English and Afrikaans), and lasted no more than 0.75 hours.

In addition to the household surveys, I conducted face-to-face key informant interviews with the most senior officials responsible for urban greening and tree planting in each municipality, following the guidelines in Appendix 4. This was done because of the identification of municipalities as implementers of Greening Plans and Strategies reported in Chapter 3. I used a semi-structured approach to facilitate open and free flowing discussion on the topics of interest, which included (i) the officials' perceptions on the distribution of trees between the various segments of their respective towns and the likely drivers

of the variations, (ii) their awareness of past or current tree planting initiatives specific to low-income areas by the municipality or an NGO, and (iii) the availability of environmental management plans and the inclusion of urban tree planting in the municipal Integrated Development Plan (IDP). All respondents consented to the interview (Appendix 3), and to the recording of the interviews via a tape recorder to ensure that full details were available for later analysis. The interviews were 0.75–1.25 h long and conducted either in isiXhosa or English according to the respondent's preference. To comply with the anonymity clause in both the ethical considerations and the consent forms signed by the respondents, I concealed their identities and those of their towns. I subsequently coded the towns with numbers 1-8, in no particular order, and this does not impact on the presentation of the data and the conclusions made. I supplemented the interviews with an examination of the latest IDP document of each municipality, looking for evidence of strategic or project commitments to urban greening or tree planting. The documents were available online and four municipalities also provided physical copies during the interview visits.

4.2.3 Data analyses

All questionnaire data were translated into English before analysis began. Data obtained were of both qualitative and quantitative nature. Preliminary data analyses were conducted using Microsoft Excel 2013. All subsequent statistical quantitative data analyses were executed in Statistica 13, and the qualitative data were initially analyzed using content analysis. Based on the hypothesis, crucial variables included perspectives on the distribution of urban trees in the older and more recent low-cost housing areas, the sources of planted trees, and the willingness to participate in tree planting programs. The relationships between some of the dependent variables such as the presence or absence of household trees and willingness to participate in tree planting programs were explored. Data of this nature (proportional data) were analyzed via Chi-square analysis or 2×2 contingency tables, and willingness to participate was analyzed using logistic regression. After checking for normality, differences in perceptions between suburbs, households with trees and those without, and between genders were analyzed using Chi-square tests. Data relating to residents' reasons for their willingness to participate were analyzed using Microsoft Excel 2013.

For the interviews, content analysis of the taped recordings was used to identify, summarize and analyze the perspectives of respondents regarding the distribution of trees in public and private spaces, the participation of residents in tree planting programs, and the prevalence of planning for urban tree planting in low-cost housing areas. Interviews were replayed up to four times. The respondents were directly quoted during the interpretation and presentation of data to contextualize and enrich analysis. The examination of the IDP documents guided by searches using keywords such as “tree”, “tree planting”, “greening”, “beautification”, and “forestry”. After noting down the generated results, I examined the context in which the keywords were used and generated the results based on the context relevant to this study.

4.3 Results

4.3.1 Respondent profile

The demographics of household respondents who participated in this study, most (68 %) of whom were female, are presented in Table 4.2. The highest represented (42 %) age group was the middle-aged between 30 and 49 years of age (Table 4.2), and the highest education attained (69 %) across the sample was Grade 12 (Table 4.2).

Table 4.2: Profile of household respondents surveyed in this study (n = 800).

Age structure and gender distribution					Education attainment		Employment status	
Age grouping	Age (yrs)	Number of respondents= n(%)			Highest education	Respondents = n(%)	Description	Respondents = n(%)
		Females	Males	Total				
Young	18-29	208 (73 %)	86 (27 %)	294 (37 %)	None-High school	224 (28 %)	Full-time	181 (23 %)
							Unemployed	374 (47 %)
Middle-aged	30-49	220 (65 %)	117 (35 %)	337 (42 %)	Grade 12	549 (69 %)	Part-time	77 (10 %)
							Retired	125 (16 %)
Elderly	>49	116 (69 %)	53 (31 %)	169 (21 %)	Higher education	27 (3 %)	Self-employed	14 (2 %)
							Student	29 (4 %)
Total		644 (68 %)	256 (32 %)	800				

Eight municipal officials, who were the available highest ranking officials responsible for parks, cemeteries and open spaces, also participated in this study. Five of these officials were male. One of the officials was close to retirement and had been on the job for 43 years (Table 4.3). Between these officials, the highest education attainment was a university degree (Table 4.3).

Table 4.3: Profile of municipal officials who participated in this study (n=8).

Gender	Age group (yrs)	Official designation	Professional background	Years of experience (in sector)
F	30-40	Manager: Solid Waste and Environment	Environmental Health Diploma	10
F	30-40	Environment and Waste Management Officer	Environmental Management Diploma	5
F	60-65	Manager: Parks and Recreation	Horticulture, Parks and Recreation Administration, Diploma in Floristry	43
M	40-50	Manager: Parks and Recreation	International Relations Degree	8
M	40-50	Supervisor: Parks, Cemeteries and Open Spaces	Diploma in Horticulture	9
M	50-59	Superintendent: Parks and Recreation	Grade 12 and experience in farming	25
M	50-59	Senior Amenities Officer and Horticulturist	Higher Diploma in Parks and Recreation Management	27
M	50-59	Supervisor: Parks, Gardens and Cemeteries	Grade 12 and experience	20

4.3.2 Distribution of trees public spaces

There was a general lack of trees along streets of both the new and old low-cost housing areas (Fig. 4.2). Only two 200m transects among the 80 sampled transects had any trees in the public space. These trees were all observed along the streets of the new, low-cost housing area in Matatiele. One transect had four trees while the other had two, and in both instances these transects were on the main access road into the suburb on two different sides. These numbers were corroborated by a municipal official from Matatiele, who reported that there had indeed been trees planted in the public spaces of low-cost housing areas, even though most of them did not survive. The low survival rate was attributed to the drought which the region had experienced over the last five years.



Figure 4.2: The typical appearance of streets in many low-cost housing areas, depicting a general lack of trees.

The lack of trees in the public spaces of low-cost housing areas was corroborated by officials from seven towns when they described the extent of tree cover in the various types of suburbs in their respective towns, and their level of satisfaction with that cover. Highlighting this, a municipal official based in Town 3 expressed that:

“Our town is divided into West and East. The East does not have trees in public spaces, and even those few that might be found in the yards might have grown on their own. Basically, that area of town is bare, and I can estimate that 95-98% of that area does not have trees both in the private and public spaces, compared to the west. It is a really bad situation”.

An official from Town 5 reported on the distribution of trees in the low-cost housing areas, focusing on the municipality’s deliberate strategy of not planting trees in public spaces, stating that:

“There are no trees in the public spaces of low-cost housing areas in this town. We have not planted in the newest areas specifically because the community in this town

knows that if they want trees they can come to us and ask for a donation and we will give them. We also do not have a plan to plant trees there in the future, particularly in the public spaces because we are not a big municipality with a big workforce, so it is not very easy to get trees planted in those areas”.

An official from Town 8 mentioned the natural circumstances associated with rocky soils that have resulted in the absence of trees, specifically in the newly established low-cost housing area. In another instance, an official from the smaller municipalities indicated that the nature of the broader municipality does not make it possible for there to be trees in public spaces, stating that the municipality serves a mainly rural population, among other things. Elaborating on this, the official said:

“Unfortunately, there are no trees in the public spaces of both our towns. The municipality does not even really have a department dedicated to tree planting because most of what we do is when it comes to environmental stuff (sic) is cut grass, allocate graves, waste management and allocate graves. The municipality does not plant trees. People who want trees plant them themselves. Remember, we are a rural municipality and we cannot abandon those rural areas to focus on RDP areas only” (Town 2).

On tree planting by residents in the public spaces, two officials indicated that such activities are permitted, in accordance with the municipal by-laws. However, one official pointed out that they allow residents to plant trees in public spaces on condition that a tree had been removed and therefore had to be replaced. Typifying those where tree planting by residents in the public space was not permitted, an official from Town 7 stated that:

“The municipality has a by-law that prohibits residents from planting anything outside of their yards, unless they have written permission from the municipality. In which case the municipality would also have to advise the residents on the permitted species to plant. But, we have not had such cases while I have been here”.

4.3.3 Distribution of trees in private spaces

The consensus on the planting of trees in the private spaces among all municipal officials was that households are responsible for planting their own trees, if they abide by the by-laws of the municipality. In that regard, four of the sampled municipalities have opened lines through which residents can ask for trees for their private spaces, similar to those reported in Chapter 3.

An assessment of the distribution of trees in private spaces revealed that most households (52 %) sampled across all towns reported having at least one tree in their yard (Table 4.4), ranging from 72 % in Aliwal North to 28 % in Tsolo. More households (60 %) in the older suburbs had trees than those in the new suburbs (44 %) ($\chi^2=22.5$; $p<0.05$). In the older suburbs, the distribution of household trees ranged from 74 % in Grahamstown and Cradock, respectively, to 34 % in Queenstown, while those in the new suburbs ranged from 76 % in Aliwal North to none in Tsolo.

Table 4.4: Proportion of households in old and new RDP suburbs with trees.

Town	Households with trees by suburb age (%)		Mean
	Old	New	
Aliwal North	68	76	72
Cradock	74	68	71
Matatiele	70	62	66
Somerset East	52	62	57
Grahamstown	74	20	47
Stutterheim	54	34	44
Queenstown	34	26	30
Tsolo	56	0	28
Mean proportion	60±2	44±2	52±2

Corroborating the greater presence of household trees in older suburbs, more of the respondents who had stayed in their respective suburbs for more than 10 years (67 %) reported having trees more than those that had stayed for less than 10 years (47 %) ($\chi^2=22.2$; $p<0.05$). There was no difference ($\chi^2=1.6$; $p>0.05$) in the proportion of households with trees in relation to household wealth, ranging from 48 % in high to 54 % in medium, and 51 % in low income households.

Of the 385 households who reported not having any trees, 25 % reported insufficient space to plant, 19 % reported lack of financial resources to buy trees, the removal of existing trees (11 %), and residents disliking trees in their yards (5 %). The rest of the respondents (40 %) mentioned a variety of other reasons, including lack of fencing, not knowing why the trees had not been planted, trees dying, damaged or stolen, or just had not thought of planting. Three prominent reasons for the removal of trees in private yards were mentioned. Most respondents (53 %) attributed removal of trees to their desire to extend their homes, while another group (28 %) had noticed that the trees were cracking the walls, or were growing too fast; with the potential of damaging infrastructure. Others noted that the trees were thorny, which posed a hazard when branches fell. Some disliked trees and regarded them as a nuisance. One respondent from one of the old suburbs expressed with sadness that:

“I had to remove all my trees because they were causing conflict between me and my neighbour on the right because she claimed that my trees were messing with her fence and she could not stand the mess they make. My attempts to reason with her failed and I just had to cut them down” (Household 481).

Many (33 %) had not planted trees because the suburb was still new and they had not got around to doing it. This was more prevalent in the new suburbs than the older ones ($\chi^2=10.4$; $p<0.05$). Others had not planted trees in their yards because their houses are not fenced yet (24 %). This was an important consideration because of the likely damage to trees by animals if they are not protected by a fence and closed gate.

4.3.4 Source of trees in private spaces

Trees in private space had been established through various ways (Table 4.5). On average, 66 % of them had been planted by the occupants of the household, while 13 % were reported to have self-seeded. At suburb scale, 70 % of households in the new suburbs reported that they had planted the trees themselves, compared to 63 % in the old suburbs (Table 4.5) ($\chi^2=2.8$; $p>0.05$).

Thirty-nine percent of households who reported having planted their trees also mentioned that they had bought those trees (Fig. 4.3), compared to 12 % who had transplanted trees from elsewhere. Those who reported that their trees had been donated (28 %) received them either from employers, the local municipality or a local business, or from the national DAFF.

Table 4.5: Establishment of trees reported by households (%) between suburbs, across all towns.

Suburb Age	Source of planted trees (%)				Total
	Present on arrival	Planted by current occupants	Self-seeded	Combination of sources	
New	8	70	10	13	42
Old	8	63	15	14	58
Total	8	66	13	13	100

While more respondents from the old suburbs (44 %) reported having bought their trees than in the new suburbs (32 %) (Fig. 4.3), there were no significance differences in the distribution of sources between the suburbs ($\chi^2=3.2$; $p>0.05$). Similarly, household income had no significant bearing on the source of planted trees ($\chi^2=5.6$; $p>0.05$).

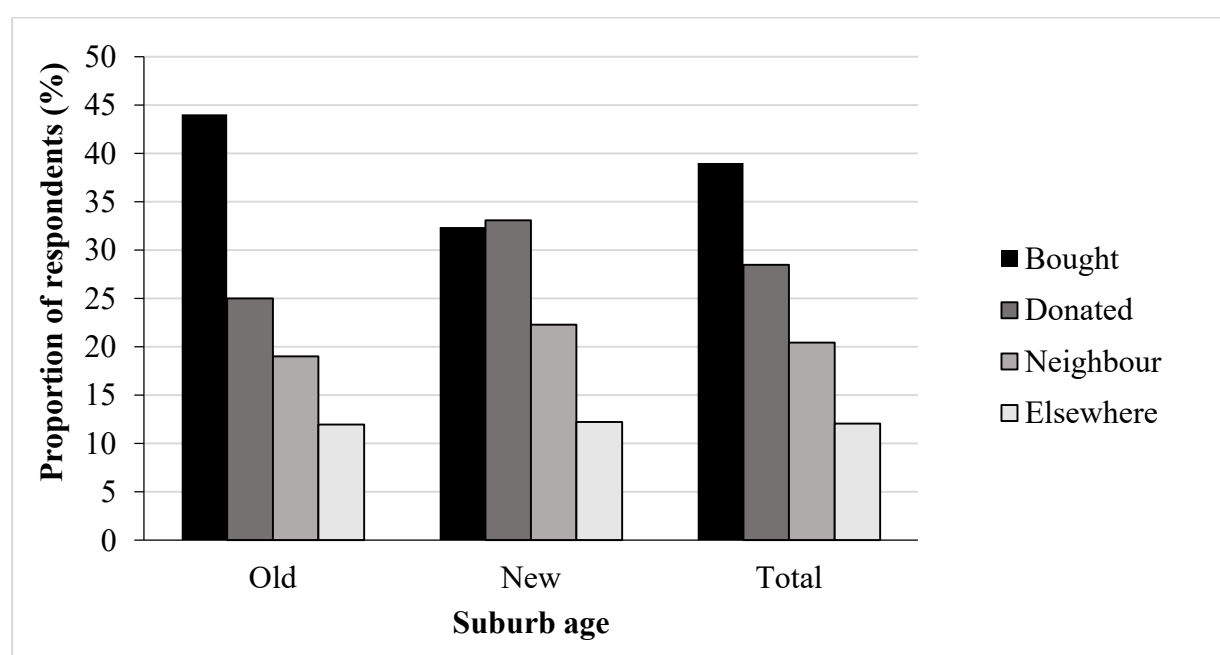


Figure 4.3: Sources of planted household trees by suburb age.

Respondents from Aliwal North were more inclined to get their trees as donations or buying them than in other towns. In Grahamstown, approximately 46 % of the respondents from the old suburb who indicated that they had planted trees reported that they bought their trees from a municipal truck that had been selling them for R5.00 (ZAR). Relaying this, one of the residents said:

“The municipality used to roam around Vukani location selling trees from a van. They were selling small trees and they were from the Parks department. Even though they were cheap, some people could not buy because of affordability, but those who could afford to buy bought those trees. Each person dug their own holes because at ultimately they are the ones who had chosen to have a tree” (Household 295).

The municipal official in Grahamstown corroborated that there had been a municipal truck delivering trees in the area, but disputed that the trees had been sold to the residents, stating that:

“Some time ago, there were two guys that used to come here and collect some trees and deliver in one of the townships. I know that Vukani location benefited from that, and there are quite a few households who received trees in that time, who still have those trees to this day....and from what I know those trees were given freely because the guys who were distributing them used to get a stipend for it”.

While another municipal official had indicated that people had come forward to ask for trees and they were given two, none of the respondents in this sample made reference to this. An official from a different town specified that they do get people coming to request trees, or some even asking the municipality to come and plant some in their suburbs, but these residents are always from the affluent suburbs. None of the respondents in any town indicated that they had acquired the trees after having participated in a tree planting program.

Twenty-eight percent of respondents from the old suburbs in Matatiele indicated that they had received their trees from the municipality as a donation and they did not have to pay for them. In distributing those trees, the municipality announced their availability during a community meeting, and people lined up to each take one. According to one of the respondents:

“We were told to collect the trees, but they were not appealing. As a result, some people took those trees and later sold them. I do not even know the name of the one I got, but it is not a fruit tree but I love it. Maybe when you look at it outside you will know what it is. They never told us what types of trees they are” (Household 675).

4.3.5 Participation in tree planting programs

4.3.5.1 Willingness to participate in tree planting

Most of the respondents (94 %) had never participated in a tree planting programme outside their yards (Table 4.6). Those who had participated reported that it was part of the annual Abor Week

events in South Africa, which prior to 2018 (refer to Chapter 3) took place during the first week of September. The occurrence of these was also mentioned by officials from five municipalities. Two of these officials specified that their municipalities do not have structured tree planting programs for low-cost housing areas but mostly depend on the celebrations of Arbor Month. During this time, municipalities get trees from the national department which they then donate to schools and some local residents. Specifying this, an official in Town 5 said:

“We’ve never really had a special tree planting program. What we have done in the past is have events during Arbor Week, where we would go to schools and talk about trees and sometimes plant them. I have a pamphlet that I drew up, and when people come to ask for trees we also give. We have not had big events. Sometimes when there is an opening of a new building there will be trees planted and we are usually part of that. Members of the public do come to these events”.

Most respondents (84 %) also reported that they had never heard of such programs before (Table 4.6). Of those who indicated having heard of such programs, 62 % referred to television programs they had watched, and could therefore not participate; while 23 % mentioned that they had heard of these programs in other towns or suburbs rather than the one they currently reside in.

Table 4.6: Participation in tree planting programs.

Town	Participation (%)		
	Never Participated	Never Heard	Willing to Participate
Aliwal North	100	96	62
Cradock	95	86	75
Grahamstown	82	62	85
Matatiele	84	73	80
Queenstown	99	93	84
Somerset East	95	88	56
Stutterheim	96	82	83
Tsolo	99	93	77
Mean	94	84	75

Background inquiry into who residents believe should be responsible for supplying trees, and planting them in public spaces, suggested that the local municipalities were deemed to be the responsible entity. However, 47 respondents indicated that they had voluntarily gone to the municipality to either request a tree, or to ask for one to be planted on their street. While one of the municipal officials indicated that people from the older suburbs had come forward and were given two trees, no respondents from the respective town corroborated this. Despite the lack of previous participation and limited familiarity with tree planting programs, 75 % of respondents across all towns expressed willingness to participate in future programs (Table 4.6). Grahamstown residents (85 %) expressed the

most willingness, while those from Somerset East (56 %) expressed the least. The general lack of willingness to participate in tree planting programs expressed by residents from Somerset East was also apparent during an Environmental Awareness program organised by the local municipality, where very few residents arrived despite numerous invitations from the municipality (Fig. 4.4). Lamenting this, the official from this town said:

“When it comes to environmental issues and having people participate in them, we first need to make them understand the importance of having and participating in such programs. We do try to do those things like you saw earlier in that awareness event, but people just do not show up to the things we organise for them. It’s a pity”.



Figure 4.4: Environmental awareness program for the community hosted by the municipality in one of the towns.

The event was also centred around encouraging residents in low-cost housing areas to transform dumping sites to green spaces by planting trees and flowers. It was mainly attended by members of the Expanded Public Works Program (EPWP) (dressed in orange), municipal officials, and learners from the local school, and very few residents.

A logistic regression test was performed to ascertain the effects of whether residents live in the new or old suburbs, whether they have trees on not in their households, their age, gender, education attainment, employment status, and household income on their willingness to participate in a tree planting program for their residential area. The logistic regression model was not statistically significant ($\chi^2=6.5$; $p>0.05$). The model explained 12 % (Nagelkerke R^2) of the variance in willingness to participate and correctly classified 75 % of cases. The young and middle-aged respondents were 23 and 7 times more, respectively, likely to be willing to participate than the elderly and increasing education attainment was associated with an increased willingness to participate.

Table 4.7 highlights the variety of reasons why respondents were willing or not willing to participate in tree planting programs. These reasons were given by respondents without access to a pre-populated list. Suburb beautification was a popular reason for willingness to participate (29 %), while the unwillingness to work without payment (47 %) was a counter to participation in tree planting

programs (Table 4.7). One respondent among those who mentioned ‘other’ reasons elaborated that they would want to participate “as a remembrance of their participation once the trees have grown, and they would be able to show their effort to their children and grandchildren”. A few of the respondents indicated that they would not be willing to participate because they are living temporarily in their respective suburbs because they are tenants. Furthermore, the 9 % of respondents who expressed unwillingness to participate because they do not have the time had all previously mentioned that they have jobs.

Table 4.7: Reasons for willingness or unwillingness to participate in tree planting programs.

Reason for willingness	Number of mentions ¹		Frequency of mention ²	Reason for unwillingness	Number of mentions ¹		Frequency of mention ²
	Suburb Age				Suburb Age		
	Old (n=400)	New (n=400)			Old (n=400)	New (n=400)	
To beautify my suburb	90	85	29 %	I can never work for free	55	38	47 %
I have little else to do	83	75	26 %	I am sickly/too old	25	34	30 %
To enjoy the benefits of trees	55	68	20 %	I have a job	19	15	17 %
To learn more about trees and tree planting	60	58	20 %	I am hardly at home	12	7	10 %
To gain work experience	56	60	19 %	I do not have the time	13	4	9 %
Other ³	26	17	7 %	Other ³	7	10	9 %

¹Number of mentions= number of times the reason for willingness was mentioned between the 602 willing respondents, or between the 198 unwilling respondents

²Frequency of mention= proportion of respondents who mentioned this reason across all towns.

³Other= reasons that were each mentioned by less than 10 willing respondents or the seven unwilling respondents.

When asked about residents’ participation in tree planting programs, none of the municipal officials could directly ascertain this. That is because there had been a prior indication across all municipalities that there were no programs in place, and none had been undertaken in the past (at least not during the tenure of the respondents), for tree planting specific to low-cost housing areas. In this regard, an official from Town 3 mentioned that:

“Most of the trees in people’s yards at the moment were planted by the occupants themselves. Given the rife vandalism of street trees in this town, it is much better to have trees planted in the private spaces so that there will be someone who is directly responsible for them.... what I am coming at is that we cannot afford to have tree planting programs in this town. As a result, we do not have any as a municipality”.

However, an official from Town 4 who had explicitly said that their municipality does not engage in any tree planting activities indicated that during the 2017/2018 financial year, their municipality was

in the process of developing some parks specifically for the low-cost housing and township areas, in which members of the community had participated. He stated that:

“This financial year we have about R200 000 that is set aside for parks for kids in three different wards. That is the little we can do, and the communities were involved because just last week, we went to present to the communities on the issue of parks. They took part in the form of decision-making”.

4.3.5.2 Activities of interest in participation

Almost half (46 %) of the respondents would prefer to engage in the actual activity of putting trees into the ground, while 36 % expressed interest in the watering and care of the planted trees (Fig. 4.5). Those who indicated that their preference was on other activities (6 %) were referring to activities which involved recruiting people for tree planting or engaging in general education and awareness on the importance of trees and planting them. No respondents expressed a desire to be part of the decision-making process regarding the entire process of planting, including deciding where to plant and the species of trees to be planted. There were no significant differences in the proportion of respondents with a similar preference between those residents with household trees (48 %) and those without (45 %) ($\chi^2=0.2$; $p>0.05$).

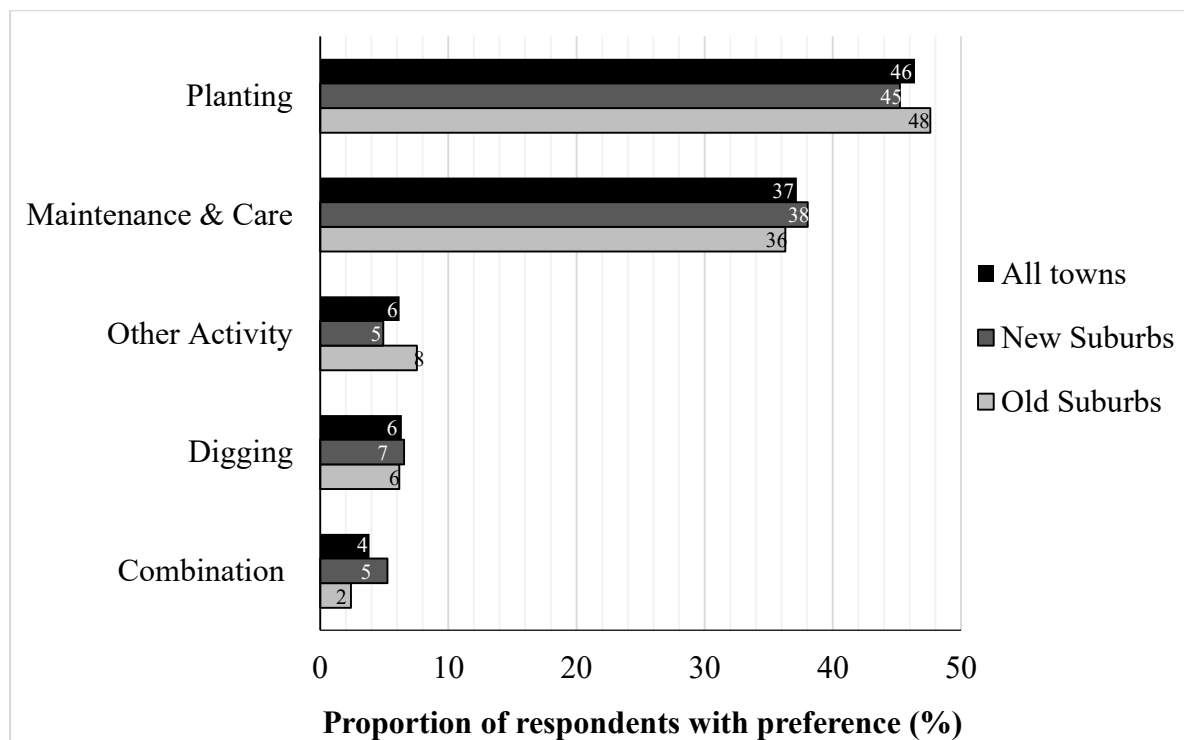


Figure 4.5: Preferred activities during tree planting by those willing to participate.

Residents' preferences for the activity they would like to engage in as part of tree planting was significantly associated with their age ($\chi^2=27.0$; $p<0.05$), with mostly the young (46 %) and middle-

aged (39 %) ($\chi^2=0.1$; $p>0.05$) respondents preferring to engage in the more labour-intensive activities like digging holes and planting trees than the elderly (29 %) ($\chi^2=16.0$; $p<0.05$). The elderly (33 %) who were willing to participate in tree planting were more inclined towards watering and caring for the planted trees. More males (62 %) than females (48 %) expressed preference for activities like digging and planting ($\chi^2=4.1$; $p<0.05$).

There were rarely specific reasons why respondents would opt for the activities they selected, with the general consensus stating that their choice was merely a preference. However, many of the respondents who opted for activities such as maintenance and other care attributed their choice to either age, health, or a general lack of knowledge about getting trees into the ground. The reason associated with age or health referred to respondents' inability to participate in physically demanding activities because they are either too old or have some form of sickness.

4.3.6 Tree planting in Integrated Development Planning

Considering that the majority of households indicated that they would be willing to participate in a tree planting program, and the general consensus from municipal officials confirming that they do not have formal tree planting programs for low-cost housing areas, the inclusion of tree planting and urban green space management in the IDP process becomes a point of interest. Except for when residents were informed to collect trees as a donation from the municipality, no other respondents from the surveyed households mentioned anything about having had a discussion about the planting of trees in any of the community meetings (which is where communities are able to table their needs for inclusion in the municipal IDP) they had ever attended. In response to whether tree planting and urban green space management are considered in the most recent IDP, three officials indicated that they were, another three indicated that they were not, while two preferred to not address the issue. Of those who indicated that they were not, one from Town 3 explained that:

“We currently do not have any mention or entry of urban greening in the IDP, and it could just be that communities do not drive the idea very much and are not prioritizing tree planting. This is both in the West and East sides of town”.

A review of the 2017-2022 IDP document from this municipality did however, return results related to trees and tree planting. They were first mentioned under the goal for a safe, healthy and secure living environment. The strategic objective of this goal is to promote the well-being, health, safety and security of the community, whose key performance indicators include a review of climate change initiatives awareness program implemented; parks, sports and recreational facilities established or upgraded; and the number of trees planted. Tree planting was clearly noted as a development priority in areas where they are needed.

The other official, from Town 1, who indicated that tree planting and urban green space management are not considered in the most recent IDP relayed how they (as officials in the Community Services Department) are never really part of the IDP process, and are only made aware of its outcomes by their senior managers. He attributed the exclusion of tree planting in the IDP to people's limited recognition of the importance of trees and the environment in general. He explained this and said:

"I am not aware that tree planting and urban green space management are one of the KPAs in the IDP. Because the thing is even with the IDP, it is done in another section and we as the people on the ground are never really involved much in it. I am a middle manager so sometimes the top management is there. They only come back to us and tell us what the community says they want in the IDP. The big problem is that the main issues that the community sometimes has is not really concerned about the environment. They are not concerned about greening and stuff. They are more interested in fixing the roads, water and sanitation or things like that. We are right at the back. They never think about tree planting. I have never come across anyone that had said they want trees and it was put in the IDP".

A search for key terms related to urban trees and tree planting through the current IDP for the municipality where Town 1 is situated did not yield any results. The closest entries that may include urban greening were related to the Arbor Week, where the list of areas prioritized for intervention was presented, and the directive for environmental sustainability to be taken into account in all stages of project cycles.

Between the two who indicated that they are considered, one from Town 5 specified that:

"...urban greenspaces and tree planting as key performance areas in the IDP are not necessarily mentioned under tree planting as such but under the parks functions together with grass cutting and other horticultural functions".

This was confirmed in the IDP document of the municipality concerned, and a review of the document showed "township beautification (paving, greening/ flowering)" as a service delivery priority for ward 16. Additionally, Strategic Objectives, Strategies, KPI's and Targets for Parks & Recreation were specified, wherein the conservation and maintenance of green spaces was flagged.

In the second instance, the official emphasized that tree planting and green space management were incorporated in their municipal IDP. She added why they might not be a priority despite featuring in the document. According to her:

"Urban greening and green spaces are there in the IDP. Unfortunately, with the IDP, it is about what the people (communities) want... If we go any to a single IDP outreach and you ask them about their needs they will tell you about water, food, and electricity. Nobody really cares about plants or greening. Yes, there

are those very few who do and are aware, especially in the affluent areas, but that is not enough for it to be prioritized in the IDP. That is also why you see the difference in the distribution of urban greening. People from affluent areas are very vocal about and push for it to happen” (Town 7).

Despite this assertion on tree planting and urban green space management featuring in the IDP, a scan through the 2017/2018 IDP document for the municipality concerned using keywords such as trees, planting, green, greening, environment, and forestry, did not return any results. Any mention of ‘trees’ appeared under ‘major events’ and highlighted that “over 200 fruit trees in the ward and more than hundred people benefited” in 2017.

4.4 Discussion

This chapter assesses the distribution of trees in the public and private spaces of low-cost housing areas, and ascertains the willingness of residents to participate in efforts to improve this distribution. I had hypothesized that the older suburbs would have more households with trees than the new ones, and that the residents would be willing to participate in programs aimed at planting trees in their respective suburbs. Contributing to growing research on urban tree distribution across various segments of cities both in the private and public spaces, one of the key results indicates that more households in the old suburbs have trees than households in the new suburbs, and there are significantly more trees in the private than the public spaces. This is resonant of the thesis that private spaces (yards and gardens) constitute the largest portion of the urban forest in towns and cities (Daniel et al., 2016; Kenny et al., 2011; Ossola et al., 2019; Pearce et al., 2013, 2015; Shackleton et al., 2018).

4.4.1 Public space tree distribution

There is a general lack of trees in the streets of low-cost housing areas of the eight sampled towns. Within the South African context, this echoes the findings of Kuruneri-Chitepo and Shackleton (2011) who reported a virtual absence of street trees in RDP suburbs of three towns. Recently, Gwedla and Shackleton (2017) reported a similar pattern, revealing that only 7 % of street trees encountered across ten towns were found in low-cost housing suburbs. Patterns of this nature are also evident in other parts of Africa and the rest of the world. Hungerford and Moussa (2017) found that poorer neighbourhoods in Niamey, Niger, do not have trees along streets, but rather inside household spaces. According to Pham et al. (2017), low-income households and certain ethno-cultural groups of the population in many cities across North America tend to have limited access to trees and by extension the benefits they provide. In this regard, Pham et al. (2012) found that people living in low-income blocks in Montréal suffer from disparities in vegetation cover. Similarly, Lee et al. (2019) reported that deprivation in terms of quantity and quality of urban tree stands was possibly faced by language minorities, the elderly and working poor of public housing estates (a public housing programme by

the British colonial government aimed at providing low-cost, self-contained rental flats free from the vagaries of nature and human-induced disasters for low-income households) in Hong Kong, China.

4.4.2 Private space tree distribution

Contrary to the distribution of trees in the public spaces, this study revealed more trees in private spaces, as evidenced by the number of households who reported having at least one tree in their yard. This is a plausible pattern, as the majority of trees in urban landscapes are typically located on private property (Nguyen et al., 2017; Pearce et al., 2013). The results of this study concur with Pham et al. (2012), who found that disparities in vegetation and tree distribution in all categories of city-blocks in Montréal were more pronounced on public land, for example with street vegetation, compared to private land vegetation. Similarly, trees planted on private land in Christchurch, New Zealand accounted for 75 % of all the urban trees in the city. Concerning tree abundance in the private space, the results of this study are inconsistent with those previously reported by Kaoma and Shackleton (2014b) and Shackleton et al. (2014) in northern areas of South Africa, who all found that 86 % of households sampled in RDP suburbs had at least one tree in their yards. These differences can be attributed to the general culture of planting by households yielding a general abundance of vegetation in the northern parts of the country than the south-east. For example, Lubbe et al. (2010) showed a widespread occurrence of trees and greenery in domestic gardens across all socio-economic suburbs in Tlokwe city municipality in the North West province of South Africa. In the same light, Gwedla (2016) reported that 75 % of households in the affluent, township and RDP suburbs of 10 Eastern Cape towns reported having at least one tree in their yard, compared to more than the 75 % of households in township, RDP and informal suburbs reported to have homestead trees in the Limpopo and North West provinces (Shackleton et al., 2014).

The age of the residential area can also partially account for these differences in tree distribution between the old and new suburbs. As seen in the results, the older suburbs tend to have more trees than the recently developed ones. However, although Kaoma and Shackleton (2014b) and Shackleton et al. (2014) reported relatively high proportions of trees encountered in private yards of RDP suburbs across three towns, these proportions were less than those reported for the older township and informal residential areas. While neither of these studies provide a detailed context on the establishment or age of the suburbs they sampled, the lower age of the RDP suburbs sampled could account for these differences. It is likely that they were not recently developed, or the older low-cost housing areas accounted for the majority of the sample. In this study, the sample included some relatively new suburbs that had only been occupied at most two years before sampling. In these instances, the age of the suburb was one of the reasons behind the lack of trees. However, more than 70 % of households reported the presence of household trees in at least two towns.

It is consistent that the older suburbs in this study have more trees than the recently developed ones. These results mirror those previously reported elsewhere (Avolio et al., 2015; Avolio et al., 2018; Grove et al., 2006). According to Clarke et al (2013) and Lowry et al. (2011), neighbourhood characteristics like home age and income, tend to interact to affect patterns of tree cover and diversity. Avolio et al. (2015) asserted that the year a neighbourhood was established had a great effect on the structure of the urban forest, reporting a greater tree cover in older neighbourhoods within the Riverside County in southern California. Grove et al. (2006) corroborated this in their hypothesis that housing age would be significant in the distribution of grass and trees in private lands. Supporting their hypothesis, they found that the amount of grass and tree cover was quadratically related to housing age, due to an initial wave of planting, followed by natural growth and then mortality (Grove et al., 2006). Similarly, older neighbourhoods in Salt Lake County, Utah, were found to have more trees and higher species richness than the newer ones (Avolio et al., 2018).

4.4.3 Sources of private space trees

Generally, residents collectively manage a significant portion of the urban forest (Conway, 2016), and independently make decisions about planting trees, which species to plant and where to source those trees. Differing with Nowak (2012) who reported that, from best-guesses of field crew doing iTree inventories, only one-third of trees recorded across multiple cities in the USA and Canada were planted as opposed to occurring through natural regeneration, the majority of residents in this study reported having planted their trees, while only a handful reported that theirs had regenerated naturally. Therefore, while these figures may not be the best representation as they did not come from interviews with homeowners who could ascertain their origins, they provide a basis for comparison where planting as opposed to natural regeneration are prevalent. Furthermore, Nowak (2012) reported that the majority (75 %) of those trees were found in residential areas compared to other land-use types such as commercial/industrial areas, parks, cemeteries, golf courses, open spaces, agricultural land, and wetland areas. This supports the findings of this study that 66 % of residents had planted the trees on their properties compared to the 13 % who referenced natural regeneration. Similarly, Thondhlana and Ruwanza (2019) reported that most respondents from Checheche Growth Point, Zimbabwe, deliberately planted trees when they moved to their homesteads, though some trees (mostly indigenous species) were already there when they constructed their houses. In their management of the private urban forest and the decisions regarding planting and removal of trees, Conway (2016) emphasized that urban residents are actively planting trees in their private space and many of them purchase those trees. The results of this study in that regard are consistent with those by Avolio et al. (2018) and Conway (2016). Plant nurseries appear to be the main source of trees planted in residential yards in Salt Lake Valley, Utah (Avolio et al., 2018).

While some residents may actively be planting trees in their private yards, others are not, while some are removing them. Conway (2016) reported similar occurrences among households in Mississauga, Ontario, Canada, indicating that residents had removed at least one tree in their yards over a period of five years. Tree removal for the purposes of property development through renovation (Steenberg et al., 2019), redevelopment (Guo et al., 2018; Guo et al., 2019), and consolidation (Brunner and Cozens, 2013) was widespread. Fifty-three percent of respondents who indicated that they had removed trees supported their decision with plans for new development on their respective properties. This supports previous research, which indicated that 51 % of land developers in Christchurch, New Zealand, removed trees in private properties to make space for new development (Guo et al., 2019). Additionally, building renovation activity, as indicated by building permits, was also a possible cause of tree removal and a source of urban forest disturbance in Toronto, Canada (Steenberg et al., 2019). Although presenting a minor impact on residents' decisions to remove trees, the disservices of urban trees such as them being thorny or a nuisance suggest that residents are aware of the disservices of urban trees. Conway (2016) and Guo et al. (2019) also implied that specific ecosystem disservices have relatively minor effects on resident decisions about tree removal in Mississauga, Ontario, Canada and Christchurch, New Zealand.

4.4.4 Participation in tree planting programs

Residents' engagement in tree planting should ideally go beyond the private spaces, but extend to the public spaces too, especially considering the benefits derived from the entirety of the urban forest. Nesbitt et al. (2018) asserted that in some cases socio-economically disadvantaged and racialized urban residents are less likely to engage in urban vegetation stewardship activities, to participate in urban forestry decision-making, and to have control over urban vegetation resources. Indeed, this statement corroborates the results of this study, which are indicative of residents' disinclination to be part of decision-making regarding tree planting. This was evident in their choice of activities to do during tree planting. Participating in the decision-making process of urban forest development could provide citizens with valuable opportunities to express their views and needs, thus enabling relevant decisions more responsive to their diverse needs (Shan, 2012). Moreover, citizens could gain a sense of empowerment and control and further promote their citizenship and willingness to take part, through such participation (Kaplan, 1980). Decision-making processes for urban forestry have in the past been oriented as a "top-down" process, without taking into account the needs of the public (Hladnik and Pirnat, 2011), as demonstrated in Chapter 3. Traditional top-down or bureaucratic approaches to planning and development of urban forests and green spaces have been increasingly criticized as inappropriate because they are "largely based on professional assumptions rather than users' needs, and these assumptions could be patronizing or even anachronistic" (Huang, 2010).

Notwithstanding residents' lack of interest in decision-making associated with urban forest development, there was an expression of general willingness to participate in tree planting activities. I deliberately generalized the question on participation to get a view of what people perceive participation to embody. The dominant theme in that regard was that residents think of participation as volunteering, as seen in the lack of interest in other aspects not associated with the physical activity of planting, and the dominant reason for not wanting to participate that was associated with expectations of financial incentives. People have varied reasons to participate in volunteer programs associated with tree planting, including varying social and environmental factors (Nesbitt et al. 2017; Ordóñez et al. 2017). The desire to participate in a formal urban forestry program, or to be involved in tree planting or stewardship in general, may be shaped by personal emotional, aesthetic and spiritual values associated with trees (Westphal, 2003), and interpersonal and intrapersonal factors associated with the individual (Moskell et al., 2010). Corresponding with Adegun (2018)'s assertion that poor urban residents are willing to pay or contribute time and materials to the development, use and management of green spaces beneficial to their households, many respondents in this study indicated their willingness to participate in a tree planting program, and associated their willingness to the potential aesthetic benefits they would derive from the trees once they have grown. An emotional aspect to willingness to participate was captured from the respondent who indicated that he is driven by the prospect of one day showing his grandchildren the legacy of his involvement in greening their suburb. This demonstrates the symbolic ritual, ceremonial or celebratory (Jones and Cloke, 2002; Lipkis and Lipkis, 1990) personal values associated with acts of tree planting. The general enjoyment for the benefits of trees was also a major reason for residents to be willing to participate in a tree planting initiative, a reason that is applicable to a number of different outdoor activities associated with the natural environment. Armstrong (2000) also saw a similar pattern among residents from low-income areas who indicated that the most important reasons for participating in community garden establishment in New York were the ability to access "fresh/ better tasting food, to enjoy nature and open space, and because of health benefits," including engaging in healthy outdoor activities and improving mental health. Aesthetics reasons for willingness to participate in a tree planting program are also popular, as corroborated by Locke et al. (2015) who reported that residents from New Haven, USA, ranked aesthetic reasons the highest as their motivation to plant trees.

Knowledge and skills acquisition are some of the widespread motivations for participation in programs or initiatives on voluntary basis. According to Clary et al. (1996) and Higgins and Shackleton (2015), a sense of learning and/or the ability to use and develop new skills or abilities through the volunteering experience, and using the volunteer experience to build career experience are some of the motivational functions of volunteerism. The motivations expressed in this study are resonant of these motivational functions. Echoing the findings of Still and Gerhold (1997), learning more about trees and gaining work experience were some of the popular reasons for willingness to

participate in tree planting expressed by respondents in this study. Still and Gerhold (1997) found that the desire for neighborhood improvement, the desire for education, and the desire for social interaction were some of the most important reasons why respondents from New York were willing to volunteer in urban forestry. Bruyere and Rappe (2007) also found that learning (about specific animals, plants and the environment, and nature observation), and career goals (getting a foot in the door at a prospective place of work, acquire work experience, etc.) were some of the motivations for volunteering given by environmental volunteers.

Public participation is crucial for the successful development and management of urban forests. However, persuading people to participate more in urban forestry-related activities is one of the major challenges to the social aspects of urban forest establishment and management (Zare et al., 2015). Ordóñez and Duinker (2013) concluded that the management of Canadian urban forests would significantly improve by overcoming the lack of detail in ecological, social, and economic management themes, which refer to components such as nativeness, naturalness, climate change, community stewardship, public participation, and use of economic incentives. Unfortunately, the municipalities in this study did not recognize or take opportunities for people's willingness to participate in tree planting programs as there have been none organized or implemented in the past. Recognizing the various constraints that municipalities are faced with in their efforts to implement urban forestry and urban greening in their towns (Gwedla and Shackleton, 2015) (Chapter 5), an exploration of the human capital offered by residents through their willingness to participate in tree planting and care would be a good place to start. Active and successful urban and community forestry programs are highly dependent on, and need the support of the active participation of people in the community (Straka et al., 2005), and leaders (Elmendorf et al. 2003).

Opportunities for involvement in urban forestry are vast, and range from events or programs that last a few hours, such as volunteer tree planting events, to longer training programs on skills related to urban forest stewardship (Moskell et al., 2010). Respondents in this study had varying preferences for involvement in urban forestry, from the digging to the actual planting, and maintenance and care of planted trees. Respondents from New York and Philadelphia ranked tree care and tree planting, both of which are physical, hands-on activities as some of the most important tasks in urban forest activities (Still and Gerhold, 1997). Corroborating this, planting, and maintenance and care of planted trees were the most popular activity preferences among respondents in this study. The preference for activities associated with maintenance and care demonstrates residents desire to engage in urban forestry beyond the planting day. This is a crucial preference because attention on how the trees will be tended to promote their survival is as important as the actual planting (Austin, 2002). The results of this study regarding the preferred activities during tree planting are also consistent with Abass, et al. (2019) who reported that all respondents in Kumasi Metropolis, Ghana, indicated willingness to give their support in a community or city green infrastructure project through planting and watering of

trees, grass and flowers when an invitation is extended to them. Tree planting alone is by no means the only opportunity for residents to volunteer and participate in urban forestry projects, as they can successfully be involved in street tree inventories, in tree maintenance programs, and in ecosystem restoration projects (Austin, 2002). Planting trees during urban forest activities is a popular activity among urban forestry volunteers. The results of this study are comparable to Hauer et al. (2018) who reported that tree planting was the most common activity involving volunteers and partner organizations in 85% of communities reporting participation in urban tree activities, compared to 40 % of communities reporting watering, and 28% of communities reporting pruning.

Unwillingness to participate in community programs, as indicated by a handful of respondents in this study, is not uncommon. In their conceptual model on reasons not to volunteer, Brady et al. (1995) classified that people do not volunteer either because they cannot, they do not want to, or nobody has asked them to. Volunteerism takes on different modes and meanings in different settings and to different people, and although it has evolved to serve almost every sector in South Africa (Russell, 2002), it is not uniform across sectors, with some sectors experiencing more enthusiasm for volunteering than others. For example, community healthcare workers may be more willing to embark on unpaid volunteering because of altruism and empathy (Dageid et al., 2016), while others in the environmental sector may do so to gain a particular skill. People may be unable to volunteer because they lack resources such as time, or they may not want to because of perceived lack of benefits (Higgins and Shackleton, 2015; Willems and Dury, 2017). The reasons pertaining to unwillingness to participate in tree planting are largely conglomerated within people being unable to participate because they do not have time or they have jobs, and not wanting to because they would not work without pay. This result is not surprising, especially considering the context of indigence as a result of poverty and unemployment in low-cost housing areas. People are more interested in the immediate and tangible benefits from participating in initiatives. Even when they do decide to volunteer, there is usually some hope for a form of incentive. While South Africa may be perceived as a country with “a giving people”, volunteering by giving time to a charity or other cause for example is the least popular form of giving (Everatt and Solanki, 2008).

The results of this study are consistent with those reported by Sundeen et al. (2007) where people frequently attribute their unwillingness to volunteer to a lack free time (43 %), lack of interest (27 %), and health problems (14 %). According to the Points of Light Foundation (2000), barriers to volunteering among residents of eight low-income communities in Washington D.C., USA include “lack of time and/or financial resources; lack of child care; lack of transportation; low self-esteem or confidence in skills; negative perceptions of volunteering or of external volunteer organizations; and cultural and/or language barriers”. Jobs can also limit time available for other pursuits (Wilson, 2012) such as participating in tree planting or other volunteer initiatives because some people spend most of their time at work and can barely do anything else after work. This is perhaps less pertinent in my

study because of the high unemployment rates in low-cost housing neighbourhoods in South Africa. On the other hand, the high unemployment rates in low-cost housing areas could account for why many respondents in this study indicated that they would not be willing to get involved because it is unpaid work. They would rather be involved in something that will help secure their livelihoods even if it is through a stipend. They do not see the financial incentive, which is what most of them would prefer, of participating in a tree planting initiative on a voluntary basis.

Although this may not have been a popular reason for residents' unwillingness to participate in tree planting in this study, other studies have acknowledged that residents living in leased properties may be less inclined to want to participate in volunteer activities (Dury et al., 2015), or specifically tree planting programs, because they are less attached to their neighbourhoods than homeowners (Rotolo et al., 2010). For example, Flocks et al. (2011) suggested that housing tenure and differing levels of control could be the cause of the uneven distribution of urban tree cover, as evidenced by the high number of renters in the suburbs with a lower abundance of urban trees. This pattern, according to Perkins et al. (2004), suggests that "renters may have low participation in tree planting initiatives because they do not believe they would reap the benefits resulting from such investment".

4.4.5 Tree planting in Integrated Development Planning

Progress in integrating key sustainability and environmental management issues into South Africa's IDPs has been limited over the years (Sowman and Brown, 2006), a pace that has been persistent up to now (Ruwanza and Shackleton, 2016). Therefore, it comes as no surprise that relatively few municipalities in this study included issues associated with tree planting in their IDPs. Furthermore, needs and programs that are not measured and ascribed a socio-economic value rarely rise to the top of the planning list and therefore are not championed or funded (Gulsrud et al. 2013). This was particularly evident in the lack of budget allocations and the cutting of funds for urban forestry reported in various municipalities in this study. The IDP process is designed as a consultative and participatory planning process where local citizens can voice concerns and aspirations for their respective towns and municipalities (Everatt et al., 2010). Unfortunately, as put forward by one of the municipal officials in this study, citizens drive a large part of the IDP process, and municipalities will not prioritize issues not communicated as a sense of urgency or priority by the citizens. However, the low attendance of community meetings by residents also exacerbates the situation because only a few people end up having a say in what needs to be prioritized, which may not be representative of the broader population.

The results of this study suggest that residents do not afford much priority to tree planting and do not see it as a point of discussion in community platforms. This became apparent when no respondents indicated having ever engaged in a discussion with their respective municipalities about tree planting. Understandably, trees may be of least priority in a context such as that of low-cost housing areas

where the majority of residents can barely afford shelter and food. Yet on the other hand, many lament, when asked, the lack or poor maintenance of trees and public green spaces such as parks (Adegun, 2018; Shackleton and Blair, 2013; Shackleton et al., 2018).

4.5 Conclusion

There is a general lack of trees in streets, with most in the private spaces of low-cost housing areas. The lack of trees in public spaces can be attributed to some municipalities actively opting not to plant in these areas, for various reasons such as soil types, and lack of capacity. There are more households with trees in the old suburbs than in the new. This finding verifies the first part of the hypothesis tested in this Chapter. Households without trees report on decisions to remove trees to make space for redevelopment and expansion, incidences of infrastructural damage, and to avoid conflict with neighbours. Many of the respondents who have trees in their households indicated that they had planted the trees as opposed to natural regeneration, and further reported that they mostly purchased those trees, along with donations. Furthermore, there was a general consensus from all municipalities that they do not host tree planting activities for low-cost housing areas. Residents corroborated this and highlighted their lack of exposure to tree planting, indicating that they had neither heard nor participated in a tree planting program in the past. However, this did not deter them from wanting to participate in the future to change the status quo concerning the abundance of trees, as evidenced by the majority who indicated that they would be willing to participate in a tree planting initiative in their suburbs. This verified the second part of the hypothesis tested in this Chapter. In this regard, the more physically demanding tasks associated to tree planting, such as putting trees into the ground, and subsequently maintaining and caring for them were the most popular activities selected. Municipalities and urban residents equally do not seem to be taking advantage of the platform of the IDP process, as evidenced by the limited incorporation of urban trees and urban forestry in general in municipal IDPs.

Greener low-cost housing areas are possible, as alluded to in Chapter 3. In this context, the first step would be for municipalities to recognize and utilize the human capital offered by residents by mobilizing those that are committed to champion tree planting. Furthermore, municipalities themselves need to be receptive of the eagerness expressed by residents and incorporate this in their plans. Recognizing the limitations on what municipalities can do outside of the stipulation in the municipal IDP, better mechanisms to encourage residents to attend community meetings need to be put in place, as these provide the platform for their collective voices to be heard. Additionally, this may lead to more people supporting the need for urban trees to also be prioritized in the implementation of projects.

Chapter 5

Barriers to, and Enablers of, Tree planting in Low-Cost Housing Areas of the Eastern Cape

“This is how we live. As you can see, we share a building and a yard with another family. There is no way either of us can be able to plant a tree. We cannot even make a garden. I am not sure about these Zuma houses. The Mbeki ones are better because at least with those you own your space and can do whatever you want. I think the government should rethink the design of these houses because now we are squashed” (Anonymous, personal communication (2017)).



A recently developed low-cost housing area in Aliwal North, where two families share a building structure as their respective homes. Some households reported dissatisfaction with the arrangement of the structure, emphasizing the compactness (Image taken with permission by researcher, 2017).

Overview

In Chapter 4, I presented the general lack of trees in both the public and private spaces of low-cost housing areas, and interrogated the limited inclusion of urban green space and tree establishment in the IDP processes of various municipalities. For this chapter, I take a closer look into what is hindering the planting of trees in low-cost housing areas, and what could enable more trees across residential areas at neighbourhood and household scales. This chapter addresses Objective 4 of the study, which was to investigate the barriers to, and enablers of tree planting in low-cost housing areas from residents' and municipal officials' perspectives. To do this, I answer the following questions:

- a) What are the barriers to, and enablers of tree planting in low-cost housing areas according to tree planting officials and professionals?
- b) What is hindering households from planting more trees and what opportunities can they explore to assist them in planting more trees?
- c) How are the barriers to, and enablers of, tree planting similar or different between towns?

5.1 Introduction

Trees are increasingly recognized for their importance to the liveability of urban areas (Chiesura, 2004). However, many urban environments are challenging for tree establishment and growth (De Lacy and Shackleton, 2014; Grove et al., 2006; Pauleit et al., 2002), and those planning and managing woodland, parks, gardens, street and square trees, and other green areas within urban agglomerations operate in highly complex environments, facing multiple and rapidly changing urban demands (Konijnendijk et al., 2006). Trees in urban settings are also affected by the people who plant, own, maintain, pass by, and benefit from them (Vogt et al., 2015), and all these effects can be potential barriers to, or enablers, of successful tree establishment. Moser and Ekstrom (2010) define barriers as “obstacles that can be overcome with concerted effort, creative management, change of thinking, prioritization, and related shifts in resources, land uses, institutions, etc.” Conversely, Feliciano et al. (2014) define enablers as “factors that cause a particular phenomenon to happen or develop”. Within the context of this study, I consider barriers to be any obstacles that interfere with the effective establishment of the urban forest, while enablers are opportunities that engender the effective establishment of the urban forest resource.

In considering barriers to climate change adaptation, Jones (2010b) produced a framework grouping them into human and informational barriers, social barriers and natural barriers. Spires et al. (2014) modified this framework and grouped the barriers to adaptation into social, resource, and physical barriers. Shackleton et al. (2016) also adapted Jones’ (2010b) framework, adding “indirect economic” barriers as a sub-component, in investigating the barriers to effective management of widespread invasive alien trees in South Africa. Recognizing Jones’ (2010b) framework, and modifications by Spires et al. (2014) and Shackleton et al. (2016), the barriers to, and enablers of, tree planting can be conceptually grouped into biophysical, social, and resource barriers and enablers (Fig. 5.1).

These barriers and enablers, respectively, do not exist in isolation (Spires et al., 2014) but are interrelated and sometimes overlap as one influences the other. Consequently, it is important that efforts to address barriers or augment enablers are designed to accommodate the “cause and effect” relationship between these variables. It is also crucial to note that while addressed barriers can translate to enablers, this does not apply to all and some enablers are independent of barriers. Additionally, the barriers to, and enablers of, tree planting are not generic between the public and private spaces although there may be some similarities, and are context-specific. For example, biophysical barriers such as climate may be common barriers to trees in both public and private space, while institutional barriers may not be much of a barrier for private space planting as they are in public spaces.

5.1.1 *Biophysical barriers and enablers*

The biophysical barriers to tree establishment and preservation can be ecological and physical, and can include climate (Fig. 5.1), urban infrastructure design and development, soil type, and water (Kronenberg, 2015; Lu et al., 2011; Pauleit et al., 2002). These barriers are applicable to both public and

private spaces. The climate of an area can either be conducive for, or not, tree growth. This means species that can thrive in particular climates need to be selected for planting. However, a lack of variety in tree species reduces the resilience of urban tree populations against recurring outbreaks of pests and diseases, and the threat of future diseases (Bassuk et al., 2009), and are unlikely to meet the varied cultural and aesthetic needs of urban residents. Therefore, a variety in suitable species would be recommended.

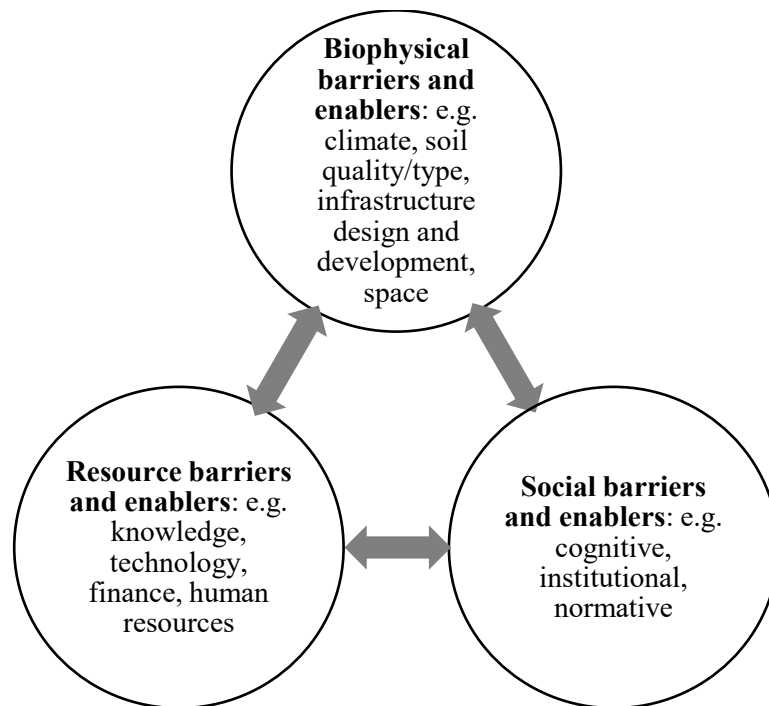


Figure 5.1: Typology and conceptual grouping of potential barriers to, and enablers of, tree planting (Source: Spire et al., 2014).

Many problems associated with urban vegetation are attributed to the soil environment (Hawver and Bassuk, 2007). This is because soils are dramatically altered by human activities in urban environments such as compaction, reduced moisture, and pollution (Bullock and Gregory, 2009). These alterations distinguish urban soils from those in other systems (Zhang et al., 2012). Soil quality degradation can be a potential barrier to the successful establishment of trees in urban areas. Soil quality refers to “the capacity of soil to function, within ecosystem and land use boundaries, to sustain productivity, maintain environmental quality, and promote plant and animal health” (Doran, 2002), and the basis for improving sustainable land use management (McGrath and Zhang, 2003; Qi et al., 2009).

Urban compactness, an example of an infrastructural design barrier limiting space (Fig. 5.1), is also a barrier to urban greening (Jim, 2000). According to Venn and Niemela (2004), an adequate area of green space is an important requisite for the development of a good green space system, hence smaller gardens in cities are less likely to harbour trees (Tratalos et al., 2007).

5.1.2 Social barriers and enablers

Social barriers can be converted to enablers when they can be controlled. Social barriers and enablers are vast and can include cognitive, normative, and institutional (Fig. 5.1) (Jones and Boyd, 2011). Cognitive barriers to, and enablers of, tree planting may relate to people's attitudes and understanding of the importance of having trees and their preferences, are often manifested at household and neighbourhood scale. They are influenced by people's behaviour. The barriers here may arise when people would rather not have trees planted for reasons such as fear that trees conceal criminal activity (Lyytimäki and Sipilä, 2009), while enablers could be associated with them choosing particular types of trees planted in a less dense and difficult to maintain manner to limit criminal activity (Donovan and Prestemon, 2012). Urban residents in areas of high criminal activity usually do not want trees planted in front of their properties as they fear that criminals will be able to hide in the trees (Pincetl, 2010). Indeed, urban tree cover has an impact on perceived safety among urban residents (Mouratidis, 2019), from fear of crime (Sreetheran and Konijnendijk van Den Bosch, 2014), to perceived reduction of crime (Gilstad-Hayden et al., 2015). The perceived reduction may result in perceived safety among residents, which Mouratidis (2019) describes as an individual's level of comfort and perception of risk within the environment and as such is an important factor in human well-being. Burley (2018) opines that certain green infrastructure initiatives may be successful in reducing crime and creating safer environments for underserved communities. This suggests that the fear of crime has to do with other factors, such as community interactions and social cohesion that may contribute to less violence in communities (improved cognition functioning and emotion which may also decrease aggression) (Burley, 2018) than just the trees being hiding havens for criminals.

Residents may also resist tree planting because they do not like trees and would not want the added burden of having to fix infrastructure that may be damaged by tree roots (Pincetl, 2010). Conway (2016) reported that property concerns, focusing on either perceived risks such as trees falling on houses or actual damage caused by the tree to drains or sidewalks, among other things, was one of the reasons residents from Mississauga, Ontario, Canada removed trees in their properties. Kirkpatrick et al. (2012) had reported similar sentiments, stating that residents from six eastern Australian cities opted to remove different types of trees because of disease or advanced age, root damage to foundations, paths or pipes, because limbs or whole tree had fallen or because there was likelihood of such a fall. Inner city African Americans in the United States may also resist the planting of trees outside their houses because they are concerned about tree maintenance and damage to their property (Perkins, 2011). There is an underlying assumption made by many practitioners and researchers that residents desire trees (Kitchen, 2013) because "trees are intrinsically good for the city (...and thus centering trees in the construction of a city's self-image)" (Braverman, 2008), and that a sparse urban forest indicates a lack of resources needed to produce high canopy cover or a lack of knowledge regarding the benefits of trees (Heynen et al., 2006). Yet, not all urban residents want trees in their yard or neighbourhood (Fraser and Kenney,

2000; Kirkpatrick et al., 2012; Schroeder et al., 2006). This can be seen in the behaviour projected towards trees in some communities, such as the vandalism of newly planted trees.

Normative barriers to, and enablers of, tree planting may relate to ways in which ‘norms’ influence how people respond (Jones and Boyd, 2011) to having or not having trees. For instance, the reality of poverty in low-cost housing areas can influence residents’ attitudes on whether municipalities should spend money on tree planting rather than prioritize other services. Additionally, the ‘norm’ of not having trees planted in low-cost housing areas could influence residents’ perspectives on both the importance of having trees and the benefits they provide (Nassauer et al., 2009). Alternatively, some residents may not be open to new tree planting of a species they are not used to and would much rather have the trees that are already planted elsewhere around their town, whether they are alien or indigenous.

Other barriers to and enablers of tree planting are institutional (Kronenberg, 2015). These are also directly linked to resource barriers and enablers as institutions have resources and decide on how they should be allocated. Institutional barriers include government failures which are characterized by financial constraints (Gwedla and Shackleton, 2015; Kuruner-Chitepo and Shackleton, 2011; Lamichhane and Thapa, 2012; Pincetl et al., 2013), political power of development interests (Gwedla and Shackleton, 2015; Ottitsch and Krott, 2005), a lack of public support for green issues, as reflected in the decision-makers' attitudes (Zabel, 2007), and failure to see urban trees as part of a broader urban regeneration agenda (Simson, 2008).

A paramount institutional barrier to tree establishment in South Africa is the lack of policies directly championing the planting of trees in low-cost housing areas (Chishaleshale et al., 2015; Shackleton et al., 2014). The few that exist were designed over a decade ago by the then national Department of Water Affairs and Forestry (Shackleton et al., 2014). A policy which actively constrains the planting of trees in newly developed low-cost housing areas is the housing policy under the RDP (Chapter 1), whose aim is to deliver large numbers of houses for the poor and previously disadvantaged at as low a cost as possible (Gilbert, 2004; Shackleton et al., 2014), resulting in an almost one track focus of providing ‘a roof over people’s heads’ rather than sustainable urban living (Shackleton et al., 2015).

5.1.3 Resource barriers and enablers

Resource barriers (Fig. 5.1) are another group of barriers that when improved or augmented, can lead to enablers. They refer to entities such as knowledge, technology, finances and human resources (Spire et al., 2014) which, when limited, hinder urban tree establishment, while enablers refer to the entities whose availability promotes the establishment of trees. Resource barriers and enablers are closely related to institutional barriers and enablers because many of them are a result of failure, or success, by institutions to provide or allocate such resources to tree planting, and occur at municipal or regional and household scales. Various studies (e.g. Biernacka and Kronenberg, 2018; Driscoll et al., 2015; Grado et

al., 2006; Stevenson et al., 2008) demonstrate that the most common resource barrier to, and enabler of, tree planting and success of tree planting initiatives is the lack (or availability) of finances. For example, one-third of urban park managers in the UK have had budget cuts over 20 % over a period of two years, and 90 % of them still face further funding cuts (Hoyle et al., 2017). In the same light, Young (2011) concluded that adequate, secure long-term financing and political support, were major barriers to the success of urban tree initiatives in selected American cities. According to Zhang and Zheng (2012), financial support is one of the most effective ways to promote urban forestry programs. The availability of finances also greatly augments other resource barriers such as technology and equipment provision, and employment of skilled personnel and human resources.

Limited skills and knowledge is also a barrier to tree planting. This is mostly exhibited in the lack of people with the knowledge and training to plant and maintain trees, as experienced by many municipalities in South Africa (Chishaleshale et al., 2015; Gwedla and Shackleton, 2015; Kuruneri-Chitepo and Shackleton, 2011; Richardson and Shackleton, 2014). This can be observed through the professions of the officials responsible for urban greening. Gwedla and Shackleton (2015) interviewed 24 municipal parks officials in relation to urban forestry in their towns. These managers had different expertise, from horticulturalists, waste managers, social workers, environmental managers and foresters (Gwedla and Shackleton, 2015). Despite the different expertise and training, all these managers were the ones responsible for the town greening initiatives. Limited skills and knowledge can also mean that urban foresters are not innovative in their techniques of tree planting, which may compromise the survival of planted trees (Yang and McBride, 2003). Innovation is crucial in urban forestry as it may contribute to the reducing the cost of tree planting, specifically when cost-saving techniques are employed.

The low abundance of trees in low-cost housing areas presented in Chapter 4 suggests that planning processes and officials responsible for urban greening are overlooking the opportunities for the newest and centrally planned suburbs to be designed according to international best practice and standards, regardless of being low-cost (Shackleton et al., 2014). Considering the potential barriers to tree planting highlighted above, blindly planning for urban forest establishment with little to no regard to these factors as they may in the short and long-term compromise the survival of the urban forest is potentially detrimental. Not only does it translate to the wasteful use of resources, but could further exacerbate the pattern of inequitable distribution which favours some parts of urban areas more than others (Chapter 4). On the other hand, an understanding of factors that can aid the successful planting of trees in areas where such opportunities have been missed in the past is an important step needed to narrow the gap in tree canopy cover between the affluent and the poorer residential areas. Specifically, an understanding of these factors from both the perspectives of the people they are planned for and those who are championing the planning is crucial as it may likely contribute to the sustenance of the urban forest by all actors.

Much research on urban forest perspectives and what is hindering tree planting in certain parts of urban areas have been through the lenses of planners, officials and managers (Davies et al., 2017; Driscoll et al., 2015; Gwedla and Shackleton, 2015), and professionals or experts (Kronenberg, 2015), with little evidence of residents' perspectives considered. Furthermore, there is ample literature exploring the constraints to tree planting in public spaces, compared to private spaces. Consequently, this chapter presents the challenges associated with urban tree planting and the opportunities that could be taken in addressing these challenges from the perspectives of both the residents and the officials (Chapter 3). Based on the results of the hypothesis put forward in Chapter 4, I hypothesized that the new suburbs experienced more barriers to tree planting in private space than the old suburbs, and conversely the old suburbs had more opportunities to enable tree planting in the private spaces. Furthermore, I hypothesized that the households without trees will report more barriers than those without trees, and conversely those with trees will report more enablers than those without trees. Barriers and enablers of tree planting can be at various scales, including planning, implementation, and management. In this study, I chose to take a broader perspective on these barriers and enablers to accommodate a more generalized view that does not confine these factors to an individual level.

5.2 Methods

5.2.1 Study sites, data collection, and data analysis

This study was conducted in the same towns described in Chapter 4. Similar methods were employed in both the collection of data and analyses, as related to the variables analyzed. The variables of interest included barriers and enablers of tree planting in the private and public spaces. In terms of analyses, the variables of interest included the frequency of mention of barriers and enablers and their types, and how these were different or similar between the new and old suburbs, between the households with trees and those without (independent variable derived from Chapter 4), and between various demographic variables such as gender, age, education attainment, and employment status. Data on the frequency of mention of barriers and enablers (continuous variables) were analyzed using *t-tests* because these were continuous data rather than proportional, and proportional data analyzed via Chi-square analysis. Multiple comparisons between towns were made via ANOVA. The respondent profiles presented in Chapter 4 also apply to this chapter, both the household and municipal officials' respondents.

5.3 Results

An expansion of factors alluded to in Chapter 3 and Chapter 4, and a look into what was hindering tree planting in both the private and public spaces of low-cost housing areas revealed three overarching themes, following Fig. 5.1. Other barriers also emerged, constituting those mentioned by less than 5 % of respondents across all towns and did not fall within any of the overarching themes.

5.3.1 Barriers in private spaces

Municipal officials were less vocal about what they thought could be hindering tree planting in private spaces compared to residents. In mentioning possible barriers, they mentioned one or two but never more. The impression given was people make choices about whether to plant trees or not, and it would be a matter of guessing why they would opt not to plant. Highlighting this, an official from Town 3 stated that:

“Because of the socio-economic differences in our town, what I perceive as a barrier to tree planting in the private space will be a guess because the affluent area is covered with trees, and people in villages also plant trees so I cannot really pinpoint it much without guessing”.

Two officials specifically mentioned that they do not know why some people do not plant trees. One of these said *“we do not go too much into private with anything so it’s a bit difficult to answer that one. If somebody want to plant, they can do it”*, while the other alluded to his assumption that everybody else should feel the same way as he does about his preference to be surrounded by trees and nature all the time. According to him:

“People are just not planting trees because they do not want to. I do not see any plausible reason why anyone would not be able to plant a tree, unless they just do not want to. They are not thinking about the benefits, maybe” (Town 1).

Another spoke about how people are different, and therefore their preferences also differ, explaining that some care about their surroundings, while others do not:

“Maybe people are just not interested in planting because it is not like they have to buy them, we give them away. But there are people with beautiful yards and you can see that they are making the effort. Some people do not care about their yards. It is up to the people. Some people love nature and others do not and do not love the environment. Personality also plays a role” (Town 5).

In terms of the perspectives of residents regarding barriers in private spaces, all households reported at least one barrier, with the highest number being six. Thirty-seven percent of households reported two barriers, while very few (0.3 %) mentioned six. Most households where two barriers were mentioned are in Stutterheim, while more of those who reported three were in Matatiele. The frequency of mention of barriers across the 800 households was 2, 016 with a mean mention of 2.5 ± 0.04 barriers per household (Table 5.1). Barriers were more frequently mentioned by households in the new suburbs (57 %) more than those in the old ($t=3.8$; $p<0.05$) (Table 5.1). On the other hand, there were no significant differences in the number of reported barriers per household between households who had initially indicated having trees (53 %) than those who did not (47 %) ($t=0.6$; $p>0.05$).

Table 5.1: The extent of perceived barriers to urban tree planting in private spaces between the old and new RDP suburbs by residents, across all towns (n=800).

Group of Barriers	Identified Barriers	Proportion of mentions by suburb (%)		Mean±SE (%)
		Old	New	
Biophysical Barriers	Limited space	55	62	58±1.7
	Poor soil type	6	10	8±3.6
Resource Barriers	Insufficient funds	30	43	37±3.4
	Lack of equipment	28	43	35±4.1
	Limited knowledge	19	30	25±4.7
	Lack of fencing	6	15	10±3.7
Social Barriers	Damage to trees	30	39	34±2.8
	Municipal restrictions	11	13	12±2.4
	Do not own the property	13	8	10±1.5
	Fear of crime	9	11	10±2.5
Other Barriers	Other ¹	12	14	13±2.3
Mean number of barriers mentioned		2.2±0.03	2.8±0.05	2.5±0.04
¹ Other barriers: age; health; the dislike of trees and general gardening; parents deciding to plant or not; clear boundaries of household yards; rejection of responsibility to plant.				

Residents identified a total of 11 barriers (Table 5.1), including “other” barriers. The most mentioned barriers were resource barriers, followed by biophysical barriers, and then social ones (Table 5.1). Between these groupings, the five most prominent barriers to tree planting in private spaces, which are explained in detail below, were limited space in people’s yards (58 %), insufficient funds to purchase trees and associated resources (37 %), the lack of equipment needed for tree planting (35 %), the experienced or anticipated damage to planted trees (34 %) and limited knowledge about which species are suitable for planting, where to get those trees, and how to plant them (25 %) (Table 5.1).

5.3.1.1 Limited Space

Fifty-eight percent of respondents across all towns identified space limitations in their private yards as a major barrier to tree planting (Table 5.1). Significantly more of these respondents were from the new suburbs (62 %) than the old suburbs (55 %) ($\chi^2=4.3$; $p<0.05$). While this barrier was more prevalent in households that already have trees (59 %) than those that do not have any (57 %), it was not significantly so ($\chi^2=0.5$; $p>0.05$). Many of those that already had trees attributed space as a barrier because they felt they could not plant any more. With those that did not already have trees, space limitation was mostly expressed in terms of them considering options such as extending their houses in the near future, and the general size of their yards, which was unanimously perceived as too small.

Figure 5.2 exemplifies the typical arrangement of houses in low-cost housing areas, and the closeness of one to the other, an illustration of the space limitation.



Figure 5.2: Example of how the houses in low-cost housing areas are arranged and the spacing between households.

Four municipal officials were also vocal about the lack of space in private yards to accommodate trees. An official from Town 2 rhetorically asked about the availability of space to make the point of its insufficiency, stating that:

“Do we really expect people to plant trees in their yards when they barely have space to move? I am sure if people could plant some trees, they would have done so by now. It’s just that their yards are very small, and also the issue of animals is there too”.

Three other officials explicitly indicated that the yards in low-cost housing areas are not big enough to accommodate trees. This was explained with statement like *“the plots where the houses are situated are not very big”* (Town 5), *“space is a limitation because the yards in these suburbs are too small”* (Town 3), and *“there is generally no space in this town, even space for building houses, which means if trees need to be planted they will have to be squeezed in”* (Town 7).

5.3.1.2 Insufficient Funds

Funding limitations were identified as a barrier to tree planting in private yards by 37 % of respondents (Table 5.1). Multiple comparisons on the distribution of insufficient funds as a barrier revealed that significantly more respondents from Grahamstown and Somerset East identified this barrier than in any other town ($F=27.8$; $p<0.05$). Many of the respondents (54 %) who identified this barrier had previously reported that they do not have trees in their yards ($\chi^2=7.4$; $p<0.05$), while (59 %) of them were from the new suburbs ($\chi^2=13.5$; $p<0.05$). Equal proportions of those belonging in the low household income group (<R4 999 per month) and those in the high household income group (>R5 000 per month) mentioned that the lack of funds was hindering tree planting ($\chi^2=5.2$; $p>0.05$). Similarly, the employment status of respondents was not associated with their mention of the lack of finances as a

barrier ($\chi^2=5.4$; $p>0.05$). A handful of respondents referred to the socio-economic nature of their respective suburbs as evidence that the residents cannot afford to buy trees or equipment associated with tree planting as they are already regarded as indigent.

The lack of financial resources was also identified by municipal officials as a possible hindrance to tree planting in the private space. For example, an official from Town 7 stated that:

“You find that among many communities the issue of tree planting is not a priority because they are hungry and poor. This is specific to the low-cost housing areas as the majority if not all people there are indigent. It is a big problem”.

However, this barrier was highlighted with scepticism by one official who had previously indicated that the municipality usually donated trees to people, and people are also encouraged to approach the municipality to ask for trees. Her understanding was that as much as people may mention the lack of finances as an excuse for planting, it would not be acceptable because tree donations are always available in the local municipality. However, she is assuming local residents know this.

5.3.1.3 Lack of equipment

Thirty-five percent of respondents across all towns mentioned that the lack of equipment hindered their efforts of tree planting in the private space (Table 5.1). The equipment mentioned included, but not limited to, spades, picks, and hoes. This barrier was more prevalent among households in the new suburbs (43 %) than the old (28 %) ($\chi^2=20.4$; $p<0.05$). Households who do not already have trees (40 %) in their yards identified this barrier more than those that already have trees (30 %) ($\chi^2=8.6$; $p<0.05$). A third of respondents (31 %) who had indicated that financing was limiting also indicated the lack of equipment as a paired barrier ($\chi^2=1.3$; $p>0.05$).

5.3.1.4 Damage to planted trees

A little more than 34 % of respondents identified potential and experienced damage to trees as a hindrance. Tree damage in the private space was associated with either animal browsing (although not necessarily malicious, people perceive it to be), stolen just after planting, or purposely vandalised by individuals who are not part of the household. The most prevalent of these factors, mentioned by 63 % of respondents who identified this barrier, was animal browsing. In situations where no trees were planted, respondents reported that planting any trees would be a fruitless exercise because animals roam around the streets and get into people's yards, browsing on any plants they come across. A respondent from Tsolo mentioned that:

“Planting trees in this suburb and even in our private yards would be a waste of time and resources because there are individuals who keep their animals in the urban area and let them out of their enclosures during the night. This has a criminal element to it because the owners of these animals then identify certain homes where they illegally

open the gates and let them graze in there. No one dares to question this for fear of their lives” (Household 165).

More (39 %) respondents from the new suburbs than the old mentioned this barrier (30 %) ($\chi^2=6.8$; $p<0.05$), and significantly more (38 %) of those without trees in their yards than those who do (31 %), raised this barrier ($\chi^2=5.4$; $p<0.05$). No significant correlations or differences were established between damage to trees as a barrier and any of the other independent variables such as gender, age or employment status.

5.3.1.5 Limited knowledge

The predominant themes regarding limited knowledge as a barrier to tree planting were about whether to plant trees or not, which species to plant, where to source the trees, or where it would be suitable to plant it. Twenty-five percent of respondents stated that their limited knowledge on which species to plant or where to source the trees had prevented them from planting. Most (61 %) of these respondents were from the new suburbs ($\chi^2=13.6$; $p<0.05$), and 53 % of them had previously reported not having any household trees ($\chi^2=2.8$; $p>0.05$). In terms of all education attainment, no significant differences were established in the proportions of those stating this barrier between all levels and those who did not ($\chi^2=5.0$; $p>0.05$).

When comparing between various age groups, significantly fewer elderly respondents (15 %) mentioned this barrier than both the younger (40 %) ($\chi^2=2.7$; $p<0.05$) and middle-aged (45 %) ($\chi^2=2.3$; $p<0.05$). Among the entire population of females, 25 % of them mentioned this barrier, compared to 23 % of males ($\chi^2=0.6$; $p>0.05$).

The limitation in knowledge was also highlighted as a possible barrier to private space tree planting by three municipal officials, two of whom associated it with residents possibly not knowing what species to plant. An official from Town 3 associated this with people’s beliefs and their limited knowledge on the benefits of being close to nature, noting that:

“...black people do not mind having their yards as concrete jungles or just because they associate that with cleanliness. Furthermore, most people in these low-cost housing locations have not been as close to nature as they should have, hence the lack of appreciation for trees. Not having trees has become a culture and some form of fashion within the black communities”.

There was evidence of this perception in a number of households, both in the old and new neighbourhoods across all towns. Many households were observed to have cleanly swept front yards with barely any vegetation or trees (Fig. 5.3), a phenomenon usually associated with cleanliness. In figure 5.3, the respondent in household (a) indicated that the vegetation and lawn had been cleared in the front so that the yard could be clean. Household (a) had some trees at the back, while household (b)

did not have any. The respondent from household (b) elaborated that her husband had cleared the grass in front of the house because they had once encountered a snake, so the clearing was also to avoid such hazards.



Figure 5.3: The common trend of removing vegetation in the front yard as a form of cleanliness in many households of (a) old and (b) new low-cost housing areas.

Another facet of the lack of knowledge was the possibility of being able to plant a tree despite one's socio-economic situation. An official from Town 7 made reference to how, according to him, people always put other problems they are dealing with ahead of having trees, suggesting that if they had a better understanding of what it means to have a tree, the other problems would not matter. Explaining this, he said:

“The limitation in knowledge among communities is a barrier because you will tell someone about a tree and they will ask you where you think they will get the water for watering that tree. We first need to make people understand the importance of having trees and other ways of taking care of them, such as using grey water”.

5.3.1.6 Other barriers

Within the “other” barriers, the age and health of respondents were mentioned by a sizeable proportion. Thirty percent of respondents who mentioned “other barriers” emphasized that they were either too old or too sick to plant. This was most prevalent in the old RDP suburbs. One respondent from an old RDP suburb was quite passionate about what had hindered them from tree planting, stating that:

“There are already too many trees in this town, especially in the CBD and affluent parts of town. I worry that if more trees are planted, and I contribute to that by planting any more in my home, our town will be a forest because everybody will think it is okay to plant more and begin planting. Living in a forest is not good because we will hardly get sunshine, and there will be increased criminal activity” (Household 349).

Nine other respondents shared similar sentiments. A few stated that they do not want to plant trees in their private space because they “do not want their homes to look like a forest”, alluding to the preference for few trees around households.

Other respondents (18 %) were adamant that their dislike for trees underlay their desire not to plant. The dislike for trees was mostly associated with the perceived disservices of urban trees, such as them attracting snakes and other dangerous animals, and creating a mess through leaf-fall. Within this group, some respondents were generally not fond of any gardening or planting activities, and thus had no desire to plant trees even in the future. Another group of respondents mentioned that they are unable to plant trees in their yards because, not only are they not fenced, but the occupants also do not really know where their yards begin or end as they had not been made aware of these boundaries. As such, they are sceptical of planting only to later discover that they have planted in the neighbour’s yard or on municipal property. This barrier was also noted by two officials. The last group of respondents who mentioned “other” barriers did not associate themselves with the responsibility to plant trees. This was due to their perception that “trees are supposed to grow naturally if they are meant to be in a particular place”. More than 10 women mentioned that the responsibility to plant trees in the household lay with males in the household, and alluded that there are no trees in their households because the males had decided not to plant. The responsibility to plant was also shifted to the parents by some of those who still live with their parents. Understandably so, they mentioned that they cannot make any planting or removal decisions because their parents own the household.

One of the municipal officials mentioned that cultural beliefs could also hinder some people from planting trees in their private spaces, exemplifying it through different uses that trees have in different cultures. He suggested that some might deliberately not plant because of the belief they associate with certain tree species, saying:

“Cultural beliefs also play a part in the lack of planting in private spaces because some trees are believed to not be suitable for private planting because they bring bad luck, while some are medicinal and therefore believed to not grow among humans or populated spaces. People believe that when you want some medicine you can only find it in the forest” (Town 3).

5.3.2 Barriers in public spaces

Municipal officials were more forthcoming about what hindered tree planting in public spaces. Each official mentioned at least two barriers, and officials based most of these on their experiences as personnel who are involved with tree planting in their respective towns.

Each household reported at least one barrier to public space tree planting, with the highest number of reported barriers being five. The majority of households (57 %) reported two barriers, a sizeable proportion of whom were from Queenstown. More households in Grahamstown (33 %) than other

towns reported three barriers, while only three households reported up to five barriers across all towns. The frequency of mention of barriers across the 800 households was 1, 756 times, with a mean mention of 2.2 ± 0.04 barriers per household.

There was little difference in the proportion of households in the old suburbs (51 %) who mentioned more barriers than those in the new suburbs ($t=1.1$; $p>0.05$). Similarly, no significant differences in the proportion of households who mentioned barriers in the public space between those that already had household trees (52 %) and those that did not ($t=0.4$; $p>0.05$). Residents perceived eight factors as barriers to tree planting in the public space, which were grouped according to the themes initially mentioned. Similar to the barriers to private space tree planting, resource barriers were more prevalent than the social and biophysical barriers (Table 5.2).

Table 5.2: The extent of perceived barriers to urban tree planting in the public space across the old and new RDP suburbs by residents (n=800).

Group of Barriers	Identified Barriers	Proportion of mentions by suburb (%)		Mean $\pm$ SE (%)
		Old	New	
Biophysical Barriers	Limited space	42	39	40 $\pm$ 3.6
	Soil type	8	8	8 $\pm$ 3.9
Resource Barriers	Municipal incompetence	55	55	55 $\pm$ 5.1
	Insufficient funds	24	31	28 $\pm$ 3.5
Social Barriers	Damage to trees	28	26	27 $\pm$ 4.7
	Risk of crime	28	15	21 $\pm$ 4.6
	Politics	22	19	20 $\pm$ 6.1
Other Barriers	Other ¹	19	22	21 $\pm$ 1.7
Mean number of barriers per household		2.3 $\pm$ 0.04	2.1 $\pm$ 0.04	2.2 $\pm$ 0.04
¹ Other barriers: newly developed suburb; no expression of interest from community; trees belong in affluent suburbs and where white people live; municipality only cares about the areas where white people live; no trees to give away for public planting.				

According to the residents, the most prominent barriers to tree planting in the public space include the perceived incompetence of municipalities (55 %), limited space on the street (40 %), insufficient funds within the municipality for tree planting programmes (28 %), the experienced and perceived damage to trees in the public spaces (27 %), and crime associated with street trees (21 %) (Table 5.2). Other barriers included the period of establishment of the suburbs, community members showing no interest in planting trees, and general perceptions about urban trees (Table 5.2).

5.3.2.1 Municipal Incompetence

Municipal incompetence was identified by 55 % of respondents across towns, and it accounted for 25 % of all barriers mentioned (Table 5.2). Significantly more respondents from Grahamstown and Queenstown ($F=59.3$; $p<0.05$), which were not significantly different from one another, mentioned this barrier than respondents from all other towns. Respondents from Grahamstown (85 %) and Queenstown (70 %) were particularly concerned about the competence of their respective municipalities compared to other towns, referring mostly to deteriorating infrastructure and the limited visibility of the municipality and their services in their respective suburbs. In this regard, a respondent from one of the households said:

“Our municipality is useless, and I am sure that you are also well aware of that. All they know or care about is to squander money and take long lunch breaks. Even those orange overalls who are paid to work probably only work for one hour every day. I have seen them sleeping on the job. There is no way we can have trees on our streets or parks when our municipality works like this. If there is anything they ever do, it is to make the areas where white people live better and more beautiful” (Household 229).

This barrier was equally identified by respondents from the old (50 %) and new suburbs (50 %) ($\chi^2=0.1$; $p>0.05$). Similarly, the differences in the proportions of residents who identified this barrier among those who already have trees (54 %) and those without (46 %) was not significant ($\chi^2=1.1$; $p>0.05$). There was also no significant difference on the basis of duration of residents ($\chi^2=2.9$; $p>0.05$).

Overall, the alleged incompetence included perceptions that the municipalities are not doing their jobs with regards to service delivery, part of which include tree planting and urban green space establishment. Another indicator was that if the municipalities were competent then the low-cost housing suburbs would have green infrastructure similar to the affluent suburbs. These perceptions were linked to the overall condition of the street (as seen in Fig. 5.3), alluding to the streets not having the appropriate infrastructure to accommodate urban trees.

5.3.2.2 Limited Space

The lack of space on the street was identified as a major barrier to public tree planting by 40 % of respondents (Table 5.2). Most (53 %) of these respondents were from the old suburbs, although no significant difference between the proportion of these residents and those from the new suburbs was established ($\chi^2=1.9$; $p>0.05$), nor between those who had trees and those without ($\chi^2=0.6$; $p>0.05$).

The lack of space for public tree planting was associated with the actual size (width) of the streets; and the undesirable infrastructural condition of these streets. Many respondents pointed out that there has not been enough space created between their yards and the road, and there are no pavements where trees could be planted along. A resident from the old suburb in Somerset East stated that:

“Our streets have no defined structure, it is just dirt roads that lose grass over time and remain muddy/dusty. As a result, I do not even see where a tree could be planted on a street that is as embarrassing as this one to look at” (Household 389).

Another aspect of space that transpired was the lack of green spaces such as public parks in low-cost housing areas where trees could be planted. The concern in this regard was the many public spaces that have been turned into dumping sites instead of recreational areas. This issue was raised in six of the eight towns, excluding Matatiele and Cradock. There was evidence of efforts to minimize the use of public spaces as dumping sites in Somerset East through the cleaning up and decoration of these spaces with painted rocks and flowers. In both instances, these public spaces were reported to be under the care of the Expanded Public Works Programme (EPWP), and no involvement by the community was reported (see illustration in Chapter 4, Fig. 4.3).

Municipal officials also weighed in on the issue of space for public space tree planting. In this regard, five officials made reference to space, while the other three did not mention it. Among those who spoke about space, three regarded it as a barrier, while the other two suggested that while the houses in low-cost housing areas may be very close to one another, there is still space that could be used for tree planting on the main streets. Explaining this, one official said:

“I do not think space is an issue. One way or another, there is a pavement where trees can be planted. It can never just be a matter of there not being enough space in public areas. The space is there, we just need to find it. There are spaces that are marked off as pavements, and those can be used to plant some trees. Space is not an issue” (Town 1).

Among those who acknowledged space as a barrier to public space tree planting, one official indicated that while the space may be limited, a plan needs to be made to ensure that trees are incorporated in the residential area going forward. She relayed that:

“Unfortunately with RDP location, there is just no space. The planning in these areas does not incorporate any kind of greening, especially parks. However, we have to make do with the space that we have, and we are planning to put in a few trees here and there in the street like we did in the past... We just have to make space, because trees do have to be planted somewhere” (Town 7).

5.3.2.3 Insufficient Funds

Twenty-eight percent of residents across all towns suggested that insufficient funds in municipalities was hindering tree planting in the public space (Table 5.2). Of these respondents, significantly more (57 %) were from the new suburbs ($\chi^2=6.4$; $p<0.05$). Concurrently, 54 % of the respondents who suggested this barrier already do not have trees in their households ($\chi^2=4.3$; $p<0.05$). This perception was mostly

expressed in terms of the municipality seeming to have other more important things to do with funds than to plant trees, and in terms of the socio-economic status of the people living in low-cost housing suburbs. Some respondents associated this barrier with their indigence, and thus their inability to pay for basic municipal services, implying that there are not enough funds because the residents themselves do not contribute financially to the municipality. This perception was mostly prevalent among respondents from the new suburbs in Queenstown.

According to municipal officials, insufficient financial resources in municipalities were the leading barrier to public space tree planting, as identified by seven of the eight officials. In four instances, officials indicated that they had made plans to plant trees in the townships and low-cost housing areas, but they did not materialize. According to one of them:

“Some years ago I actually had a list which was about planting trees in the township and RDP area, but that did not happen. It just fell flat because there was no money to do it. But, I tried” (Town 1).

In another instance, the official reported that they do not have enough resources and funding for tree planting, and their budget in that regard is always the first one to be reduced during budget cuts. In two instances, the municipalities did not have budgets allocated to tree planting activities at all. They said:

“There are not enough resources and funding for tree planting. The budget is always cut” (Town 6).

“I will not lie to you, we do not have a budget for tree planting in this town. We have not planted any trees in any suburbs, even in the affluent areas. We depend on donations only” (Town 4).

Emphasizing the absolute absence of funds for tree planting related activities, an official from another municipality explained that:

“This municipality does not have money. The money we normally have in this department at the end of each month is for staff salaries and paying for the Eskom electricity debt. We then have to scrape for the next month” (Town 3).

A similar situation was experienced in another municipality, where there was barely any funding set aside for tree planting. Corroborating this, the official from this municipality said:

“The main thing at this stage is our finances. We cannot buy and we do not even have enough money to maintain those in other areas. The money that we have does not include a budget for tree planting and beautifying of areas. We had that a long time ago, but that budget was cut. We also do not have a nursery anymore, and that magnifies the problem. We are basically always waiting for people from the Forestry to donate to us” (Town 8).

In another municipality, lack of funds was due to budget constraints which can also be traced back to Integrated Development Planning. In this regard, the official believed that:

“...it becomes very difficult to implement something that is not in the IDP because you cannot say we are bringing plants to the people and yet they asked for electricity. They will just fight with you. However, we do still try to budget for greening, but that amount is never as much as it would be if residents brought urban greening as a priority in the IDP, which would mean more funds towards it” (Town 7).

In one of the smaller municipalities, the municipal official mentioned that the only thing that is done in their division of the municipality is the cutting off grass and waste management. In her experience, the municipality does not prioritize tree planting. Explaining this, she said:

“Because of budget constraints and the size of this municipality, many of things are cut out and you find that things like tree planting and town beautification are not provided for because they are not regarded as a priority. We do not perform those functions because of that. All is we do is manage waste and make sure that the grass is cut. We have to cut grass, but planting trees and other stuff is not something we can do right now. Maybe in the future. We did try to establish a park, and during the planning stages when we submitted the budget we were told that it will have to wait because it will cost the municipality too much money” (Town 2).

In other municipalities, the lack of funds was linked to the lack of resources such as equipment to facilitate tree planting. A respondent from one of these municipalities explained that many times when they do get some funding which could be channelled to tree planting and development of parks efficiently, they are ordered by the government department that contributes those funds on how to spend them. According to him:

“Money is the biggest problem. We do not have money to plant trees. When you are planting trees you need a tractor or a water truck and tanker. That costs money and we do not have the money to buy those things (...). For the other things like developing a park, we get money from the government departments. However, we had a big fight with one of the departments that gave us money because they said that money was not for buying equipment. You know, we have a big problem with the government. Those guys’ attitudes are strange. They just want the money to be used to pay salaries. They tell us to appoint more people, but there is no work for many people. What we need is equipment and some machinery to be able to do some of the work efficiently. You see for example, in the funding that we got for the park and beautification, the government department that gave us money insisted that we hire 100 people. We only need about 30 people; the other 70 people are just sitting around doing nothing but still get paid. All they care about is employing people. They do not think that those employees need equipment and protective clothing, for example” (Town 1).

The official who did not think that the lack of financial resources was hindering tree planting in the public space indicated that their municipality has a nursery where they propagate trees, so when needed, trees are always readily available. However, she suggested that while they may have the trees available, they do not have the workforce to plant those trees.

5.3.2.4 Damage to trees

Twenty-seven percent of respondents across all towns identified the experienced or perceived damage to trees planted in public spaces as a possible barrier to continued tree planting in these spaces (Table 5.2). Similar to some tree planting barriers in the private space, residents from Tsolo were particularly concerned about this barrier in public spaces more than those from other towns ($F=64.1$; $p<0.05$). This concern was mainly associated with the free-roaming domesticated animals such as goats, cattle and horses all around the town. This barrier was predominantly expressed with the sentiment that “*no one will take care of the trees on the street*”, which would be an unnecessary exposure to vandalism.

A few respondents from Grahamstown expressed their concern of expected vandalism in relation to trees that had been planted elsewhere in the townships, where there are barely any trees left of those that were planted on the main street because they had been stolen or destroyed by donkeys. Another key belief that transpired from the respondents from the old suburb in Grahamstown was the apparent practice wherein residents steal public infrastructure, including trees, to sell in exchange for alcohol or money to spend on alcohol. A few respondents likened this behaviour to previous experiences where people dug trees out of people’s yards to sell them. Two respondents from the old suburb in Grahamstown strongly noted this barrier, giving an account that:

“The municipality sold us trees a long time ago for ZAR5.00 with the truck that was going around. Most of us got a fruit and a shade tree. I planted both of mine, but when I woke up the next morning, both trees had been dug out” (Household 277).

“I do not have any trees anymore because someone decided that I should not have any, even though my employer had kindly given it to me. It was dug out and stolen while I was at work, and word on the street was that someone had recently sold a small tree. If young people are able to do that with trees in our private yards, how much more when the trees are there on the street? It will be free for all. Planting on the street is just a waste of time and money” (Household 291).

While few respondents gave these accounts based on some of their experiences, vandalism of planted trees in the public space seemed to be expected by most. This was specific to vandalism by animals. From the perspectives of five municipal officials, vandalism was also a prominent barrier to public space tree planting. This was especially the case in the B4 municipalities (municipalities that are predominantly rural). An official from one of these municipalities noted with expressions of defeat that:

“We cannot do any real planting in any of our towns because the people here keep animals in urban areas. They come from the rural areas with their livestock, and that is just normal here. The trees we got as a donation some town ago which we planted along the main road in one of our towns were completely destroyed, mainly by animals. We cannot waste resources planting trees we know will be gone by the morning” (Town 2).

Similarly, officials from another town suggested that vandalism is more likely to be from animals than people, referencing the few trees they had previously planted in one of the low-cost housing areas, which according to her, have grown. In her account, she specified that:

“I know that people can be malicious because they burned one of the parks we built in one of the townships. This is a form of vandalism. However, vandalism is not a big issue for street trees. I really do not think people would cut down the trees. Maybe animals could graze on them, but we have not experienced much of that” (Town 7).

Another perspective from an official from a different municipality was that residents are more likely to vandalise trees than animals. He associated this with people’s behaviour and attitudes towards trees in general. In his account, he also made reference to trees that had previously been planted by the municipality along the main road in a township area. Unfortunately, most of those trees had since been vandalised. In another town, something similar happened at the hands of residents. According to the official from this town:

“Vandalism is also a major problem. Our nursery was destroyed because of vandalism. The last time we received a donation of 25 trees and these disappeared over the weekend. Somebody just cut and dug it out, and maybe they came with a van because all the trees were gone” (Town 8).

Finally, perspectives on both people and animals likely vandalising planted trees were also voiced. This was suggested as a factor in small and medium-sized towns. According to the officials in these towns:

“We also have not planted because of the vandalism. You plant 100 trees, and if you are lucky only two of them would grow. You then get despondent. The vandalism comes from both people and animals. Even the children just do not care about trees. I have seen with my own eyes, children just breaking trees. I mean why? In the end then there is just a little stick that is left” (Town 5).

“Vandalism is a problem, especially in the townships. The problem is also that they do not take the tree to go and plant elsewhere, they just ruin them. The people in those townships have goats. A goat will never just leave a tree. You plant a tree now and by the afternoon that tree will be eaten up by the animals. We try to protect the trees with enclosures but people dig those out too and make firewood with them. It is also a

problem that we do not work on weekends, and when we come on Monday we see all this damage” (Town 6).

5.3.2.5 Risk of crime

Crime was a prominent perceived barrier to tree planting in the public space, as mentioned by 21 % of residents across all towns (Table 5.2). This barrier was mostly mentioned as a result of the fear of the unknown, where respondents associated criminal activity with criminals having somewhere to hide when committing crimes. A few households in one of the towns reported that there had been incidents of deceased bodies found among the treed areas around the town, while others mentioned incidents associated with sexual assault and mugging being committed in the areas with trees around towns. One respondent from Stutterheim narrated an event where she had been a victim of mugging while walking through a treed public open space in the evening. This respondent specified that this event occurred in another urban area outside the province, but still maintained that if such incidences can occur in one place it means they can happen anywhere else. Residents from the old suburbs were more concerned about the risk of crime than those from the new suburbs ($\chi^2=11.2$; $p<0.05$). There was equal fear for crime as a barrier to public space tree planting between both females (22 %) and males (20 %) ($\chi^2=0.5$; $p>0.05$), and unanimous identification of crime as a possible barrier to public space tree planting between all age groups ($\chi^2=0.2$; $p>0.05$).

5.3.2.6 Politics

Politics were also identified as barriers to public space tree planting by 20 % of respondents and two officials, who inversely suggested that they could also be enablers. In one instance, the official spoke of how most efforts they put into performing their duties are deterred by politics. For example, she mentioned how ward councillors always take centre stage in the promises of service delivery, without considering the processes that have to be passed, saying:

“With politics in the municipality, and no matter how much we try to avoid them, things just do not happen the way we want them. A councillor will promise people houses, but there will be no consultation with anybody else or other departments in the municipality. They will just identify land and demarcate it for building houses, with no consideration for an EIA, or even situating green infrastructure there. This is a very common phenomenon in most municipalities” (Town 7).

The other official spoke about how in his town, some low-cost housing areas are allocated a ward councillor (which is a political appointment) who does not live in the area, which means they are not directly embedded in the realities of residents who reside in the area. He made an example of how in his town, a ward councillor for a low-cost housing area is a white individual who resides in an affluent area, and who has on numerous occasions demonstrated how she might not relate to the people she is tasked to represent. The residents who felt politics were a barrier were mainly referring to the current

administration and management structures of their various municipalities, and their perceptions on service delivery. According to a respondent from one of the rural municipalities:

“Our municipality does not care about us here. Everything they do is political. They only care about Town X (the seat of the municipality) because all the politicians are there and live there. Everything, I mean everything good, is meant for Town X” (Household 116).

5.3.2.7 Other Barriers

Municipal officials touched on the disconnection and lack of communication between departments within municipalities, and how this has constrained their ability to introduce trees in low-cost housing areas. According all these officials, they were never involved in the plans for the development of new suburbs, and there was no evidence that the people who were employed before them had been included in any plans either. An official from one of the medium-sized towns shared that:

“There was no conversation between our department and the building people in the construction of those new areas. No consultation whatsoever and no communication as well. I do not even think a plan for incorporating urban green spaces and trees in the new developments even exists in urban planning and development. That is because all that is done in another directorate which we do not liaise with. We barely collaborate with other departments in this municipality. Everybody just does their own thing that is relevant to their department” (Town 5).

Another official shared similar frustrations, noting how the lack of communication does not only affect the planting of trees, but other functions within his department, such as the use of protected areas. His experience was that he is not involved in the development of new areas in any way. He said:

“What happens with these things is that we have a housing department. They are running that thing and they do not communicate with me about anything. They decide everything including where the houses will be in the area they choose. They go through all those processes, I do not know their processes. I have never been involved in it and they do not liaise with us. At some point they even wanted to venture into the land in the nature reserve to build houses, and luckily I picked it up quickly and told them that it will not happen. I had to take them to the nature reserve so that they could see exactly what it is and why they cannot build there” (Town 1).

Officials from the smaller towns also reported similar experiences regarding the lack of communication between municipal departments and how that contributes to the lack of urban trees and green spaces in general. Sharing their experience on this, one of these officials said:

“You see, the municipality’s response to the government initiative of building houses was a little flawed because this response never took into consideration the environmental impact of building those houses. But maybe because here they developed in already existing areas but with no formal services. People there used to live in shacks so they probably just wanted to ensure that everybody has a home” (Town 4).

A few barriers mentioned by less than 5 % of households across all towns, included the period of establishment of the various suburbs. The fact that some suburbs had recently been established was seen as one of the reasons why there are no trees in the public spaces. This was expanded with expressions like: *“this suburb is new, so tree planting has not been a priority yet”*, or *“the municipality is still prioritising other services besides tree planting”*, or *“the suburb is still new and there are no clear boundaries and demarcations of where the public and the private space are yet”*. Another identified barrier within this group was people’s clear lack of interest in trees and tree planting in general. A couple of respondents mentioned this barrier under the assumption that trees are absent in the public space because the residents themselves do not want to plant. Again, the socio-economic context of low-cost housing suburbs was identified as a barrier, with a few individuals explicitly expressing that urban trees are for the more affluent residential areas and not the townships or RDP areas. Within this barrier, the development history of South Africa came up a few times, with one respondent suggesting that:

“We did not have houses and all trees were cut down so houses can be built for us. If we deserved to have trees then the municipality would have left a few and just made them look beautiful. We believe that trees are for white and rich people because there are trees in town where they live but not where we are” (Household 516).

A municipal official referred to a shortfall in the part of the municipality, where there are no plans to in place to ensure that knowledge is passed on from the older employees to those who are joining the municipality as new employees. However, he noted that the municipality was only recently doing nothing to address this shortfall. He relayed that:

“Many people in this department are not trained for the work they do. In this department we have people who started the department but now have retired and had to be replaced. We never had a plan for people that come in. The department itself has many functions like waste management, parks, cemeteries, sports fields etc. Now these people at waste removal you will find out that when we are short staffed for parks and cemeteries we just take from waste management without them being the correct people for the job or necessarily training them. It is only now that we are developing a plan to train people. Even in this area, finances are a problem. Hence we are working with one of the bigger neighbouring municipalities to train our staff” (Town 4).

5.3.3 Enablers of Tree planting in Private and Public Spaces

A variety of solutions to the low abundance of urban trees in the private and public spaces were suggested by both residents and municipal officials, with some overlaps between the two. In terms of residents, these solutions were contextualised based on their view of whose responsibility it is to plant trees in both the private and public spaces, respectively, and are therefore presented as such. Municipal officials contextualised their suggested solutions based on their view of the municipality being the entity responsible for public space tree planting, and residents responsible for their own private spaces.

Municipal officials altogether mentioned seven possible enablers of tree planting, two of which they attached to both the private and public spaces. Three of these enablers were a direct inverse of the barriers they had mentioned, and thus there is no expansion on them. The highest number of suggested public and private space tree planting enablers by a household was four, respectively. For private spaces, residents mentioned enablers 1, 387 times, and 2, 069 times for the public space. The enablers of tree planting in the private space were mentioned more by respondents from the new suburbs (53 %) than the old (47 %) ($t=2.9$; $p<0.05$), while those for the public space were equal between the old and new suburbs ($t=0.2$; $p>0.05$). Similarly, those who had initially reported having trees in their yards (56 %) mentioned more public space enablers than those who had reported no trees (44 %) ($t=1.3$; $p<0.05$), but there was no difference with regards to private spaces ($t=0.1$; $p>0.05$).

Table 5.3: Suggested enablers of tree planting in private spaces.

Group of Enablers	Suggested Enabler	Proportion of mentions by suburb (%)		Mean±SE (%)
		Old	New	
Biophysical Enablers	More space	31	33	32±2.0
	Conducive soil type	9	19	14±2.5
Resource Enablers	Availability of funds	44	45	45±1.6
	Availability of equipment	17	25	21±2.9
	Availability of trees	21	19	20±1.4
Social Enablers	Improved attitude towards trees	21	24	22±2.2
Other Enablers	Other ¹	21	20	20±2.5
Mean number of barriers per household		1.6±0.03	1.8±0.03	1.7±0.03
¹ Other enablers: trees were there on arrival, conducive climate, and suitable tree species.				

On average, households mentioned 1.7±0.02 (Table 5.3) enablers for private space tree planting, and 2.6±0.03 (Table 5.4) enablers for public spaces. The most frequent suggestions regarding private spaces include the availability of funds (45 %), more space (32 %), improved attitudes towards trees and tree planting, the availability of trees (22 %), and availability of equipment (21 %) (Table 5.3). With regards

to public spaces, residents suggested that enlisting community skills sets (77 %), education and awareness about trees and their importance (68 %), improved attitudes towards trees (34 %), and the allocation of space (33 %) (Table 5.4) could enable tree planting in public spaces. The availability and allocation of space and funds, and the attitudes towards trees were suggested as enablers that could apply in both the private and public spaces in all contexts, and are presented together.

5.3.3.1 Availability of funds

Forty-five percent of respondents felt that having enough disposable income to purchase trees would assist them in greening their private spaces (Table 5.3), while 25 % felt that the municipality allocating funds specifically for tree planting would improve the presence of trees in public spaces (Table 5.4). For 42 % of respondents, this enabler was a direct inverse of limited finances as a barrier to tree planting in the private space. On the contrary, only 28 % of respondents related an inverse of the limitation in funds as a possible enabler of tree planting in public spaces.

The differences in the proportions of respondents who identified the availability of funds as an enabler of private space tree planting between those from the old (49 %) and the new suburbs (51 %) were not significant ($\chi^2=0.1$; $p>0.05$). Similarly, the respondents who had reported having trees (52 %) in their yards and those who indicated not having any (48 %) equally identified the availability of funds as an enabler of tree planting ($\chi^2=0.01$; $p>0.05$). Average household income had no significant bearing on the identification of the availability of funds as an enabler to tree planting, nor did employment statuses ($\chi^2=3.2$; $p>0.05$). In relation to public space tree planting, no respondents expressed awareness of municipalities having budgets allocated for trees and tree planting. The unanimous assumption of those who suggested the allocation of funds (25 %) (Table 5.4) was that those areas with urban trees in public spaces do so because the residents there make financial contributions as part of the rates they pay to the municipality.

This assumption was directly alluded to by one of the municipal officials, who referenced the funds the municipality gets from residents, and how these affect the work they do. He said:

“We have stopped dreaming. It is very frustrating when you used to have and we could do something when the finances were not a problem. Things went well then. There are many of people who have flooded to this town over the years. It is mostly indigent people and they do not contribute to the funds of the municipality because they do not pay rates. So they are also an extra expense and all that stuff, not specifically on my side or my field of work, but in general” (Town 8).

Four municipal officials also suggested that financial injections into the municipality could enable tree planting. These were mainly directed to donations in the form of money which could assist in purchasing trees and the necessary equipment, as well as actual trees. One official said:

“Donations from provincial and national government would help. If we can get those, then we will be in a better position because those donations dictate what can be done. We cannot get donations anywhere else. If we could get more money, we would do more. Nobody wants to give municipalities money. Do you think that if I was a business person I would want to donate funds to the municipality, an entire government? No, I would never do that. Municipalities and the government are the providers, not the other way around. That is why we are so dependent on other government structures for funding and donations. You will only get donations if you have big projects happening, wherein you can approach business and encourage them to plough back to the communities that support them. Those are the only possibilities. But then again, we all know that even in those things, politics are always involved” (Town 4).

In relation to financial injections and donations, three officials referred to donations of trees from their respective district municipalities, nurseries and businesses around the province, while another two indicated that donations towards an existing nursery in one instance, and one that needs refurbishments could enable tree planting. Referencing their defunct nursery, the official said:

“Re-establishing our nursery would help because when we have a nursery we will not have to spend money having to buy trees elsewhere” (Town 8).

The two officials who mentioned donations from the district municipalities as enablers explained that the donations compensated for the financial restrictions, and in another instance the district municipality continues to donate whenever they have trees. One of these officials relayed this continued support, saying that:

“...sometimes they will give the trees to the waste management department and the lady there will tell me to come and get some and do whatever or plant them wherever I want and she will take some and plant at the waste site. The district municipality is quite invested in tree planting. They always come out to us as the different managers and tell us that they have trees to give us and ask us to plant them. They always get the mayor involved as well. We even get some donations from local nurseries when their trees have not been bought they can just tell me they have about 30 trees to donate and I collect them” (Town 6).

Another official indicated that having their own nursery as a municipality has helped them with having to spend less on buying trees for the residential areas where they have planted (not low-cost housing areas), and has enabled them to donate trees to more households than they would had they not had a nursery. She also indicated that they collect the seeds they use to propagate the trees.

5.3.3.2 Allocation of space

According to 32 % of all respondents, bigger private yards would enable the planting of trees in the private space (Table 5.3). Additionally, 33 % of respondents suggested that increases in the allocation of public spaces could enable tree planting (Table 5.4). The allocation of space in private spaces was a popular enabler among respondents from the new suburbs (42 %) than the old (39 %) ($\chi^2=0.4$; $p>0.05$). More of those from the old suburbs (36 %) than the new (30 %) were in favour of more allocation of space for planting in public spaces ($\chi^2=3.6$; $p<0.05$). An elderly resident from the new suburbs in Queenstown expressed how the allocation of space could be an enabler, stating that:

“Our municipality is useless. I do not understand why they choose to make us live in matchboxes of houses and yards. There is barely any space to do anything, even having a garden is impossible. How much more then when one wants to plant a tree or two? There is just no way. The government should just provide us with homes that have enough space for us to even have a lawn where we can plant the tree and be able to relax under during the summer scorching sun. If they continue forcing us to live in these matchboxes, then they should forget our support in 2019. Maybe these young ones with barrettes will do a much better job” (Household 420).

Table 5.4: Suggested enablers of tree planting in the public space.

Group of Enablers	Suggested Enabler	Proportion of mentions by suburb (%)		Mean±SE (%)
		Old	New	
Biophysical Enablers	Allocation of space	36	30	33±1.9
	Soil Type	8	17	13±1.9
Resource Enablers	Allocation of funds	29	22	25±1.6
	Enlisting community skills sets	78	76	77±2.7
	Education and awareness	68	69	68±2.0
Social Enablers	Attitude towards trees	34	34	34±1.9
Other Enablers	Other ¹	6	12	9±1.4
Mean number of barriers per household		2.6±0.04	2.6±0.03	2.6±0.04
¹ Other enablers: collaboration with other towns, reduced restrictions.				

Another suggestion from a respondent in the old suburbs in Cradock was that:

“The government should build us all double storey houses like they do in other towns. This will create enough ground space for us to plant some trees and also have bigger gardens. As it is currently, I cannot even plant maize because I will not have enough space for the spinach and potatoes” (Household 708).

Another suggestion was that the government should plant trees both in the yard and along the street before residents move in, and it should all come as a package. A male respondent from Stutterheim mentioned that he thinks that is how people get homes in the affluent areas, the trees are part of the new home. Municipal officials communicated this enabler through making suggestions for both the allocation of more space for both the private yards, and for the clear demarcation of property boundaries so that people could know where their spaces end, specifically for private space tree planting. Many residents from some of the new suburbs also alluded to this.

5.3.3.3 Attitudes and behaviour towards trees

The attitudes towards trees as an enabler of private space tree planting was suggested by 22 % of all respondents (Table 5.3), and 34 % with regards to public spaces (Table 5.4). No differences in support of this enabler for both private ($\chi^2=1.2$; $p>0.05$), and public spaces ($\chi^2=0.01$; $p>0.05$) were established between residents from the new suburbs and those from the old. Respondents with trees in their households (52 %) were in agreement with those with none regarding improved attitudes as an enabler for both the private ($\chi^2=0.05$; $p>0.05$), and the public spaces ($\chi^2=0.01$; $p>0.05$). Respondents' highest level of education had no significant association with their perception that improved attitudes and behaviour towards trees could enable tree planting in private spaces ($\chi^2=5.2$; $p>0.05$), but this perception differed between education levels for the public spaces ($\chi^2=12.0$; $p<0.05$) as more of those with a Grade 12 qualification or more (69 %) suggested this enabler than those with less (31 %).

Improved attitudes as an enabler was related to respondents' perceptions that some people do not want or like trees, and thus vandalise them, while some use them to commit criminal activities. Another perspective was associated with residents' supposed disrespect for municipal by-laws. In this instance, the by-laws prohibiting the keeping of domestic animals in urban areas were raised. Many of the respondents suggesting this enabler noted with concern that there are some residents who deliberately ignore these by-laws by keeping domestic animals in their households. Respondents argued the failure of municipalities in enforcing these by-laws. Some respondents related this enabler to the barrier of municipal incompetence, suggesting that if the municipalities were performing their duties properly, animals in urban areas would not be a problem. One municipal official suggested that if people could start interacting, or using the trees and sitting under them relaxing, then he would be encouraged to plant more. In his words:

“It gives me the spirit to want to do more. Wherever I see an open space and there I trees available for me to plant, I will just plant. I will make a plan and make space”
(Town 6).

5.3.3.4 Enlisting community skills sets

According to 78 % of respondents across all towns, the enlisting of communities' skills sets could be a major enabler of tree planting in the public space (Table 5.4). The distribution of this sentiment was homogenous across all suburbs, expressed by 78 % of respondents from the old suburbs, and 76 % from the new ($\chi^2=0.4$; $p>0.05$). Both females (75 %) and males (80 %) were in support of such ($\chi^2=1.8$; $p>0.05$). However, there were no differences by employment status ($\chi^2=9.4$; $p>0.05$), or household income ($\chi^2=7.8$; $p>0.05$), or the age of respondents ($\chi^2=0.3$; $p>0.05$). This enabler was expressed to imply that the municipality should create jobs by recruiting community members with various skills to plant trees and beautify suburbs. Some respondents even suggested the likelihood of such projects being sustainable because the community members themselves will have played a big role in their establishment.

5.3.3.5 Education and awareness

Education and awareness in the form of training and workshops was suggested as a possible enabler of tree planting in public spaces by 68 % of respondents. The sentiment was aligned to some people not recognising the importance or the need for trees when many other developmental issues need to be prioritized. The proportion of respondents from the old suburbs (68 %) was similar to the new suburbs (69 %) ($\chi^2=0.09$; $p>0.05$). More females (71 %) than males (61 %) believed that education and awareness could enhance tree planting in the public space ($\chi^2=7.7$; $p<0.05$). The respondents who had initially indicated not having trees in their households (72 %) were in favour of this perception more than those who reported having them (62 %) ($\chi^2=4.6$; $p<0.05$).

The loose interpretation of this enabler by most respondents was that people's prospects of planting trees in public spaces would be improved if they knew why they had to, and how they could plant. Yet, respondents' level of education had no significant bearing on their suggestion that education and awareness on trees and tree planting could enable public space tree planting ($\chi^2=2.2$; $p>0.05$).

Municipal officials related changed attitudes and behaviour towards trees to education and awareness on trees and their importance on numerous occasions, with recommendations that increased education and awareness could transform people's appreciation and attitudes towards urban trees. One official drew from his experience of organising awareness campaigns and said:

"I know that the awareness campaigns we do have an impact on some people, no matter how few. So, we just need to continue doing them. You have to do a lot of education before any trees are planted. We need to educate people so that can know"
(Town 4).

Another official suggested that:

"Behavioural change and the willingness of the people to have trees planted could assist in ensuring planted trees survive. Obviously education and awareness would

play a big role in that because people need to be taught why and how to look after the trees. I think they need to be educated more. People in the environmental field should go, which we do not do, and involve them and educate them about the importance of having trees” (Town 7).

In the same light, another official suggested that if people are aware of what trees do for them, they will be more inclined to plant them and ensure that they are not vandalised. He gave some evidence of this, stating that:

“People were liking trees very much, even the people working in the municipality were fond of trees and nature back in the days. If we could have that again, it would help. If people could love and have a passion for planting trees, we could have so many more trees planted” (Town 1).

5.4 Discussion

The objective of this chapter was to investigate the barriers to, and enablers of, tree planting from the perspectives of residents and municipal officials in selected old and new low-cost housing areas across multiple towns. I had hypothesized that the new suburbs experienced more barriers to tree planting in private space than the old suburbs, and conversely the old suburbs had more opportunities to enable tree planting in private spaces. Furthermore, I had hypothesized that the households without trees would report more barriers than those without trees, and conversely those with trees would report more enablers than those without trees. A number of barriers and enablers emerged, and the majority of them were related to human agency, and emerged within certain institutional contexts, compared to those that result from urban morphology (Biernacka and Kronenberg, 2018) such as compactness and density of residential areas which limit space for tree planting. Biophysical, resource and social barriers to private space tree planting were the most identified by respondents in this study. This resonates with Gashu and Gebre-Egziabher (2019) who found that structural and capacity barriers, followed by technical problems, were the most important barriers to developing green infrastructure in Bahir Dar and Hawassa, Ethiopia. Many of the barriers which surfaced in this study resonate with those reported by Grado et al. (2006) in Mississippi, Kronenberg (2015) in Poland, Pincetl et al. (2013) in Los Angeles, and Stevenson et al. (2008) in Pennsylvania, to name a few, indicating relatively few differences between developed and developing country contexts. Furthermore, the results presented in this chapter reveal that the barriers to, and enablers of, tree planting do not differ much between different towns, and between the private and public spaces. This was evidenced by both the average mention of barriers and enablers by households in the old and new housing developments, and the similarities in the barriers and enablers identified for the private and public spaces.

5.4.1 Space

South African low-cost housing areas are compact and dense residential areas where the pressure for their development is to accommodate as many people and at as little a cost as possible (Chapter 1). This is evidenced by the dimensions of the building structure, and the small size of a household plot (<1000 m²) in these developments (Shackleton et al., 2014). The lack of space in both private and public spaces is one of the most prominent barriers to urban tree planting identified in this study. Indeed, while some cities are better endowed with ample high-quality plantable spaces for urban greening, many compact cities in the developing world often suffer from inadequate space for urban greening and tree planting (Elewa, 2014; Jim and Chan, 2016). This is true for both private and public spaces. Small yard sizes are typical of many low-income areas worldwide. For example, Nguyen et al. (2017) reported that residents from low-canopy, low-income areas in New York and Baltimore, USA, were unable to plant large trees in their private properties because the yards were small. In addition, wealthy citizens are more able to afford larger lots for their homes and are able to spend more money on landscaping during the construction of their homes, leading to a higher number of trees (Zhu and Zhang, 2008). Limited space in low-cost housing areas of South Africa for tree planting is an understandable concern because many households consider expanding their homes or adding an additional structure (such as a shack) in their yards. This is especially prevalent in the older low-cost housing areas where home-owners erect shacks at the back of the yard because the family is too large to fit in the main house, or lease them out to tenants.

Limited space along streets and road verges is also typical of many cities, shifting the planting of trees to public gardens, parks and local pockets of open space scattered throughout the built-up areas, including small rest gardens, playgrounds, areas adjacent to road junctions and interchanges, residual and artificial slopes (Jim, 1986). The findings of this study in this regard mirror the assertions by Jim et al. (2018) that the shortage of total plantable cover (TPC) presents a fundamental constraint to tree growth in a dense town plan. Similarly, Ng et al. (2012b) illustrated that narrow footpaths, high pedestrian flow, traffic constraints and the shading caused by high buildings are some of the limitations to urban greening in the streets of urban Hong Kong.

Jim (2013), Tan et al. (2013), and Tian and Jim (2012) all suggest that other greening strategies such as green roofs and vertical green infrastructure, like green façades, could be an option for greening compact city environments where space is scarce. However, this may not be as practical in a developing country context, especially in the face of the South African weak economic climate, coupled with the work that still needs to be done to encourage communities to have green infrastructure in private spaces. However, green façades could be more practical for residents in the homes that are already occupied, especially in relation to food security because these can be designed with urban agriculture in mind (Beacham et al., 2019). Addressing space constraints could enable tree planting, as suggested 33 % of

respondents. This means that bigger yards and wider pavements need to be considered in future housing developments. This also means that government's objective to low-cost housing developments should include liveability and sustainability rather than providing as many people as possible with a shelter at the expense of decent residential areas.

5.4.2 Funds

Limited or insufficient funding for tree planting is a common barrier globally (eg. Driscoll et al., 2015; Haaland and Konijnendijk van den Bosch, 2015; Kronenberg, 2015; Stobbart and Johnston, 2012). According to Driscoll et al. (2015), insufficient funding was listed as the greatest barrier to the expansion of urban forestry programs by community officials and program managers in the Portland – Vancouver metropolitan region. Similarly, Ries et al. (2007) reported that fiscal constraints existed at the local level in many cities, regardless of size, resulting in a lack of funding support for urban tree programs. In evaluating government failures related to the management of urban trees in Poland, Kronenberg (2015) reported that a high proportion of respondents (61 %) highlighted insufficient funds as a barrier. Funding for green infrastructure is a major obstacle experienced in many other countries, especially the developing ones, as asserted by Gashu and Gebre-Egziabher (2019), who opined that intensity of some capacity barriers such as lack of funding is serious in developing countries cities, including Ethiopia. The lack of funds was one of the common barriers to public space tree planting among the residents and officials in this study. This is reminiscent of Gwedla and Shackleton (2015) and Kuruneri-Chitepo and Shackleton (2011), who all found that the lack of funds in selected South African municipalities was limiting efforts to plant and maintain trees in public spaces. Governments the world over are parsimonious in their spending for green infrastructure and urban forestry. Urban green spaces, and urban forestry programs in general, must compete for funding from city budgets and are often downgraded in favour of services deemed more essential (Grado et al., 2006). For example, Gwedla and Shackleton (2015) reported that the budget allocation for the departments responsible for urban tree planting and maintenance in multiple municipalities is usually the smallest compared to all the other municipal departments. Similarly, Lamichhane and Thapa (2012) found that many municipalities in Nepal accord very low priority to urban forestry, as evidenced by the allocation of inadequate human and financial resources. One of the municipal officials in this study alluded to this, highlighting that the Community Services department is always the first one targeted for budget cuts.

At household level, the lack of financial resources as a barrier to private space tree planting was contrary to Shakeel and Conway (2014), who concluded that “even the poorest households in selected neighbourhoods in Mississauga, Canada, may have been wealthy enough to overcome the barriers that are typically associated with low-income neighborhood's low tree cover, owing to an average income above 38 610 CA”. I did not consider income inequality a factor in this study, as all sampled areas are reserved for indigent people and my assumption is that even if there are different income levels, they

are all still at the level of minimum wage. As a result, the identification of lack of funds for private space tree planting was plausible and uniform across all suburbs, with no pronounced differences among the narrow range of income levels.

There was an assumption raised by residents in the study, and supported by a municipal official, that residents' contributions to the municipality revenue through the payments of rates could assist in enabling tree planting. With higher per capita income, the city has more budget for urban tree programs. Gwedla and Shackleton (2015) showed that larger and wealthier towns (which are correlated attributes) had a higher street density than smaller and poorer towns. Similarly, Heynen (2006) insinuated that "it is still expected that more effort is taken to publicly subsidize and maintain street trees within upper-class and middle-class areas owing to the political responsiveness and social-capital accumulation that tends to correlate to middle-class income areas". Similarly, Grado et al. (2013) speculated that population size may also influence the available tax base of a community for programs, and thus the potential for instituting activities. Zhu and Zhang (2008) posited that urban development in some big cities of the USA contributes to the increase in urban trees as richer communities have a larger budget for public urban forests, complemented by private lots where most of the trees are grown. This had been previously reported by Escobedo et al. (2006), asserting that the total public urban forest budgets are greater in the higher socioeconomic strata than the lower ones in Santiago de Chile.

Funding limitations go beyond affecting the purchase of trees and maintaining them, but affects other aspects of urban forestry such as equipment, hiring of skilled personnel or training existing staff. There are instances where some municipal departments are unable to perform any tasks because the funds they receive become depleted after salaries have been paid. This was flagged by one of the municipal respondents in this study, echoing the conclusions by Gwedla and Shackleton (2015) that the limited numbers of people with the relevant skills to see to the appropriate planting and maintenance of street trees, and the lack of equipment, are usually as a result of insufficient budgets.

The dependence of many municipalities on donations for trees from other entities revealed in this study emphasizes the multi-actor nature of urban forestry and tree planting. It implies that while municipalities may be the entity mandated to implement urban greening initiatives, they need support from other stakeholders too. They might have the expertise (which in some cases is also deemed lacking), but without the resources it becomes difficult for them to perform their duties and deliver services. Therefore, allocation of more funds could indeed enhance tree planting, but the current economic climate of South Africa advocates for the involvement of other stakeholders outside of local government to contribute. This is not just applicable for public space tree planting, but for individual homes too. In that regard, other actors such as businesses, as mentioned in Chapter 2, should come on board, and invest more in Arbor Month celebrations. Contributions of this nature have been acknowledged to make a difference in some private space tree planting initiatives in the developed world

(e.g. Nguyen et al., 2017). Nguyen et al. (2017) noted three non-profit organizations that were instrumental in the distribution of urban trees in private residential lands with municipalities in five cities in the USA through various sponsors and partnerships, concluding that these programs contributed significantly, which eased financial pressure on municipalities, to efforts aimed at tree planting and increased canopy cover, as cited in their respective mission statements.

5.4.3 Damage to trees

Damage to trees was identified as one of the leading barriers to tree planting in both public and private spaces, by residents and officials alike. There are various sources of damage to urban trees, including deliberate or accidental vandalism by residents, and browsing by animals. This damage was experienced and expected in different ways by respondents, with some relaying experiences of having trees damaged or stolen, and others relating their experiences to animals. Although tree damage is clearly more evident after trees have been planted, it can discourage the planting of new trees as the general perception is of a high likelihood of them being destroyed. Vandalism is a worldwide threat to urban trees (Black, 1978), with it having been reported to affect up to 30 % of newly planted street trees in the United Kingdom (Pauleit et al., 2002). Locally, Gwedla and Shackleton (2015) reported that municipal parks managers regarded vandalism as one of the leading limitations they face in their efforts to advance urban forestry in their respective towns. Similarly, Richardson and Shackleton (2014) found that more than 25 % of trees had been vandalized, a pattern that was corroborated by both the municipal officials and the residents in those towns.

The keeping of livestock in urban areas has historically been controversial, which reflected a dominant paradigm to classify and separate “urban” from “rural” land uses (McClintock et al., 2014). However, that dynamic is gradually shifting in many parts of the world, with more and more residents in urban areas opting to keep livestock in their properties, especially among the urban poor in developing countries (FAO, 2010). Therefore, susceptibility to damage by animals is highly likely, especially in the South African low-cost housing and old township context, where many residents keep livestock in their households as a livelihood strategy or as a cultural norm. According to Shackleton et al. (2017a), livestock in urban areas is a common feature of many developing country towns and cities, and in cities like Dar es Salaam the capital city of Tanzania, approximately 70 % of households have livestock. Regardless of the motivations, this practice can be in conflict with urban greening efforts at the city, neighbourhood, and household scales (Chapter 6).

Another prominent facet of damage to trees is related to criminal activity, where people deliberately dig out and destroy newly planted, or steal them. Criminality towards urban vegetation is not uncommon. He and Zhu (2018) reported that approximately 40 % of informal growers involved in community gardening in the Hangzhou metropolitan area, China, complained about deliberate damage or stealing of their vegetation by other residents. At a much bigger scale, Jim (2015) reported that there has been

increased theft of agarwood in a peri-urban forest in Hong Kong, China, which has also lead to many other trees being destroyed indiscriminately in the amateurish search for the resinous wood.

The reluctance of some officials to motivate for tree planting in public spaces has been informed in part by previous experience of having had trees planted vandalized within a short space of time. For example, the Makana local municipality in Grahamstown planted a number of trees along a few main streets in the township area (low-cost housing areas are also in close proximity to the township area). After more than a year of planting, only about 43 % of the trees had survived vandalism, despite the presence of protective structures, which was admitted by 48 % of respondents claiming to have witnessed someone or something damaging a street tree (Richardson and Shackleton, 2014). Kuruneri-Chitepo and Shackleton (2011) had previously noted this behaviour, reporting that an official from one of three towns in the Eastern Cape said there was no intentional neglect of township and RDP areas, but that newly planted trees were persistently vandalized.

Changed and positive attitudes about trees could mitigate incidences of vandalism. This was suggested as a possible enabler of planting in both the private and public spaces. As indicated by Kirkpatrick et al. (2012), residents' attitudes towards urban trees influences the decisions they take regarding those trees in general, and whether to plant or to remove them. People vary in their appreciation of urban forests and green spaces and there is a strong tendency for residents to respond positively to statements praising trees, and negatively to those suggesting that trees can create problems (Kirkpatrick et al., 2012; Lohr et al., 2004; Shackleton and Mograbi, 2019). Therefore, if people have positive attitudes towards trees, then their behavior towards them will also be positive and inclined towards nurturing and protecting them. On the other hand, the opposite is possible.

5.4.4 Municipal competence

Municipal incompetence is synonymous to government failure because it speaks to municipality's or government's failure to perform certain duties. Residents attributed the lack of trees in public spaces in low-cost housing areas to the incompetence of municipalities in service delivery. Kronenberg (2015) describes phenomena of this nature as government failure, alleging that many environmental problems persist because of the inability of public institutions to correct those problems, likely because of either a lack of adequate policies or inadequate policy enforcement, or even lack of information. In many instances, urban greenery is included in legislation and policy, as I discussed in Chapter 1 and reported in Chapter 3. However, the regulations and policies are sometimes unclear or just not observed (Kronenberg, 2015). For example, Ottitsch and Krott (2005) indicated that one of the most important weaknesses of urban forest policies in Europe was the unsatisfactory implementation of existing legislation, programs and plans.

The perceived incompetence of municipalities can also be traced back to policies and urban development plans that barely specify or discuss urban greenspaces and tree planting (Diko and

Palazzo, 2019). Previous studies in South Africa have shown that there are relatively few policies that deal specifically with and promote tree planting and maintenance in towns and cities, with barely any national land use or development plan that specifically makes provisions for urban trees or green space planning (Shackleton et al., 2014), and very few municipalities have tree planting or greening strategies (Chishaleshale et al., 2015). Given these limitations, it is therefore unlikely that municipalities would engage in activities that are neither planned for nor considered in the broader urban agenda of their municipalities. Another example of this was displayed in this study, where officials would speak about by-laws relating to urban trees and tree planting. However, document searches and analysis specific to municipal by-laws returned very few results on the actual presence of these by-laws within municipal policies and documentation.

Another aspect to the alleged incompetence of municipalities may relate to the lack of understanding of the importance of trees, especially among those decision-makers who are not directly involved with Community Services or Parks departments such as municipal managers, thereby rendering them the least of municipalities' priorities. This can be evidenced by budget cuts where some departments responsible for tree planting are either not allocated such funds or theirs are channeled to other priority departments. This was highlighted by one of the respondents in this study. According to de Groot et al. (2012), municipalities and implementing agencies of urban greening often need information relating to environmental issues translated into the language that they are accustomed to use, such as the monetary values of their investment in certain environmental infrastructure.

5.4.5 Politics

Politics were identified as a barrier to public space tree planting, albeit only by a handful of respondents in households and municipal officials. Municipal officials were more vocal about this as they get to negotiate for the recognition of the need to for trees in urban areas within political circles. Green space planners and managers often struggle to keep green space issues on the political agenda (Konijnendijk et al. 2006) because urban trees are rarely seen as part of a broader urban regeneration agenda (Simson, 2008), and often lack public support (Zabel, 2007). One of the officials in this study alluded to this. The lack of political will evident in the poor enforcement of urban by-laws in Kumsi, Ghana, can also be linked to the rapid decline of urban green spaces due to densification (Diko and Palazzo, 2019). Political awareness is always a prerequisite for the effective management of urban green spaces (Hoyle et al., 2017) because decisions pertaining to any kind of urban developments and budget allocation are always politically influenced. The implementer needs to prove the necessity of such development and to get political buy-in for any chance of success. This is especially true for local politics and the nature of national governance in South Africa, where ward councilors and their committees have a significant bearing in what happens in their respective wards in line with participatory governance (Piper and Deacon, 2009). Chishaleshale et al. (2015) found that the lack of political support was one of the

challenges faced by officials responsible for planning and management of urban trees and green spaces in the Eastern Cape and Limpopo provinces of South Africa. Politicians, as decision-makers, for whom the idea of urban green infrastructure is still relatively new, are usually not aware of the need for reliable budgetary support to urban green initiatives (Zhang et al., 2007). Furthermore, reluctance to invest in green infrastructure and tree planting can be interpreted as ineffective as local authorities often have to deal with problems which already exist (such as improving infrastructure damaged by street trees), rather than trying to prevent similar problems in the future (Randrup et al., 2001). Increased political support is important for successful urban forestry (Elmendorf et al., 2003).

5.4.6 Fear of crime

Fear of crime has been regarded as a significant social problem in urban areas (Sreetheran and Konijnendijk van Den Bosch, 2014). Crime is widespread in South Africa, and usually widespread in townships (Breetzke, 2020) as a result of socio-economic deprivation (Breetzke, 2010). Therefore, it comes as no surprise that the fear of crime in relation to urban trees is prevalent in low-cost housing areas, as expressed by approximately 20 % of respondents. These results concur with Shackleton et al. (2015) who found that residents in from Bela-Bela and Tzaneen who believed that trees attract criminals also disagreed strongly with a statement relating to parks being great places to bond and relax with family and friends, with similar experiences related to crime narrated in both studies. Both these findings correspond with those by Pincetl (2010) who reported that residents in areas with high criminal activity often do not want trees planted in front of their properties as they fear that criminals will be able to hide in the trees.

Gender tends to be a significant and strong predictor of fear of crime in urban green spaces (Sreetheran and Konijnendijk van Den Bosch, 2014). There are gendered patterns of mobility and access to the public sphere as a function of perceived safety and control among women, whose fear and perceived risk of male attack undermines their free involvement in urban public life and activity (Brownlow, 2006). Several studies (e.g. Abass et al., 2019; Brownlow, 2006; Mureva et al., 2014) have demonstrated this, highlighting the more pronounced fear of women in green spaces and urban forests compared to their male counterparts. While females may be more susceptible to crime in urban forests, there are many attributes that influence criminal activity, including personal, social, and physical factors. This pattern speaks more to vulnerability and past experiences of crime despite instances where they might less likely than other groups to be victims of crime (Scarborough et al., 2010). The results of this study regarding expressed fear of crime between females and males are contrary to others conducted elsewhere. For example, Abass et al. (2019) reported that more females (95%) than males (43%) were of the view that green spaces such forest reserves, parks and gardens that were deemed an unnecessary public nuisance as they only serve as breeding grounds for dangerous reptiles such as snakes, debilitating insects as mosquitoes and safe havens for criminals should be rezoned or converted

to other beneficial uses. Similarly, Shackleton et al. (2015) found that a greater proportion of females than males expressed fear of crime in relation to visiting parks. These differences could be attributed to the types of green spaces considered where more females would feel unsafe in a park or open space than a male would. In the context of this study, focus was put on individual trees in private and public spaces. However, females in this study were more inclined to express previous experiences related to trees and crime than males.

Despite this evidence, there have been contrasting schools of thought in relation to urban trees potentially abetting criminal behavior and activity. On the one hand, there have been reports of increased incidences of crime due to urban trees (i.e. Sreetheran and Konijnendijk van Den Bosch, 2015), while some studies have demonstrated that urban trees reduce the incidence of crime by getting residents out into the neighbourhood (i.e. Kuo and Sullivan, 2001). For instance, Burley (2018) reported a reduction in violent crime counts in the years following the planting of new trees in 94 Portland neighborhoods, with reported rates even lower in terms of violent crime counts in the lower income neighbourhoods. Therefore, the fear of crime associated with urban trees is subjective and highly dependent on people's experiences and the lens through which that crime is evaluated. However, more awareness on the positive aspects of trees and their potential to reduce criminal activity also need to be communicated more so that residents can make informed decisions about whether to plant or not. This speaks to the education and awareness suggested as an enabler to tree planting by 68 % of households supported by four officials.

5.4.7 Communication and cooperation

Municipal officials also flagged the lack of communication and cooperation between various departments within municipalities as a barrier to tree planting. This is applicable to both the private and public spaces, because in an ideal situation, recipients of low-cost houses would move into homes that have all needed infrastructure, including green infrastructure and trees. However, this is not the case. The common mode is that each department focuses only on what they specialize in or are required to develop, with little to no regard for the functions of other departments. The current pattern in South African low-cost housing developments by the DHS is the building of a housing structure and limited coordination with departments such as DEFF. This results in urban green spaces and trees being frequently treated as an after-thought, planted in residual spaces after other uses have made their claims (Jim and Chan, 2016). The “after-thought” nature of urban greening plans and initiatives is one of the major underlying issues to some of the barriers to tree planting experienced by many municipal officials. For example, if tree planting was incorporated in the development plans for new housing developments, sufficient space would be allocated (Jim, 1986). On the other hand, trees planted in yards before homeowners occupy the property could save municipalities some money in their greening

budgets. This requires other sector departments such as the DHS to come on board and incorporate urban greening in their plans and strategies of low-cost housing developments.

Gwedla and Shackleton (2015) posited that there is weak or no cooperation and communication between the relevant national and provincial government departments responsible for the planning and construction of low-cost housing areas, a pattern that had previously been highlighted by Roberts and Diedrichs (2002) in the implementation of Durban's Local Agenda 21 program. The lack of cooperation and coordination between the Department of Roads and municipal authorities is also one of the major gaps in urban forest development in two cities of Nepal (Lamichhane and Thapa, 2012). There are a number of reasons for the lack of communication and coordination between departments at all levels of government, which are beyond the scope of this study. But, this lack of communication is not only between departments in municipalities, but also between urban policies pertaining to various functions of government (Simson, 2008). Therefore, more integration and coordination in this regard could enhance or facilitate for more opportunities for tree planting.

5.4.8 Knowledge, attitudes, education, and awareness

Knowledge is a component of attitude, and lack thereof could influence people's attitudes towards urban greenery (Abass et al., 2019). In the context of this study, respondents reported lack of knowledge about which species to plant, where to source trees, and how to plant them as limiting factors to them considering tree planting. This implies a general lack of knowledge about trees and tree planting altogether. Conway (2016) concluded that the lack of knowledge was behind tree removals, either because residents had not understood how large a tree would become or did not know how to properly care for it. This implies that had they had sufficient knowledge on the species suitable for planting, they could have made different choices and would not have to ultimately remove those trees. Similarly, Kirkpatrick et al. (2013) reported that negative attitudes to trees often resulted from limited knowledge about and poor decision-making in relation to trees in cities, stating that major problem is that people (either the residents or municipal councils) do not know the correct trees to plant.

Residents from Checheche Growth Point, Zimbabwe, expressed similar sentiments regarding limited knowledge as one of the challenges they face regarding tree planting and nurturing, stating that they needed assistance in the provision of tree seedlings, training on how to grow trees, awareness about trees (particularly which fruit species were more suited for dry environments), water provision, pesticides and tree enclosures (Thondlhana and Ruwanza, 2019). Al-Mayahi et al. (2019) also reported that lack of knowledge, establishment and maintenance cost, poor soil quality, etc. were some of the reasons for non-gardening among households in Al-Mawaleh and Al-Hail areas, A'Seeb Wilayah (district) in Oman. In expressing lack of knowledge, one of the officials attributed the culture and norm of having front yards without vegetation to lack of knowledge. Visscher et al. (2016) neatness of yards and fitting in with the neighborhood are preferred by most residents as fewer respondents preferred

front yards that were dominated by tree plantings or prairie gardens. This implies that the trend for bare front yards may be more of a preference and conforming to the neighbourhood design than lack of knowledge.

5.4.9 Community skills sets as an enabler

A significant proportion of household respondents in this study suggested that the enlisting of community skills sets could enable tree planting, specifically in the public spaces, because many people are able and available to assist, whether voluntarily or for employment. I highlighted the possibilities for this in Chapter 3, and demonstrated this willingness in Chapter 4. Urban tree planting initiatives require new forms of governance (Chapter 2) that foster greater institutional capacity and account for a range of stakeholder attitudes that are not the norm in municipal management of landscapes and traditional grey infrastructure (Nguyen et al., 2017). Residents play significant roles in the greening of cities and suburbs, working individually, with neighbours or other residents, and in collaboration with municipal and non-profit organizations (Watkins et al., 2018). Stevenson et al. (2008) found that assistance from communities for tree works was important in both sustained and developing tree planting programs.

Participation in tree planting and urban forest expansion has been appraised as a core necessity in designing and offering urban tree programs that are more likely to be sustainable because they meet local needs (Janse and Konijnendijk, 2007; Donovan and Mills, 2014). The participation of communities and homeowners in both new plantings and the maintenance of existing trees has been proven integral (Greene et al., 2011; Jack-Scott et al., 2013) because it can lead to empowerment for collective action (Westpal, 1993, 1999, 2003), higher ratings of satisfaction with the trees, especially with street trees (Sommer et al., 1994; Summit and Sommer, 1998) and outcomes resulting from their efforts (Kobori and Primack, 2003; Shan, 2012), a greater sense of ownership (Padgee et al., 2006), and improved sense of stewardship (Moskell et al., 2016). Above all, urban tree planting initiatives that require the involvement of residents in tree planting and stewardship need to invest in knowledge and insights into people's beliefs, values and attitudes related to tree stewardship and urban forest governance (Heberlein, 2012). These are important to understand peoples' intended and actual participation (or non-participation) in stewardship and the initiatives in general (Moskell and Allred, 2013). The solicitation and enlisting of community skills for tree planting is an especially viable option considering the other barriers municipalities are currently faced with, including the lack of skilled personnel.

5.5 Conclusion

The barriers to and enablers of tree planting highlighted by households and municipal officials can be grouped into biophysical, social and resource barriers and enablers, according to classification by Spires et al. (2014). A number of barriers to tree planting in both the private and public spaces were identified

by officials and households, including limited space, limited funds, lack of equipment, anticipated and experienced damage to trees, fear of crime, politics, limited knowledge, and alleged municipal incompetence. On the other hand, officials and households suggested a number of opportunities to be explored in enabling tree planting in both private and public spaces, including allocation of more space, funding, changes in people's attitudes towards trees, availability of equipment, enlisting of community skills sets, and education and awareness about trees and tree planting. These barriers and enablers were similar between the old and the recently developed low-cost housing areas, although more households in the new than the old suburbs identified barriers for private space tree planting, which verified the hypothesis set out for this Chapter, and between households who already have trees in their yards and those who do not. However, the hypothesis related to the barriers mentioned by households with trees was not supported as the identified barriers were not significantly different to those mentioned in households without trees. Conversely, there were no major differences in the number of enablers of private space tree planting between the old and new suburbs, thus rejecting the hypothesis that old suburbs had more opportunities to enable tree planting in the private spaces. Similarly, the hypothesis that households with trees would report more enablers than those without trees was not supported as no significant difference could be established. Other independent variables such as gender, household income, employment status and highest education had no significant bearing in the recognition of these barriers and enablers.

While there were some similarities in the barriers and enablers mentioned by officials and households, there were some important factors to both group independently which spoke mostly to social barriers and enablers. For example, officials believed that the lack of communication and cooperation between various departments was hindering tree planting efforts, while residents believed that municipal incompetence was part of the problem. Similarly, municipalities were more in favour of education and awareness and changed attitudes could assist, residents felt that the enlisting of community skills sets and positive attitudes could enable tree planting.

Chapter 6

Engaging multiple stakeholders in participatory learning for tree planting in low-cost housing areas: an activity systems approach

“The participation and engagement of residents in tree planting and urban forest expansion has been appraised as a core necessity in designing and offering urban tree programs that are more likely to be sustainable because they meet local needs” (Donovan and Mills, 2014).



This is an invitation that was designed and distributed by the GreenChamps-M community group from Matatiele inviting residents from the Area C low-cost housing area to attend a tree planting awareness event planned and organized with the GreenChamps-M (Background picture taken by researcher in Stellenbosch, 2017).

Overview

In the previous three chapters I argued the need for the involvement of multiple actors, especially residents, in efforts to expand the urban forest in low-cost housing areas. Specifically, Chapter 5 presents the barriers to, and enablers of, tree planting from the perspectives of residents from low-cost housing areas, and of municipal officials from the respective towns and highlights, among other things, residents’ eagerness to use their skills and expertise for tree planting. Building on those results, this chapter presents findings from an activity systems perspective on tested scenarios where urban residents were championing tree planting in their respective towns and residential areas. As such, this chapter presents the interventionist perspective to tree planting, where I address Objective 5 of this study, which sought to design and test means of engaging communities from low-cost housing areas in participatory tree planting. This chapter describes the processes and experiences which characterized the participatory introduction of tree planting and trees in a low-cost housing context. In doing so, I address the following question:

- a) What processes and experiences characterize the participatory introduction of trees and the potential success or failure of a tree planting initiative in a low-cost housing context?

In this chapter, as a member of the Department of Environmental Science (DES) at Rhodes University, I position myself as a change-agent or interventionist researcher because I came into the research space with an auxiliary motive of encouraging the practice of tree planting to communities in low-cost housing areas. Therefore, I also identify as part of the subject in various activity systems because I engaged with communities as an interventionist researcher whose object was to have trees planted in low-cost housing areas, where I worked with other members of the subject to fulfill.

6.1 Introduction

Beyond the many institutional and technical governance measures that need to be implemented for the effective establishment and governance of the urban forest, implementing entities such as municipalities and NGOs have other ways of advancing urban forestry goals, including outreach to and involvement of the public through means such as literacy campaigns or organization of volunteers, although communities can also initiate such engagements themselves (Sheppard et al., 2017). Urban forests are human-engineered systems, their structural and compositional resilience therefore lie in the collective actions of individuals (Mincey et al., 2013). Humans have been planting and managing trees in cities over the course of civilization, and contemporary urban forestry has seen an evolution of the practice into a field of professionalized practice that engages numerous actors, including government officials, public and private land managers, researchers, professional associations, arborists, activists, and the public (Chapter 2) (Campbell et al., 2016; Mincey et al., 2013). The scarcity of resources (Chapter 5) for tree planting and management and policy ambitions to empower citizens (Buijs et al., 2019), and the emergence of increasing numbers of bottom-up initiatives by citizens, have spurred an interest in the role of active citizenship (Mattijssen et al., 2018a) and how this can improve the governance of urban green spaces. This is especially true in situations where citizens do not wait for authorities to act but employ their own activities in the public green domain (Mattijssen et al., 2018b). Public participation processes in urban forestry are implemented through certain techniques or tools for communication and interaction, and can range from limited representation to broad-scale representation (Sheppard et al., 2017). The broad-scale representation technique is more direct and provides stronger opportunities for learning, are more flexible, and they can also establish dialogue between individuals with diverse interests, and help reach workable solutions under complex and uncertain conditions (Sheppard, 2005).

In engaging various stakeholders in the establishment and governance of the urban forest, the open co-governance mode (Chapter 2) is particularly crucial as it seeks to fulfill the objectives of all actors, owing to the diffusion of power and flexible collaboration (Arnouts et al., 2012). This is also pertinent in a context of limited resources such as that of low-cost housing areas and small municipalities, as revealed in Chapter 5. Multiple actors in urban forest governance each bring a suite of skills,

resources, and knowledge that overlap the same goal of improved numbers of trees and the benefits they provide. However, many tree planting initiatives rarely incorporate an array of stakeholders. Even when they do, the hierarchical arrangement (Arnouts et al., 2012 as described in Chapter 2) of urban forest governance is usually at play, as seen in the tree planting initiatives reviewed in Chapter 3. Particularly, many initiatives do not take full advantage of the human capital available and willing to assist in expanding and managing the urban forest (Chapter 4). Therefore, interactions between planners and managers, and local stakeholders are crucial to facilitate the identification of planning and management priorities (Dilley and Wolf, 2013; Flint et al. 2009).

While initiatives incorporating residents and citizens have been garnering support and much recognition because of their potential to increase social connectivity and resilience, and putting more power and responsibility into the hands of groups, networks, neighbourhoods and local communities (Nunbogu et al., 2018), it is not easy for professionals to adequately engage with these initiatives (Van Dam et al., 2014). This is because often citizen-led, designed and implemented initiatives may conflict with policy (Van Dam et al., 2014) or the procedures of other entities and actors. This resonates with self-governance, and highlights its challenges, including potential contradictions with formal national or local policy agendas (Nunbogu et al., 2018). For example, residents of a particular street may organize themselves to plant and care for trees with little to no regard on the municipality's policy on the species to be planted on particular streets (in a case where such a policy exists) for particular reasons, such as cultural or social ecosystem services. This is not ideal and points to the importance of partnerships. Self-governance may be more appropriate for private space planting where homeowners can decide what species to plant, where to plant them, or even whether to plant any or not. Therefore, initiatives in the public domain should be designed in a way that incorporates the objectives of all affected and interested stakeholders. Based on Kooiman (2003)'s continuum of governance, open co-governance and self-governance are more appropriate for urban forest governance because tree planting and management happens at the public and private spaces, and different actors are involved in each case, but may overlap to some degree.

Municipalities have universally adopted the role of implementers of urban forestry, including in South Africa too. However, evidence points that municipalities, as key enablers of tree planting in low-cost housing areas, are battling and not fulfilling this mandate (Chapter 3, Chapter 4) because they have limited capacity and resources (Chapter 5). Furthermore, residents in the Eastern Cape identified municipal incompetence as a key barrier to tree planting, and further suggested the enlisting of community skills sets in addressing it. Therefore, an exploration of alternative methods, such as ones that bring together several stakeholders, including residents, may assist in carving a more practical path to achieving greener residential areas, even for the poorest areas of the country. This aligns with the country's constitution which advocates for participation of local residents and communities in the development of their residential areas (Chapter 1). Furthermore, the NEMA Act of 1998 elaborates that:

“...the environment is a functional area of concurrent national and provincial legislative competence, and all spheres of government and all organs of state must co-operate with, consult and support one another; and whereas it is desirable, that the law should establish procedures and institutions to facilitate and promote public participation in environmental governance”.

Therefore, based on the country's legislation, municipalities are mandated to work with communities in their development plans and implementation. Yet, it is an area that is currently under-developed in the country (Ruwanza and Shackleton, 2016). It is a rare case in South Africa that residents and communities take up tree planting initiatives without some form of intervention from an external agent outside of the traditional community structure. Chapter 4 brought this to light. This is particularly true for tree planting in a context where this was not previously popular or prioritized and the residents themselves do not have the resources to implement such initiatives. Moreover, they perceive it to be the responsibility of municipalities, which may decrease residents' desire to initiate tree planting programs for public spaces. For example, Moskell and Allred (2013) reported that 65 % of residents from Canarsie and Jamaica, New York City, believe that only a government entity should be responsible for street tree stewardship. Therefore, an understanding of a typical tree planting initiative implemented in a low-cost housing context where residents demonstrate an interest to be part of, and the factors that shape the prospects for tree planting, can assist in determining areas to focus on the most when initiating a tree planting initiative amidst the complexity of context where tree planting was previously not a priority.

In advocating for municipalities to work more with communities, I attempt to explore tangible ways in which the mandate as per the Municipal Systems Act, 32 of 2000, which requires municipalities to develop a culture of participation by the community and create mechanisms, processes and procedures accordingly (Tshoose, 2015), can be fulfilled in a meaningful way. To do this, an activity systems lens is useful as it allows for the mapping of stakeholders that are supposed to be championing tree planting and their roles, the resources they use and need, and where there might be shortfalls. This provides a method to gain insights into complex situations and to conceptualize how real world phenomena are entrenched within the situations that are being examined (Yamagata-Lynch, 2010). For context, the concept of activity in CHAT centers on human collectives rather than individuals, and involves people operating jointly in a persistent system of relations with other people and institutions as well as with the natural world (Foot, 2014). An activity system is the unit of analysis in activity theory, which is concerned with redirecting focus from what goes on inside an individual's mind, to what happens between human beings as they set out to fulfill an objective, and the instruments they use in pursuit of the objective to change their purposeful collective activities (Sannino and Engeström, 2018). Thus, activity systems consider knowledge, or knowing, to be achieved through participation in practice (Blackler, 1995), whose object is what people work towards collectively to meet an identified need (Chaiklin, 2011). In the context of urban forestry, the object of an activity system may be to

plant trees or to develop a park or fence of an open green space. Any of these would need an interaction of various people ('community'), and would require certain resources and procedures ('rules' and 'mediating tools and artefacts' of the activity system) which when done and acquired collectively will culminate in a developed urban forest or park (the 'object' of activity). Activity systems are not static, but develop over time in cultural history. I explain activity systems and their characteristics in detail in Chapter 2, and all the analysis conducted in this chapter is based on those characteristics.

6.2 Methods

6.2.1 Study area

This study was conducted in three small South African towns in the Eastern Cape province, namely, Grahamstown (Makana Local Municipality, Sarah Baartman District), Matatiele (Matatiele Local Municipality, Alfred Nzo District), and Tsolo (Mhlontlo Local Municipality, O.R. Tambo District) (Fig. 6.1). These towns were selected from those surveyed in Chapter 4 and Chapter 5, in consideration of interest expressed by both the residents and municipal officials.

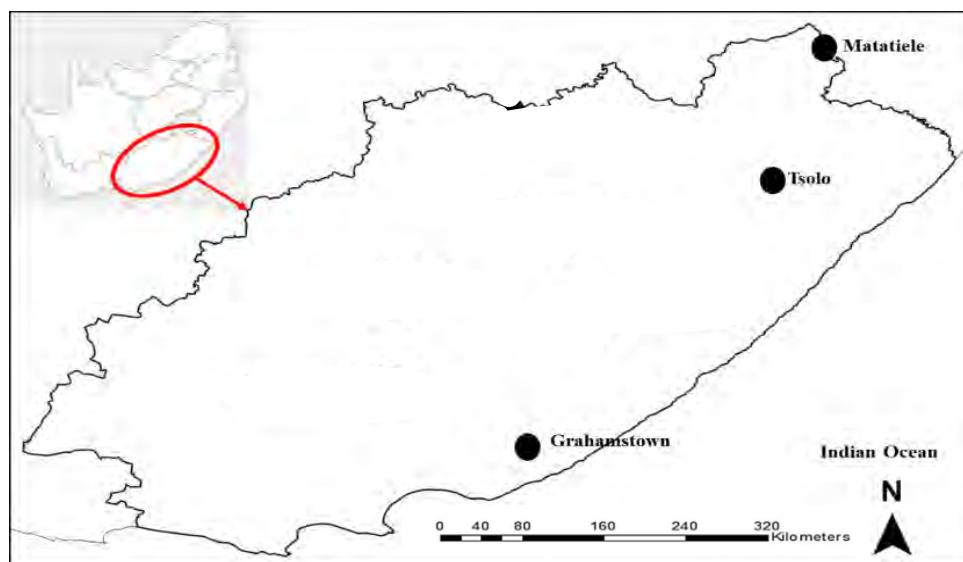


Figure 6.1: The location of study towns within the Eastern Cape province of South Africa.

Grahamstown is located at an altitude of 650 m.a.s.l, is in the thicket/fynbos biome (Mucina and Rutherford, 2006) and has a moderate climate with an average seasonal temperature ranging from 9.8 °C to 23.1 °C (Shackleton and Shackleton, 2016), while Matatiele, in the grassland biome, is located at an altitude of 1, 909 m.a.s.l and has a warm climate with an average seasonal temperature ranging from 9.0 °C to 22.5 °C (Oelofse et al., 2016). Tsolo, also in the grassland biome, is located at an altitude of 945 m.a.s.l and has a cool climate with an average seasonal temperature ranging from 3.2 °C to 26.5 °C (Sigwela et al., 2017). Grahamstown receives approximately 466 mm of rain p.a., Matatiele 609 mm p.a., and 629 mm p.a. in Tsolo (Mucina and Rutherford, 2006).

Grahamstown is situated in a Category B2 municipality, Matatiele in a Category B3 municipality, and Tsolo in a Category B4 municipality (Table 6.1). A Category B2 municipality refers to a local municipality with a large town as core, while a Category B3 municipality refers to a local municipality with small towns, with relatively small population and significant proportion of urban population but with no large town as core (Stats SA, 2015). Finally, a Category B4 municipality refers to a municipality that is mainly rural with communal tenure and with, at most, one or two small towns (Stats SA, 2015). Therefore, although these are all small towns in the Eastern Cape province, their socio-economic contexts are different. Specifically, in the Makana municipality, whose administrative seat is Grahamstown, approximately 65 % of households have an average annual income above ZAR 54, 000, while in the Matatiele municipality (Matatiele is the administrative seat) this accounts for approximately 50 % of households (ECSECC, 2017). On the other hand, approximately 52 % of households in the Mhlontlo local municipality have an average annual income of ZAR 54, 000 and above (Mhlontlo Local Municipality, 2019). This is considering that Mhlontlo local municipality has two main business centres compared to both Makana and Matatiele local municipalities. These figures are much lower than the average annual income of households in the Eastern Cape province in general (ZAR 90, 156), and those of South Africa as a whole (ZAR 138, 168) (Stats SA, 2015).

Table 6.1: Characteristics of municipalities where study towns are located.

Characteristics	Towns		
	Grahamstown	Matatiele	Tsolo
Local municipality	Makana	Matatiele	Mhlontlo
Location	33°18'36"S; 26°31'36"E	30°20'32"S; 28°48'22"E	31.31°S; 28.75°E
Size (km ²) ^a	65.1	11.2	46.7
Population size ^b	67 264	12 466	7 794
MAR (mm) ^c	466	609	629
Biome ^c	Thicket	Grassland	Grassland
Primary economic sectors ^b	Government, trade, finance and business services, manufacturing, agriculture, transport, communication, construction	Community services, trade, finance, agriculture	Wholesale and retail trade, agriculture, forestry, fishing
Dominant languages	isiXhosa, Afrikaans, English	isiXhosa, seSotho, English	isiXhosa, English, Afrikaans
Number of low-cost housing areas	3	3	2

^a From Gwedla and Shackleton (2017)

^b From StatsSA (2015)

^c From Mucina and Rutherford (2006)

In 2016 the level of unemployment in Makana local municipality was estimated at 34 % (Shackleton and Shackleton, 2016), and domestic employment is the largest job market in Grahamstown. The Matatiele local municipality reported that one of the major challenges faced by residents in ward 20 (where the study site is situated) is high unemployment and alcohol abuse (Matatiele IDP, 2018). In

2015, the unemployment rate for Mhlontlo was 38% (Mhlontlo Local Municipality IDP, 2017). According to Statistics South Africa (2015), the median household income of people living in government-subsidized low-cost houses in the Eastern Cape was ZAR 2 500 per month in 2014, and 80 % of the households living in low-cost formal housing are from quintiles 1 to 3 (quintile 1 is the poorest and quintile 5 is the richest).

6.2.2 Data collection

This part of the study uses an inductive approach through empirical observation that lets the data speak for itself. More than integrating into the study areas to build trust and to take an active part in the research process, I employed a naturalistic inquiry to “understand the social world in which I observe, describe, and interpret the experiences and actions of specific people and groups in societal and cultural context” (Lincoln and Guba, 1985). I chose to be upfront with my goal of wanting trees to be planted in low-cost housing areas because the gist of inquiry in my study dictated that I do. However, I did not impose my expectations because I needed the research to unfold on its own for me to understand the dynamics of community tree planting and to make credible conclusions.

This part of the study employed a case study approach to the qualitative inquiry. I was interested to understand *what* happens in low-cost housing areas that may impact the successful planting of trees in these areas, *how* it happens, and *why* it happens that way in various settings. To achieve this, a case study approach proved more sensible. A case study is a research approach that is used to generate an in-depth, multi-faceted understanding of a complex issue in its real-life context (Crowe et al., 2011). Case study designs can be categorized according to intrinsic, instrumental and collective case studies (Stake, 1995). An intrinsic case study is typically undertaken to learn about a unique phenomenon, where the researcher defines the uniqueness of the phenomenon (Oades et al., 2019). On the contrary, an instrumental case study uses a particular case to gain a broader appreciation of an issue or phenomenon (Stake, 2013), while a collective case study involves studying multiple cases simultaneously or sequentially in an attempt to generate a still broader appreciation of a particular issue (Stake, 2000). This study employed a collective case study as it sought to study multiple cases simultaneously to understand what characterizes typical tree planting initiatives in different areas.

Data collection took place in two stages, at the stage of interviews and at the stage of attempting to implement suggestions tabled during the interviews and discussions. Participatory research techniques, in the form of focus group discussions, following a pre-designed discussion prompt sheet (Appendix 8) and consisting of both males and females, were employed in the first stage of this inquiry. I was unable to ensure a gender balance in the focus group discussions as these were established solely on respondents’ willingness to participate. The number of participants in the focus groups varied at each meeting and each study site. There was an average of 19 participants in the Grahamstown group, 14 participants in the Matatiele group, and an average of 10 participants in the Tsolo group. All participants provided signed consent prior to participating (Appendix 7). I began

each session with a recap of what was discussed in the previous meeting. These recap sessions were mainly done by the participants who had been present, taking turns to narrate.

The focus groups were useful in stimulating ideas, which were aimed at assisting participants learn (Berg, 2007) about the urban forest and why it might be important to have it. Specifically, these focus groups were used to elicit a more qualitative understanding of the barriers to and enablers of tree planting highlighted in Chapter 5, as well as to craft a way forward in addressing the barriers and enhancing the enablers. Focus groups are particular types of group interviews where the moderator (researcher/evaluator) asks a set of targeted questions designed to elicit discussion and collective views about a specific topic (Ryan et al., 2014), with interactions occurring amongst participants, and between participants and the moderator. They offer participants an opportunity to share and address the themes of the research on their own terms without the limitations of a rigid survey structure (Robson, 2002). Additionally, the focus groups enabled the participants to interact with one another, confirming or contesting the validity of individual statements (Creswell, 2003). This was also useful in identifying some of the contradictions which surfaced as part of the analysis. All focus group discussions were conducted in isiXhosa as this is the dominant language in all three study areas, and were recorded with a tape-recorder. Each focus group discussion was between 1.0-1.25 h long, and held in a venue within walking distance to residents.

Tree planting awareness events, following the procedure outlined in Appendix 9 and Appendix 10, were also held in the three case studies on separate occasions. These were organized by the researcher with assistance from selected participants (selected by the group), as informed by the participants during focus group discussions. The events were held in available venues within the case study sites. They were recorded via a video camera and some pictures taken. A formal program was followed in two of the case studies, while the other event was snow-balled. Data from these events were used in the study contextually as they were.

For this stage of the research, I negotiated access for medium-term data collection with both the local municipal manager, and the ward councilors. Access and use of a central venue were also negotiated with the municipality and ward councilors. The size of the groups ranged between 8-15 participants on average, and these numbers varied between different meetings in each town. A register of the participants was kept for each meeting, and the days and times of meetings were negotiated with the participants in the first meeting once everybody had agreed on their availability. In this meeting, the nature of the project was explained again, including that of the focus group discussions, the responsibilities of the facilitator as well as the participants' roles. The discussions were facilitated by two individuals (the researcher and a research assistant). The discussions were facilitated using an interview guide generated by the researcher, but any other emerging conversations from the discussions were explored on the basis of their relation to the topic. Some of the topics explored in the interview schedule include the differences participants notice about the various suburbs in their towns,

and what roles they think members of the community can play in ensuring that trees are planted in their respective residential areas.

6.2.3 Data analysis

I transcribed and translated the audio recordings after playing them for up to three times. The translation of the transcripts to English occurred during transcription. I was able to do this because I am a mother-tongue IsiXhosa speaker and a proficient English speaker. Furthermore, I was present during all focus group discussions and events, and was therefore familiar with all contexts related to the unfolding of the research process. The transcripts were then studied, together with field notes, and thematic analysis, content analysis and coding used to identify, summarize and analyze emerging themes. In defining analytical themes and categories, deductive inference, where I drew on categories from existing theory from conceptual framings of CHAT and of activity systems, was used. Using deductive inference, I was able to identify the central activity systems in all case studies, which became the focus of analysis in all cases.

Inductive inference, where I drew on categories that emerge from reviewing of the data, was also used. Here, I was able to relate the characteristics of the activity systems generated deductively to the general context of the South African low-cost housing areas. Inductive inference was also instrumental in the analysis of emerging contradictions within and between tree planting activity systems (Chapter 7). The cues on the manifestation of contradictions also assisted in the identification of contradictions from the transcribed transcripts, together with notes detailing researcher's experiences during the research process. Coding involves organizing material into categories and labelling the categories before bringing meaning to the data in preparation for analysis (Creswell, 2003). Coding was first used to identify individual participants and assign codes for each of them as part of concealing their identities, and to identify data sources. For example, the M after a participant signaled that they are from Matatiele, while the T and G signaled Tsolo and Grahamstown, respectively. The numbers next to each letter were used to differentiate each participant from the other within the same activity system. Coding was then used to identify emerging themes from transcripts, which was preceded by content analysis. Content analysis of transcripts involves reading and re-reading the interviews to get a sense of the whole, i.e., to gain a general understanding of what your participants are talking about (Erlingsson and Brysiewicz, 2017). In coding, I used the elements of an activity system (Chapter 2) to allocate data and experiences from the various cases, and highlighted similarities in the data. This assisted me with the activity systems analysis which I used to map various actors, their roles and the tools they used in achieving the goal of tree planting. After watching the videos for the events up to three times, data from the videos and pictures were transcribed as needed, and notes taken for relevant information.

Activity systems analysis supports the systematic and systemic approach to understanding human activities and interactions in real-world complex problems (Yamagata-Lynch, 2010), and is therefore a

holistic approach in documenting, analyzing and communicating human activity by helping researchers and participants articulate their observations regarding complex human interactions (Yamagata-Lynch et al., 2013). Detailed characteristics of activity systems are provided in Chapter 2 Section 2.4.2. In describing the emerging activity systems in this study, I focus on the central activities only as they are the ones which were directly interacting and affected by other related activities (Yamagata-Lynch and Haudenschield, 2009).

6.3 Results: Description of interacting activity systems

The emerging themes in this part of the study were centred on: i) the differences in tree distribution between the various suburbs in the respective towns, ii) the responsibility for tree planting in private and public spaces, iii) the role of residents and communities in tree planting, iv) the design of tree planting initiatives from the perspectives of residents, and v) its implementation. Using these themes and the discussions around them, a number of central activity systems and their neighbouring activity systems became apparent.

6.3.1 Activity Systems in Matatiele Case Study

The second- and third-generation of CHAT activity systems were used analytically in this case study. Three interacting activity systems for tree planting emerged from the Matatiele case study, which were the GreenChamps-M, the local municipality, and the DAFF activity systems. The GreenChamps-M activity system was the central of the three, although all three were interested in the desired outcome of improved tree canopy cover in low-cost housing areas at various scales. While there may be other neighbouring activity systems associated with tree planting and those whose subjects may have been present at some point in the research process, I have deliberately reduced the activity systems to present those that were evident and influenced tree-planting activity throughout the research process. The intervention associated with the activity system in this case study was over a 13-month period. I first approached the participants for this part of the study in May 2017, and was not engaging with them in June and between December and February 2018. The last engagement with this activity system with regards to data collection took place in June 2018.

The GreenChamps-M activity system

The GreenChamps-M activity system in Matatiele was comprised of the researcher and 17 residents from one low-cost housing area who participated in the focus group discussions. These participants, referred to as GreenChamps-M were the subject of this activity system. Out of the 17 participants in the Matatiele focus groups, only three had not been approached during household surveys. However, they were aware of the purpose because they had attended the community meeting organized by the ward councillor to introduce the research. The participants met once a week on Thursdays, except when the day fell in the beginning of the month when most participants were not available because of social grants pay-outs. Figure 6.2 presents the central activity system in this case study.

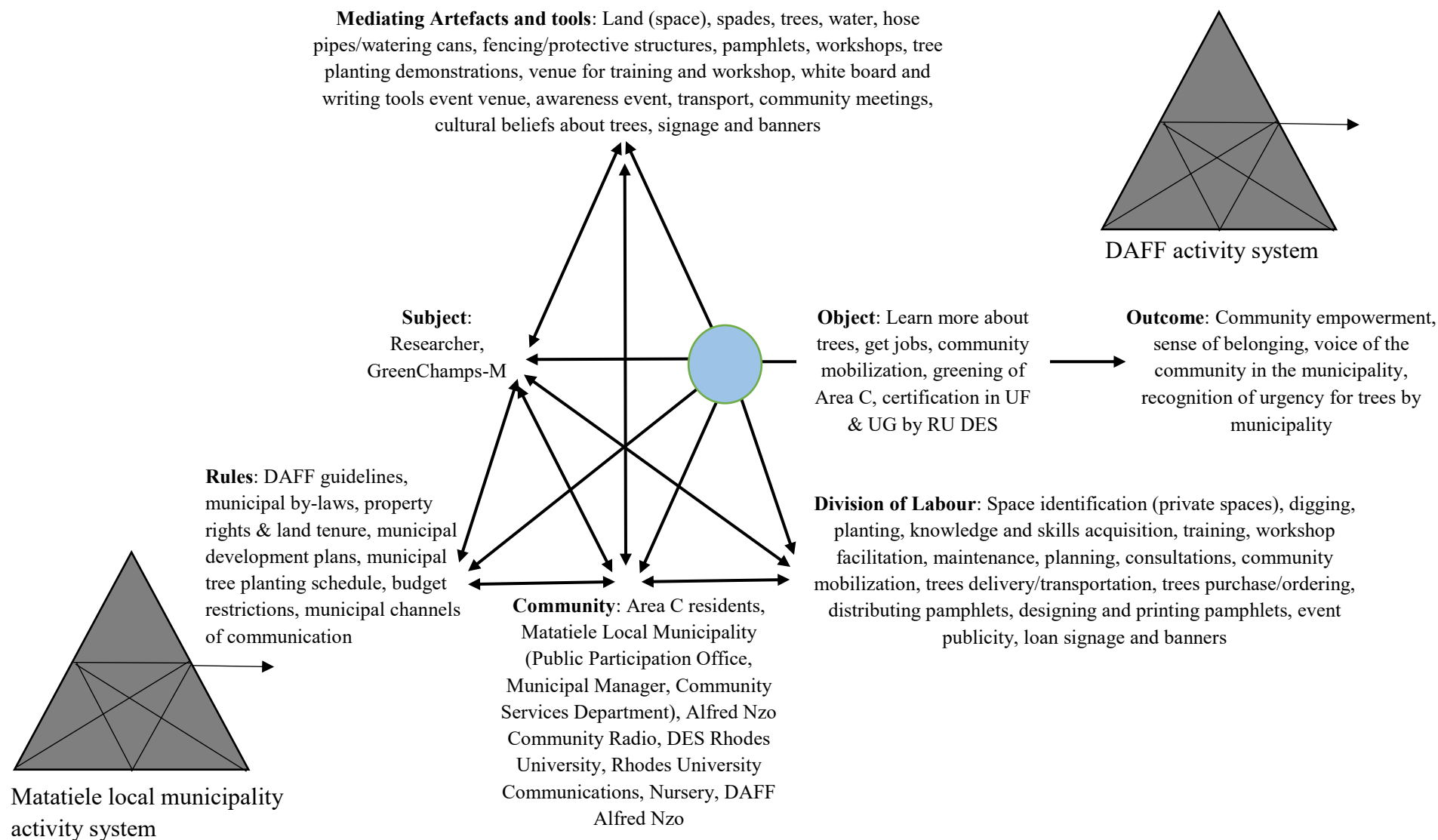


Figure 6.2: The GreenChamps-M activity system as a central activity system for tree planting in the Matatiele case study.

6.3.1.1 Subject

Participants in the focus group discussions, together with the researcher were the subject of this activity system and gave themselves the GreenChamps-M name (Fig. 6.2). Half of these participants were not in any form of employment at the time of data collection, and only two were in full-time employment, working shifts. The rest were employed part-time. Nine members were female. Three male participants had a higher education background as they were currently pursuing tertiary education studies. The age group of the participants was between 22-56 years and had all lived in Area C for at least 15 years. Two members of the focus groups, both of whom are female, were members of the ward committee, while another worked closely with the community development worker (CDW) of the ward.

6.3.1.2 Object

The immediate object of the activity system, which emerged during household surveys and focus group discussions, was learning more about trees, the planting of trees on the streets and the prospect of receiving trees to plant in private spaces, and to get jobs. On the other hand, the mobilization of the broader Area C residents to learn about trees and to plant them, and to receive certification in a course about tree planting which states that they had participated in a tree planting project, also emerged as objects during focus group discussions. Subsequently, the subject managed to work on the object of receiving trees for private space tree planting and mobilizing the broader Area C residents to learn about trees and planting. This was achieved through a tree planting awareness event planned and organized by the subject. The subject was also interested in receiving certification (Fig. 6.2) for having participated in a tree planting program because they believed that there should be formal confirmation that they participated and learned new things from a research project. They indicated that they had previously received certification in some of the projects they had been part of. Universities do not usually give certificates to program participants for research purposes. Certificates are only given if people take a short course that is accredited by the university. This research did not have a delivery of a short course as part of its output. I subsequently explained to them what the difference is between this research and some of the projects they had participated in (after they had explained the nature of these projects to me), what it would take to receive a certificate, and what the university currently offers in that regard. The university currently offers the Urban Forestry and Urban Greening for Sustainable Municipalities (UF&UG) short course by the Department of Environmental Science. The UF&UG short course, aimed primarily at university students and professionals working in city planning, is a SETA accredited course pegged at NQF 6 and 7 in the national qualifications framework (DES, 2013). Participants in the course are challenged to consider public versus private landscapes and asked to draw up an urban greening plan of their own, and all attendees receive a certificate of completion, and those who successfully complete their course assignment are given a certificate of competence (ELRC, 2011).

6.3.1.3 Mediating artefacts and tools

Material/Physical artefacts and tools

To achieve the object of this activity system, physical tools and mediating artefacts were required, including land (space) for planting in the private space and adequate infrastructure to protect the trees, planting equipment (such as spades), the trees to plant, water and watering tools (Fig. 6.2). The trees in this activity system came in two stages. In the first instance, 20 trees were distributed to the subjects of the activity system. The participants had indicated that they would prefer the *Prunus persica* and *Olea africana* trees as these were the most common and could withstand the area's climate. Ultimately, I managed to purchase 20 *Olea africana* trees from a nursery in Kokstad, which I transported using a hired vehicle. These trees were purchased using research funds. In the second instance, trees were distributed to Area C residents during a tree planting awareness event that was organized as part of the Green-ChampsM activity system object. A total of 200 trees were distributed, comprising of *Celtis africana*, *Olea africana*, and *Prunus persica* species. Of these, 100 were donated by the Matatiele local municipality from those they had received from the DAFF the previous year, and the other 100 were purchased by the researcher using research funds. The trees from the local municipality were not in good health and their leaves were wilted. Their sizes ranged between 2 m-5 m. They had been kept behind a municipality building for approximately 9 months prior to the event. However, it should be appreciated that the event was held in winter so some may have lost their leaves because of seasonal changes. Those trees were delivered to the event by a municipal truck and off-loaded by municipal employees. The other purchased 100 trees were in good health, although some had lost their leaves. They were 5 m tall and had been ordered in Durban through the nursery in Kokstad. The nursery facilitated their delivery.

Residents in Area C have running water installed in their homes and some have rain tanks. Residents were generally unhappy with the municipal water supply and compared it to the water from affluent areas. One of the participants even went home (she lives close to the venue of the meetings) and brought a kettle she uses to boil water. The consensus regarding the water was that the municipality cannot even provide them with sufficient and clean water, and it is therefore difficult for them to 'waste' the water by watering trees. Although this may not sufficiently account for their reluctance to use this water for watering their trees, for them it spoke to the municipality's neglect of their needs compared to people living in affluent areas, and how they could not expect the municipality to help with tree planting when they can barely provide them with clean water. There was no mention of the implications of the current drought in their perceptions of limited water.

Before the required tools could be mobilized, the subjects needed to meet at a central venue which was the community hall, and this was furnished with tables and chairs, and had electricity. During the research process, the participants were unhappy about a venue provided by the municipality to host one of the tree planting awareness events aimed at complementing the object of community

mobilization for tree planting. The participants perceived this as evidence of the municipality wanting to take over the initiative, take it away from the residents of Area C, and give it to their friends who are politically aligned to the municipality or family members (nepotism). I discuss this further as a contradiction to the activity system in Chapter 7. The facilitator (researcher) as part of the subject, also used a white board and markers (Fig. 6.3), computer and a projector as additional means of communication.

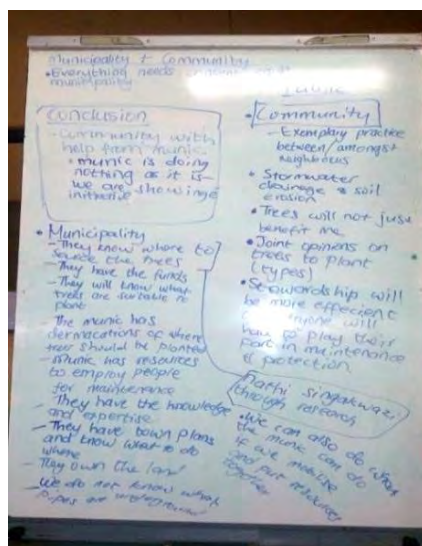


Figure 6.3: The whiteboard used to display key points related to trees during focus group discussions in Matatiele.

Conceptual/Mental artefacts and tools

The conceptual/mental artefacts and tools involved in this activity system were vast. Two meetings needed to be held to communicate the research and this was done in collaboration with the municipality. The first meeting was with portfolio heads and ward councillors in the Matatiele local municipality, and the other was a meeting with the broader community of residents. This was a meeting that had already been organized by the municipality as part of their own program, but it was moved to earlier to accommodate the researcher. The researcher produced pamphlets (Appendix 11) that communicated information about trees and tree planting, and these were distributed to participants and residents. A representative from DAFF also brought some educational materials which were distributed to participants and residents. Before participants could start planting trees, there was a demonstration facilitated by the DAFF official as well as a workshop on suitable species to be planted in Matatiele, where to get them and how to plant them. This was repeated during the awareness event, which was organized to conscientize the broader community about urban tree planting and encourage them to plant in their private spaces. The radio interviews and the banners provided by Rhodes University also served as mediating tools to help reach as many people as possible regarding awareness about tree planting. Both of these contributed to the arrival of many of the people for the awareness event, who had not been part of the focus groups. Some of the conceptual tools used by the subjects include tree planting demonstrations, pictures, and videos during discussions.

Prior knowledge about trees and familiarity with the practice also mediated the object. According to one of the participants, they grew up in the rural areas where tree planting was a norm and their home had been surrounded by trees. In response to an aspect of the object pertaining to learning more about trees, this participant said:

“My kind of learning will be different because I grew up seeing my mother plant. So, I take that knowledge and learning I gathered and use it to plant the trees that I have. That is how I have managed to be able to plant and maintain the trees in my garden. I grew up seeing it happen” (Participant 6M).

Cultural beliefs about certain trees also mediated the object by ensuring that only the species people want are provided. In the excerpt below, the participants in the focus group relay their reservations about certain species based on their cultural beliefs, and tracing the historicity of their reservations to species they had received previously from the municipality and how the experience they have of those trees now puts them in a better position to know that not all species are good:

“Participant 5M: *I thought those trees they gave us were not good. This is because the municipality harvests any trees for us, even those that are not supposed to be planted in among homes. I was told mine is a poverty bearing tree.*

Researcher: *That is interesting. So, did the trees really bring you poverty?*

Participant 1M: *The one I got was also apparently a poverty tree. I cannot really say yes or no because I do not know how my life could have been. But, a big part of me wants to believe that maybe it did.*

Participant 3M: *The municipality selected those trees using whatever criteria they used. We had no choice but to take them if we wanted trees. You were just told to take a tree and move on. It is possible that they just took any trees from the forest. Forest trees are not supposed to be among people, hence the poverty reported.*

Furthermore, participants demonstrated their prior knowledge about certain invasive species and their displeasure in having them. This is expressed in the excerpt below:

Background voices: Imagine just coming to someone’s home and planting any tree you like.... or even a black wattle [laughter].

Researcher: *What is wrong with black wattle?*

Participant 6M: *It uses a lot of water and it might destroy the house.*

Participant 7M: *There is nothing planted in this town, except for black wattle all over*

Researcher: *Was the black wattle planted or did it grow on its own?*

Participant 6M: *Black wattle is disrespectful; I ‘m sure it just decided to grow on its own.*

Participant 1M: *It comes from the farms now its growing uncontrollably. It came with the white man from the farms.*

The IDP process and document also mediated the object of tree planting in the GreenChamps-M activity system. This is because although the subject’s motive is to have trees planted, it is unlikely to happen unless it is stipulated as a priority in the IDP of the municipality. This is founded on the basis that the municipality cannot implement a development project unless it is a KPA in the IDP. However, the IDP of the Matatiele local municipality does not mention the municipality’s mandate to plant trees. Instead, maintenance of trees is mentioned. For example, page 121 of the document

highlights that one of the annual targets for the 2017/2018 financial year was to “cut grass and prune trees in Ward 1, 19, 20 and 26 by 30 June 2018”.

As previously mentioned in Chapter 3, the national Arbor Month launch celebrations for 2017 were held in the municipality. This became an opportunity for the Matatiele community to be exposed to tree planting as an important practice. The event mediated the object of tree planting and legitimized the idea of tree planting, which had only been communicated formally for the first time to them by the researcher four months earlier. Expressing this impact, one of the participants shared that:

“Thank you for telling us about the event. I am sure it will be a good experience. We will even get some ideas from there on how to go about doing our own thing here in the township” (Participant 6M).

In the weeks leading up to the launch, the participants had indicated their wish to be an integral part of those celebrations, but no channels had been put in place to allow for community involvement. During a conversation between the facilitator and one of the municipal officials, the official suggested that the municipality was apparently not at the forefront of organizing the event, and therefore could not facilitate for the research participants to participate or be stakeholders in the planning of the event in any capacity.

6.3.1.4 Community

The community in this activity system was broad, and included residents from Area C which is the residential suburb, the Matatiele local municipality, the DAFF (Alfred Nzo district), the Alfred Nzo Community Radio which served as a marketing tool for the research to reach the broader community of Matatiele and specifically the residents of Area C, the Department of Environmental Science (DES) at Rhodes University where the researcher comes from, the Rhodes University Communications Division, and the Kokstad Nursery.

Officials from the Environmental and Solid Waste Management (ESWM) division of the Community Services department and the Public Participation department represented the municipality. The Community Services department in the municipality is responsible for public safety, environmental and solid waste management, and public amenities including cemeteries, parks and open spaces, sports fields, and streets, while the Public Participation department is responsible for public participation and the effective handling of community queries and petitions, and the ward councillor with her committee are the main liaison personnel between the municipality and the community. The ESWM has a workforce of less than 10 permanent employees, and they work mostly with the EPWP. This program is a national government initiative, which contributes to Government Policy Priorities in terms of decent work and sustainable livelihoods, education, health, rural development, food security and land reform, and the fight against crime and corruption (DPWI, 2018). One of its objectives is to create work opportunities for poor and unemployed people in South Africa so as to contribute

significantly to halving unemployment, through the delivery of public and community services (DPWI, 2018).

As discussed in Chapter 3, the DAFF is the custodian of forestry in the country. The department's goal in relation to urban forestry is "to support the development and implementation of urban greening initiatives with local government and other stakeholders, in order to improve environmental conditions and the quality of life in urban areas, with a focus on urban forestry" (DWAF, 2003). One of their specific roles in achieving this goal is to "develop a limited number of urban greening models to demonstrate effective community participation and the potential of trees to contribute to urban livelihood" (DWAF, 2003). As such, the department's key strategies for tree planting, specifically in low-cost housing, township and informal settlement areas, speaks to food security through the provision of fruit trees, and biodiversity conservation and other aesthetic benefits through the provision of indigenous trees.

All these community members had been involved in the research process at some point, some directly while others indirectly. For example, the Rhodes University Communications Division did not have much to contribute to the research but were promoting the visibility of the university in the communities where Rhodes students conduct research.

6.3.1.5 Division of labour

The subject was engaged in a series of discussions and participatory learning activities throughout the research process, and was responsible for formulating and planning the object of the activity system. They also acquired knowledge and skills related to urban trees and tree planting from attending demonstrations and engaging with the facilitator and presenters. They also identified spaces to plant in their yards, dug the holes, planted the trees, and maintained them. The members of GreenChamps-M also distributed pamphlets (Appendix 11) about trees and tree planting to the residents of Area C (Fig. 6.2), which were accompanied by invitations to the tree planting awareness event that was held at the Town Hall. During this distribution, they went door-to-door and briefly spoke about the importance of having trees planted in households. The researcher was also part of this team. The group also suggested that each member of the group bring at least one neighbour to the event. The majority of the participants did so. The subject of this activity system also elected three members to be the leaders and liaise with the municipality and other stakeholders that may be interested in tree planting, including businesses. These leaders represented the group in a monthly municipal meeting and introduced GreenChamps-M as 'a stakeholder interested in championing urban greening in the Area C residential areas'.

The other members of the community element were engaged in various activities that all mediated the object of tree planting in some way or the other. Area C residents as members of the community identified spaces for planting in their private spaces where they also dug holes, planted the trees and maintained them. They also came to acquire skills and knowledge about trees, their importance and

planting and maintenance, and were instrumental in the distribution of pamphlets and invitations to the broader community. The local municipality provided the physical mediating artefacts such as the venue for meetings, training, demonstrations and event, and also delegated the offices of Public Participation, Municipal Manager, and Community Services to be part of the research process, while the regional DAFF donated some trees to the subjects and transported them, offered tree planting demonstrations and information pamphlets about trees and tree planting to the subjects. The Alfred Nzo Community radio served as a marketing platform for the research and the event, where the researcher was engaged in various interviews regarding the research between two shows and a news bulletin on the radio station. The Rhodes University Communications Division supplied the signage and banners which were put up in some of the workshops with the community, and on the day of the tree planting awareness event. This was done as a form of advertisement to the rest of the community and passers-by to be aware that there is something going on, and hopefully attract them to be part of it. Finally, the DES at Rhodes University intervened by supporting the researcher. For example, the DES provided some mediating artefacts (conceptual and material) such as trees, transport, additional information pamphlets and invitations. These had to be bought, transported, designed, and printed. The researcher, using DES facilities, was also responsible for planning the study before entry into the physical research environment, conduct the necessary consultation with the municipality, ward councillors and residents, as well as facilitate the research process.

6.3.1.6 Rules

The activity in Matatiele was governed by a variety of laws, policies, norms and practices, all of which were associated with some members in the community element. Property rights and land tenure were some of the laws that dictated where residents could plant their trees, and these were underlain by municipal by-laws which dictated how residents should treat municipal land and property. This was especially critical considering that the government provided the houses that all the residents occupy. Other critical guidelines that needed to be adhered to were those provided by the DAFF pertaining to the procedure for tree planting. Residents needed to be aware of whether tree planting was provided for in the IDP to align their initiative to something that had already been established. Budgetary restrictions dictated how much could be done throughout the research process (Fig. 6.2). The municipal channels of communications were also instrumental. Following these channels put the research process in a better position to be recognized by the municipality. These channels included, among others, communication with the Speaker of the municipality, the ward councillor and ward committees, and waiting on them to engage with the relevant department and officials on my behalf as the researcher. Once that was done, I was given various platforms to approach the municipality and communicate the research as needed.

6.3.1.7 Outcome

The outcomes of the GreenChamps-M activity system were six-fold. At household survey scale, residents received trees through the project, which were donated by DES at Rhodes University, and the local

municipality through DAFF. Six months after receiving the trees, one of the participants invited the researcher to see their planted tree. According to her, she had planted and supported the tree using the lessons learned during demonstrations, which resulted in it growing. Fig. 6.4 shows the *Olea africana* tree planted in front of the house in the garden.



Figure 6.4: An *Olea africana* tree planted by one of the subjects of the activity system which they received while participating in the research.

At the focus group scale, members felt empowered to be able to plant their own trees after having each received a tree from DES (Fig. 6.5), and tell their neighbours to do the same because of seeing the examples from them, while some members experienced a sense of belonging by being part of the study and having something to look forward to. The conversation below shows this outcome:

Participant 6M: *Nhana sisi, you have really helped us by being here.*

Participant 8M: *Yhu Nhana, you have really helped us. We finally also got something to do instead of sitting under the sun day in and day out. The worst is that even this sun is making us sick (sighs).*

Researcher: *How do you mean sisi 6M?*

Participant 6M: *By being here I felt like I belong somewhere, I belong in something that is much greater than me [...] I felt like I have a purpose, and those trees in my house are testament of that (crying). You saw us as important people when everybody saw people that are just dependent on the State, and you brought a project that no one has thought about.*



Figure 6.5: Some members of the subject of the GreenChamps-M activity system receiving trees from DES Rhodes University to for private space planting.

The voice of the community in the municipality was also an outcome in this activity system. This refers to the recognition of community needs as a priority in the agenda of service delivery in the community. This was deduced from a report from one of the participants in the focus group, who indicated that they had been part of a meeting in the municipality, where they tabled the existence of the group of community members interested in planting trees in their residential area. That resulted in the allocation of a Community Development Worker (CDW) by the municipality to work with the group, and liaise with the ward councillor on activities and plans of the group. In her address to the attendees of the tree planting awareness day she said:

“As I am sitting here, and hearing the name of this group of enthusiastic community members, I realised that they are actually a stakeholder now, a very strong stakeholder from Ward 20. I immediately imagined them in the war-room. I decided that we will sit in the war-room with this stakeholder, because at the end of the day Nhana is leaving. We will not know their challenges and needs as they develop this project going forward, because what we want is the sustainability of this project. This project is now known by the municipality, and we will work together going forward”.

6.3.2 Activity Systems in the Tsolo Case Study

Based on the second-generation and third-generation of CHAT, four interacting activity systems emerged from the Tsolo case study, and these were the New-Chris, the local municipality, the district municipality, and the school activity systems. Households who participated in focus group discussions constitute the New-Chris activity system, and the school activity system was represented by the Tsolo Residency Junior Secondary School (subsequently referred to as Tsolo Residency J.S.S). The local municipality activity system refers to the Mhlontlo local municipality, while the district municipality activity system refers to the Executive Mayor’s office of the O.R. Tambo District Municipality (subsequently referred to as ORTDM). The New-Chris activity system was the central activity system, and details of his will be presented. The shared object between the community and school activity systems was the planting of trees in the respective private spaces (households and school yard). The intervention associated with the activity system in this case study was over a 10-month period. I first approached the participants for this part of the study in July 2017, and was not engaging with them between December and February 2018.

The New-Chris activity system

The New-Chris activity system in Tsolo represented a group of residents from Chris Hani (new development) and New Homes (old development) low-cost housing areas. The residents who are subjects of this activity system had all previously participated in household surveys, and continued to participate in focus group discussions where they formulated the object of their activity system. The researcher was also part of the subject of the activity system. This group met once a week on Saturdays. Meetings were only postponed when there was a function in any of the residential areas or a funeral. Figure 6.6 illustrates this activity system, followed by details of each element in the activity system.

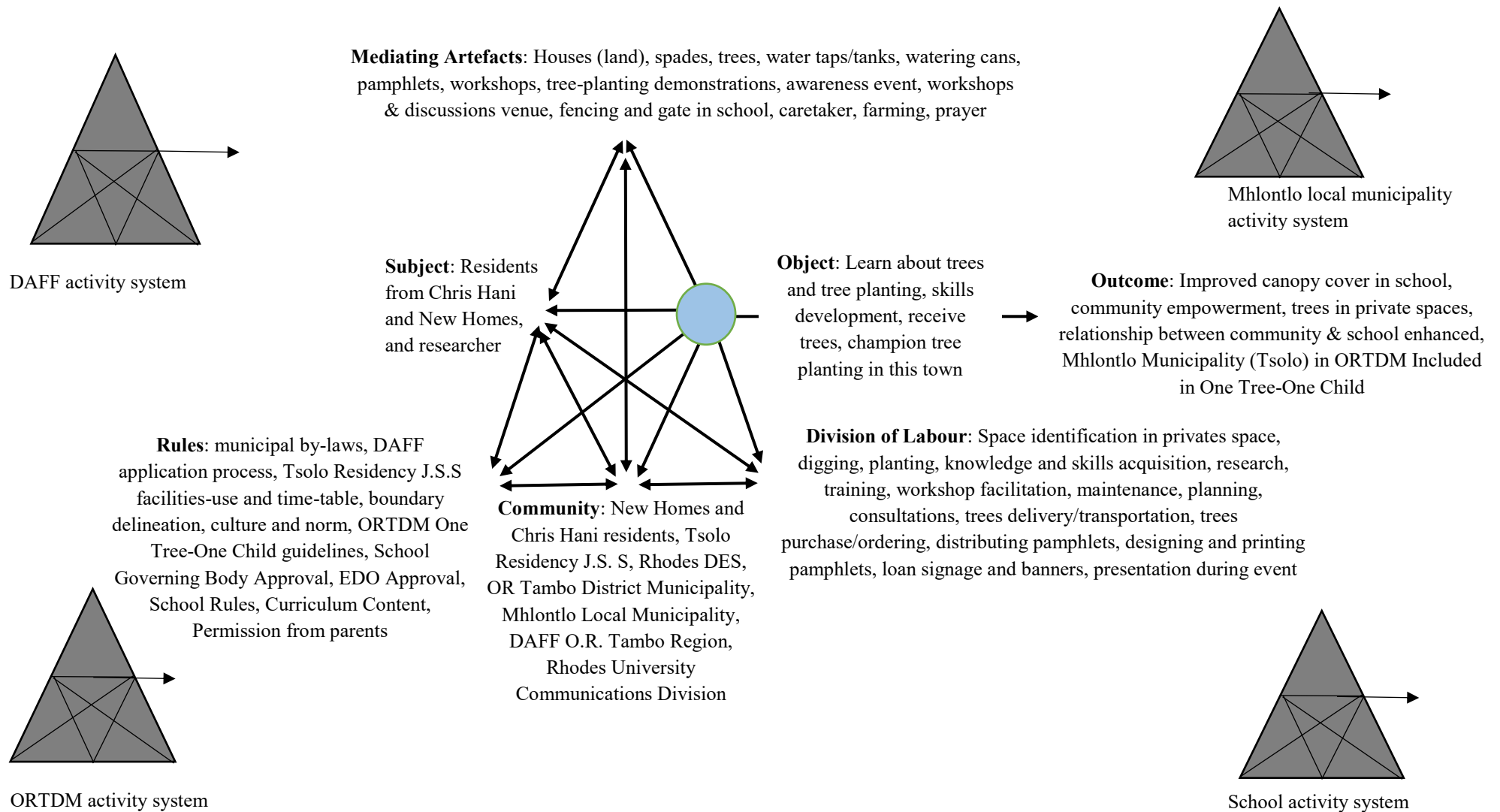


Figure 6.6: The New-Chris activity system as the central activity system for tree planting in the Tsolo case study.

6.3.2.1 Subject

The subject of this activity system comprised of 13 people, 11 of whom are female. Six of the participants are from New Homes and had all stayed there for at least 18 years. The seven who live in Chris Hani had been staying there for less than two years. Before moving into the recently developed area, they lived in an informal settlement called Azania, which is where the new low-cost housing area was developed. Nine of these members were unemployed during the research process, while two were self-employed. The age group of the participants was between 20-66 years. The highest education attainment (excluding the researcher) in the group was Grade 12. One female member of the group was a ward committee member.

6.3.2.2 Object

The object of this activity system was to learn more about trees and tree planting. Further to this, the participants communicated that to develop skills, to champion tree planting in the town as a whole, and in the low-cost housing areas, to have trees planted in private spaces, and to establish a park in one of the open spaces in the residential area that is currently used as a dumping site were included in the object.

6.3.2.3 Mediating artefacts

Material/Physical artefacts and tools

The material/physical artefacts and tools involved in this activity system include land and trees to plant (Fig. 6.7), tools such as spades to dig, and the water needed to water the trees. The trees were purchased in East London and were donated by the ORTDM. They also transported them to the school. The tree species included *Calodendrum capense*, *Celtis africana* and *Harpephyllum caffrum*.



Figure 6.7: One of the participants with the tree they had received as a donation from DAFF. This participant reported having a hole ready to plant.

Water is not readily available for Chris Hani residents and they sometimes go for days without water. During such times, they have to carry water from the nearby river. When water is available, Chris Hani residents get their water from one communal tap, compared to New Homes which has approximately six

communal taps. Some residents in New Homes have installed their own taps by connecting to the communal ones, while others have rainwater tanks. The tanks that have been installed in Chris Hani do not yet collect water as the gutters had not been installed.

The central meeting place for the participants during all meetings was a classroom at Tsolo Residency J.S.S, and this venue was offered by the school on condition that the school would also benefit from the project. The classroom had electricity, chairs, and a blackboard which was used to draw and write any ideas as needed. The DAFF and ORTDM were interacting activity systems that provided trees. These trees were sourced and transported by the two entities independently.

Conceptual/Mental artefacts and tools

The conceptual/mental artefacts and tools in this activity system include a community meeting that was held once in the town hall. This meeting was a quarterly meeting hosted by the municipality, and was organized only for the ward that incorporates the study suburbs and two affluent areas. The researcher was invited to this meeting by the ward councillor to inform residents about the study. The demonstrations held by Mr Forester (see Section 6.3.2.5) and the official from the District Municipality both mediated how the subject fulfills the object of planting in their private spaces. During the demonstration by Mr Forester, one of the participants commented that they had not been aware that there is a procedure to how the tree is planted, rather than just digging a hole, and planting the tree hoping that it will grow if it is watered. This was also the first exposure the researcher had had to the correct procedure to plant a tree. Furthermore, Mr Forester spoke about suitable species to be planted in Tsolo and exemplified with some in his garden. This subsequently informed the participants' choices on what species they would like to get.

The object of tree planting was also mediated by the cultural practice of farming in the Tsolo activity system. Subsistence farming is a common livelihood strategy in this town, as generally explained in Chapter 5, and to a large extent dictated the decision of where trees could be planted in the two low-cost housing areas. This was expressed by participants during focus group discussions, and also became practical when trees were planted at the school. This meant that fencing and a gate were essential for both the households and the school. The school had these, as well as a caretaker who personally expressed his commitment to looking after the trees, especially during school holidays when there is no one at the school. The caretaker was also present during the event held at the school. In addition to the demonstration and workshop provided by Mr Forester, an official from ORTDM also gave a presentation to the learners and teachers about tree planting, and demonstrated the process of planting to them. Some of the learners showed their enthusiasm by planting two trees as part of the demonstration. This demonstration was accompanied by pamphlets (Appendix 11) which were prepared by the researcher. The learners were told to take the pamphlets home to their families.

In meeting to plan for the object, the participants began each meeting with a prayer and singing. According to one of the participants, this is how meetings are normally done and it helps ensure that there is harmony in the room. All participants were of the Christian faith therefore no religious rights were contravened in the process. Fig. 6.5 illustrates these components in the central activity system.

6.3.2.4 Community

The community in this activity system comprised of residents from Chris Hani and New Homes low-cost housing areas, the ORTDM, the Mhlontlo Local Municipality, Tsolo Residency J.S.S, and the DAFF O.R. Tambo Region. The ORTDM was represented by the Office of the Executive Mayor, which is host to the One-Tree-One-Child program in the municipality. The program, aimed at making valuable contributions to the improvement of global climate challenges for improved food and livelihood security for future generations in the district by engaging children and communities in tree planting activities, was initiated by the office of the Executive Mayor of the ORTDM. The program believes that sustainable community development and improved household food security does not depend on individuals, instead its rest upon collective efforts. Therefore, the project is jointly supported by several stakeholders both from the public and the private sector, including the DAFF, DoE, COGTA, SAPPI, ECRDA, ward councillors, schools, and the five local municipalities that are within the geographic borders of the ORTDM, namely: Ingquza Hill, King Sabatha Dalindyebo, Mhlontlo, Nyandeni and Port St Johns Local Municipalities. Schools and learners have been the primary drivers and beneficiaries from the program through indigenous tree planting for greening purposes and the distribution of fruit trees to plant at home for food and nutrition security. The program carries the notion that planting trees with children has long lasting effects, including economic, environmental and social benefits, and it further promotes a strong relationship between a child and the natural environment.

Tsolo Residency J.S.S is a public combined school located between the New Homes and Chris Hani low-cost housing areas, but serves the entire community of Tsolo, including rural areas. The school is fenced with a gate and has three *Eucalyptus sp.* trees on one side of the yard. There is a caretaker responsible for maintaining the schoolyard, opening and locking the school gate and classrooms.

The Mhlontlo Local Municipality was represented by the ward councillor and the Community Services department. Entry into the ward was negotiated with the ward councillor and his committee. The Rhodes DES and Communications Division were also part of the community in this activity system. Finally, the DAFF OR Tambo Region was represented by an official delegated by the national office to advance urban forestry in the five municipalities in the ORTDM.

6.3.2.5 Division of labour

The subject of this activity system was engaged in a series of discussions and participatory learning activities throughout the research process. They acquired knowledge and skills related to urban trees and tree planting from attending demonstrations and engaging with facilitators and presenters. They also

identified spaces to plant in their yards, dug the holes, planted the trees, and maintained them. Some members of the subject (residents) gave a talk to the learners during the tree planting event held at Tsolo Residency J.S.S. The residents from New Homes and Chris Hani low-cost housing areas attended a meeting that was organized by the ward councillor to introduce them to the research. Only four other residents who had not been part of the focus groups attended the tree planting awareness event that was hosted at the school. These residents received trees and planted them in holes they had prepared. The participants in focus groups also received trees which they subsequently planted in their private spaces. These participants were also part of organizing the event and contributing with some of their ideas. Three of the participants addressed the audience during the event regarding what they had learned, the importance of trees and planting. Another resident (Mr Forester) who lived close to the school and is a retired forester offered his services to conduct a workshop and demonstration about tree planting to the focus group participants. Mr Forester conducted the demonstration in his garden, as seen in Fig. 6.8.



Figure 6.8: Mr Forester demonstrating the suitable trees to be planted in Tsolo using a *Podocarpus sp.* tree in his garden.

Mr Forester was recommended by one of the participants during a focus group discussion as he is a well-known retired forester. At the time of data collection, Mr Forester was a member of the traditional leaders' council in the ward which covers all residential areas around the urban center. Mr Forester was approached by the researcher and invited to demonstrate the planting of trees in the urban context to the members of New-Chris group. He offered to conduct the demonstration in his property during one of our sessions, both as a demonstration and a workshop. Ultimately, Mr Forester committed to giving two sessions to the participants, a demonstration and workshop session, and a follow-up to demonstrate the progress of the planted trees. The participants walked to Mr Forester's home on both occasions. During the first session, he offered three seedlings of fruit trees, which he had harvested from his garden. He also provided an information sheet about indigenous trees that grow easily in Tsolo. The information sheet was circulated to the rest of the participants.

The school provided the venue where all meetings between the researcher and participants took place, and the venue for the tree planting awareness day. The school also dug holes where the trees were planted by the caretaker and some of the members of the New-Chris group. The school also provided a classroom where the trees were kept overnight. During the tree planting event held at the school, the ORTDM donated trees to be planted at the school both as part of the debut to the One-Tree-One-Child program implementation at the school, and as a stakeholder in the advancement of urban forestry in the low-cost housing area where the school is situated. The leader of the program also delivered talks about tree planting to the learners, teachers and community members present, and demonstrated the procedure for planting a tree. Fifteen trees were planted around the school on the day, and most of the learners had participated in the engagements about trees and the actual planting. Together with the ORTDM, DAFF OR Tambo region donated trees to be planted at the school and to be given to members of New-Chris group to plant in their yards. They also provided transport and delivered the trees to the school a day before the event.

6.3.2.6 Rules

A variety of laws, practises and norms governed the practice of the activity. The lack of delineation of the boundaries for private property made it difficult for the subjects from Chris Hani to know where they may be permitted to plant. People were not sure where their yards begin or end because the municipality had not yet indicated the boundaries for each household as the area had only been recently developed. Expressing this, the participants said:

Participant 4T: *Planting will not be that easy, even in our homes because there is no fence and we have not been given the go-ahead to do so.*

Researcher: (...) *I am curious though, there are some houses I saw in Chris Hani that were fenced. What is that about?*

Participant 3T: *I think people are estimating. What is happening there is that the municipality said people should do their own temporary demarcation. The people could have taken bigger or smaller slices, we do not know.*

Researcher: *What happens then if people have overestimated the sizes of their yards?*

Participant 3T: *I think they will have to adjust their yards because as you saw too they did not use proper fencing. What they have done can easily be altered.*

Participant 4T: *Those people were forward and did things before proper procedure was followed. That means then they will have to accept whatever happens to their structures.*

Participant 1T: *This temporary thing is a waste of time. People should just leave it as it is and not have some form of fencing, because even that fencing does not protect against anything really.*

The group also had to follow the rules and time-table of the school for any meeting and activities performed at the school. These rules and guidelines were communicated by the principal. As a result, meetings at the school predominantly took place on weekends. Before we could access the facilities or involve the school in any way, the School Governing Body (SGB) and the Education District Officer (EDO) first had to be informed and approve the request. The principal communicated this to the researcher verbally and permission was granted. In an effort to have the learners involved in tree planting in the long-term during school hours, educators were encouraged to speak more about tree planting in

class, and school rules related to activities within the school premises had to be considered. Parents' permission was also sought for the involvement of the children in the demonstration for tree planting and their continued participation in that regard.

In donating trees to the participants and for planting at school, DAFF had to make an application to the provincial office in Bhisho. In this regard, the DAFF official sent an email for all interested parties and entities in the Eastern Cape to make an application. I indicated my interest in this regard. The ORTDM also had guidelines in place that needed to be followed in their participation in the research. While their One-Tree-One-Child program is mainly focused in schools, they had to make some adjustments to accommodate the residents in the context of this research.

6.3.2.7 Outcome

Prior to the beginning of this research process, the school had three *Eucalyptus sp.* trees. Subsequently, ten indigenous trees (*Calodendrum capense*, *Celtis africana* and *Harpephyllum caffrum*), were planted along a fence in the school yard. The relationship between the school and the Chris Hani community was also enhanced. This was communicated by the principal in the vote of thanks, where he mentioned that the New Homes and Chris Hani communities had shown leadership and commitment to the school by being part of a project that would uplift the school. As such, he pledged his commitment to working more with the community in other projects too besides tree planting. Another aspect of empowerment that emerged from this activity system was the voluntary participation of residents in planting trees at the school. I observed this immediately after the crowd had dispersed during the event. A group of participants stood up, without instruction, took spades, trees and buckets of water and started planting in the holes that had remained. In noticing this, the representative from ORTDM said:

“Nhana, you see that there, that is what participation and empowerment are about. Those people are owning this, they are empowered. They feel a responsibility towards those trees. You should be happy because this is an achievement for your objectives”.

As per the participants object of receiving trees, one of the outcomes of this activity system was the donation of trees to all the participants. Each participant received two trees, a fruit and an indigenous tree, courtesy of DAFF and ORTDM. Furthermore, the ORTDM pledged to include Mhlontlo local municipality and urban Tsolo in particular, in their One-Tree-One-Child programs.

6.3.3 Activity Systems in the Grahamstown Case Study

Three activity systems emerged from the Grahamstown case study, which were the Extension 10 Greening Group, local municipality and the Assumption Development Centre (ADC) activity systems. The Extension 10 activity system was the central activity system and comprised of the residents who participated in focus groups as the subject of the activity system, while the local municipality and ADC activity systems interacted as auxiliary activity systems with the central one. The intervention associated with the activity system in this case study was over a 9-month period. I first approached the participants

for this part of the study in August 2017, and was not engaging with them between December and February 2018. The last engagement with this activity system with regards to data collection took place in May 2018.

Extension 10 Greening Group activity system

The Extension 10 Greening Group activity system (Fig. 6.9) represented residents from Extension 10 low-cost housing area who participated in focus group discussions for this research. All these residents had initially participated in prior household surveys (Chapter 4 and Chapter 5). This group met every week on Tuesdays, except in the first week of the month. This was because most of the participants were not available due to social grant payouts.

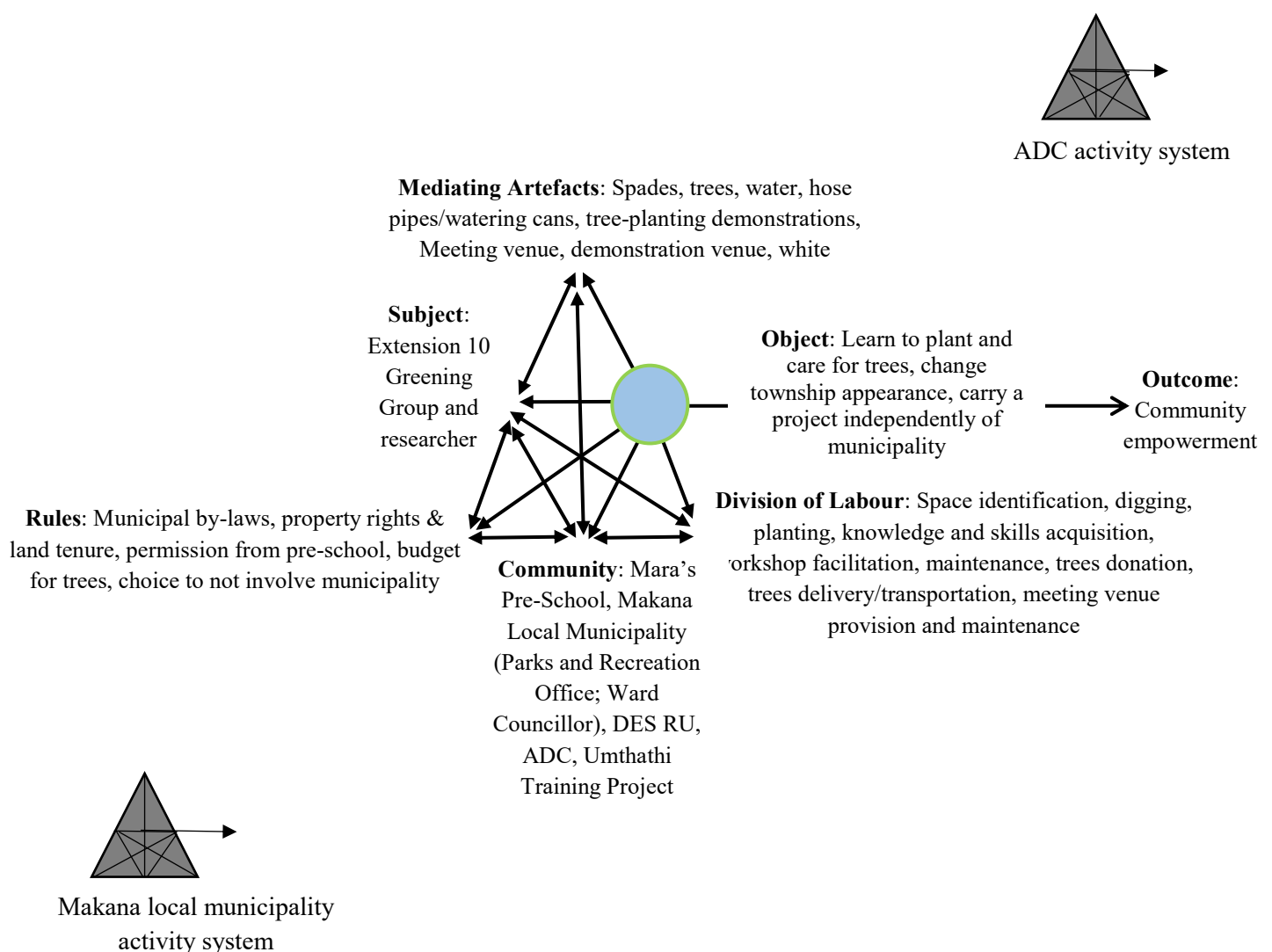


Figure 6.9: Activity systems in the Grahamstown case study, with the Extension 10 Greening Group as the central activity system.

6.3.3.1 Subject

The subject of this activity system was the Extension 10 Greening Group and the researcher. The Extension 10 Greening Group comprised of 19 members, 12 of whom are female. Their age groups range from 19-62 years. Nine of the members were unemployed, while three were employed on a full-time basis but on alternate days. One member was employed full-time and was an employee of the ADC but decided to join the group since she too was a resident of Extension 10. The other six members worked on the 'Working for Water' program which required their services on an *ad hoc* basis. The highest education qualification among the participants (excluding the researcher) was Grade 11. One of the members was married to a ward committee member, while two others reported having been ward committee members in the past.

6.3.3.2 Object

The immediate object of this activity system was learning to plant and care for trees and carrying out of a project (tree planting) without the municipality's intervention, and to change the appearance of their residential area. The latter aspect of the object was in response to the participants' frustration, mistrust and hostility towards the local municipality. The general consensus in this regard was that the municipality serves mostly areas of the town where white people live, as was the norm by the apartheid administration, as evidenced by the canopy cover in those areas compared to the low-cost housing areas and townships. The object of this activity system transformed over time as the participants realized that the local municipality mediates the activity of tree planting in some way. This was evidenced, for example, by the admission from two participants that the municipality usually provides trees when someone or a group of people approach them with a request.

6.3.3.3 Mediating artefacts

Material/Physical artefacts and tools

The physical tools used in this activity system include the land/space for planting, the equipment for digging and planting, the trees, and the water. The trees included *Olea africana* and the *Harpephyllum caffrum*, which had been propagated in the municipal nursery. The trees were distributed to each of the participants and each chose a species of their choice from those that were available, and five were planted at Mara's pre-school. One of the participants took two, indicating that one was for her neighbor who had pleaded for her to bring a tree. I transported these trees from the nursery to the participants. Similarly to the previous two case studies, water was a problem in Grahamstown and the participants felt that the lack of water would hinder the efforts to plant or impair on the survival of the trees. The recent drought across the country could have also contributed to the water problem, because dam levels had consistently been low which meant that water could be unavailable. However, the conversation around the scarcity of water among participants was more along the municipality's failure to provide water than on why they are unable to do so and the drought. The venue provided by the ADC was both a physical and conceptual

artefact because it is where the meetings were held but also served as a platform for participants to deliberate on how to achieve their object.

Conceptual/Mental artefacts and tools

The starting point in involving stakeholders in the intended object of tree planting was to call a meeting with the residents and the municipality. The first meeting which was held at the offices of the municipality was with the ward councillor, ward committee members, and a local environmental activist. In this meeting, I explained the research and its purpose, and sought permission to work with the residents and assistance in mobilizing them. Thereafter, the ward councillor invited me to a community meeting that was held in an open space in Extension 10. In this meeting, I made a presentation to the residents and invited them to participate in focus group discussion.

The participants' displeasure with the municipality, which was a result of historical events associated with perceived poor service delivery to the township and low-cost housing areas and how the municipality only focuses their service delivery to the affluent area, mediated the object of the activity. This is because the participants were set on 'showing the municipality how things are done' by pushing to not involve the entity in anything. In expressing this displeasure and in response to a suggestion by the researcher for them to participate in the greening and cleaning of the main street in town organized by residents from the affluent suburbs, the participants said:

Participant 4G: *Now you are trying to do more apartheid.*

Researcher: *How do you mean?*

Participant 4G: *I mean you want us to go and do something for white people when they always have things done for them handed on a silver platter. You are black and you must get rid of that mentality of doing things for white people. It is 2017 now and we are not their servants anymore.*

Participant 2G: *Did you not come here for us? Why now do you want us to go and do what we are supposed to do in this township in town?*

Researcher: *That is not what I mean. I just think it would not be such a bad idea to be involved in a community project and maybe we can learn a thing or two, which might help with what we want to do here in the low-cost housing area. But I completely understand where you are coming from.*

Participant 1G: *Those people already have all the resources they need, I am sure they even have the municipality helping them too. Here, we have no one, just you. So, can we please just focus on here.*

Participant 9G: *High Street is fine. It does not need any more trees. We planted aloes there some time ago and we were not even paid for that by the so-called municipality. They should do their thing without us, and we will do the same without them.*

Researcher: *I understand.*

Furthermore, the participants' impatience with the process of engagement and learning also had an impact on their object of learning to plant and care for trees because they were not interested in anything else but to get tree planted. I explain this further as a contradiction in the activity system in Section 6.3.2.4.

To accommodate the participants' impatience, I showed them a 10-minutes long video about residents independently choosing to plant trees in their yards and residential areas after witnessing one of the residents doing it for the past 10 years, and the importance of trees and tree planting (Fig. 6.10). While the original video was aimed at encouraging people from "tree scarce neighbourhood" to take the initiative to plant trees themselves, I also used it to communicate to the participants that tree planting is not a short process and is likely to be sustainable if taken up by groups of people. The video was produced and filmed in Los Angeles, and narrated in English. It showcased one man's enthusiasm to have a 'green' private space, which prompted the rest of the neighbours to do the same for their private spaces and other areas in the neighbourhood that needed trees the most. A non-profit environmental advocacy group, City Plants, also supported the residents' initiative by giving away trees to those who were interested in adopting a tree (City Plants, 2016). The video was streamed directly from the City Plants website (City Plants, 2016). This was a conceptual artefact meant to engage them further in tree planting since they had no interest in discussions. Indeed, they started opening up and engaging more about what they like and dislike about what they saw in the video. The video was referenced a few times in the sessions that followed to encourage discussion.



Figure 6.10: Participants from Grahamstown watching a video about tree planting and the importance of trees around the household.

6.3.3.4 Community

The community of this activity system was Mara's pre-school where participants planted trees, the residents of Extension 10, the Makana local municipality, the ADC, and the Umthathi Training project. The municipality was represented by the ward councilor and a representative from the Parks and Recreation department.

Mara's pre-school where trees were planted was selected by the participants in the focus group in an effort to demonstrate what they were involved in to the rest of the residents in the area. The pre-school has approximately 20 children between the ages of 3-5 who are cared for by three teachers. The principal

of the school, a qualified educator in Early Childhood Development, is also pursuing an advanced qualification with the Education Department at Rhodes University.

The Parks and Recreation department of the Makana Local Municipality is situated in the Public Safety and Community Services Directorate of the municipality. They are responsible for the management of parks and open spaces such as streets, management and maintenance of the aerodrome, sports and recreation facilities and amenities, cemeteries, and the commonage. The department has a permanent workforce of five people whose job description entails the management and maintenance of parks and open spaces, including tree planting, and these five people each have teams of general workers working with them. The department has a nursery and a horticulturist. However, the department does make use of expertise from other sections within the directorate when work beyond their current capacity arises, with the leadership of the five core members as they are the ones who are specialists for the job. Additionally, the department has a manager who is responsible for the general management of the department that is concerned with strategic functions and approves plans of the department in alignment with the municipality IDP. The ward councilor for Ward 3 was also representative of the municipality.

The ADC is a non-profit organization that offers “a vibrant space where entrepreneurship and business skill development are promoted in a community sensitive way, which was developed in response to the wishes and needs of the Joza community, seeking to transform the economy of the community and encourage young people to explore their business ideas” (ADC, 2018). The center works with institutions like Rhodes University, the Makana Municipality, the Grahamstown Business Forum and the National Arts Festival, in a bid to create opportunities and support for aspirant entrepreneurs and job seekers. With 350 members who benefit from workshops, courses and additional interventions in 2018, 16 businesses have started up and are currently operating in affiliation with the ADC since 2012 (ADC, 2018). Its aim is to “break the cycle of poverty in Joza through empowering individual members of the community to reach their potential, whether as an employee or a self-employed business person” (ADC, 2018).

The Umthathi Training Project came on board later in the research process, after a suggestion from some of participants as a prospective partner. The Umthathi Training Project is a non-profit organization “that promotes a better quality of life and sustainable healthy living through an integrated capacity-building program in organic food production, nutrition and health, income generation, cultivation and conservation of useful indigenous plants” (Umthathi, 2018). The project is funded by up to 18 partners, including Rhodes University (Umthathi, 2018). They are currently heading a community vegetable garden in Extension 10 where some members of the Extension 10 Greening Group are involved. Consequently, championing tree planting became an opportunity for them to extend their services to the community.

6.3.3.5 Division of labour

The subject dug holes both in their homes and some in Mara’s pre-school. The holes in Mara’s pre-school were dug by the male participants. They also planted the trees that had been donated by the Parks and Recreation department of the municipality.

Mara's pre-school was the recipient of the trees donated by the Parks and Recreation department of the Makana municipality. The pre-school also provided the digging tools, which are kept there to be used by the EPWP workers when they tend the pre-school garden. The EPWP workers assigned to the pre-school water and maintain the trees. The Parks and Recreation department of the municipality donated 25 trees, which were distributed between the participants and the pre-school. In addition, the municipality had delegated a group of its workers to demonstrate how to plant a tree to the participants. They brought their own equipment and two trees.

6.3.3.6 Rules

Permission from the principal was needed before planting took place and the children got involved in the activities. I received assurance from the principal that the parents had been notified of our visit and none of them objected. The use of the ADC venue for meetings and workshops also came with rules that we had to adhere to. For example, I needed to align the days of our meetings with the ADC schedule as it is generally a busy facility.

The availability of participants in this case study also governed the object of tree planting. During this research, I was informed that alcohol abuse was prevalent in Grahamstown, specifically in the low-cost housing areas. This meant that people were unlikely to meet on Mondays and sometimes even Tuesdays because they were suffering the ill-effects of excessive alcohol consumption over the weekend, and could not engage in any meaningful discussions. This also became an issue when suggestions among the group surfaced that some participants should be provided with alcohol for all their efforts of participating in the project. The participants' choice to not involve the municipality in any way also regulated how much they could do, as they quickly realized that some contributions from the municipality were needed.

6.3.3.7 Outcome

The outcome of this activity system was three-fold. First, the subject of the activity system, excluding the researcher, received trees to plant in private spaces. The second outcome of the activity system was the planting of trees in the local pre-school. The event itself led to more residents enquiring about what was going on and how they too can get trees for their private spaces. The school principal was not present during the event, but subsequently called to thank the group for the trees and promised to take care of them.

Finally, this activity system saw a potential partnership with the Mthathi Training Project which became part of the community later in the research process. Mthathi Training Project committed to helping the Extension 10 Greening Group revive the Arbor Month celebrations in Grahamstown, which participants feel could enable tree planting in their residential area. The extract below expresses these sentiments:

Researcher: *At least now there is the NGO that has shown interest in what we are doing. Maybe that could work in our favour.*

Participant 1G: *Umthathi deals with plants so I am sure they will even be able to give us some small trees that they cultivate in their nursery in Extension 7*

Participant 4G: *They can even help us revive the Arbor Day thing in Grahamstown. The municipality has failed dismally with that. We just need to stick to them and we will also have a beautiful suburb*

Participant 11G: *But they also cannot do much by themselves, unless the municipality also pulls up their socks. A lot depends on this dysfunctional municipality.*

6.4 Discussion

I began this study with the intent to understand how, in the face of existing barriers to tree planting, residents from low-cost housing areas can contribute in improving the *status quo* of a lack of trees in their residential areas. Therefore, this study embraced an activist and interventionist approach to tree planting. CHAT is by nature an activist and interventionist approach (Sannino, 2011). Envisioning new forms of engaging in, and encouraging the planting of trees in low-cost housing areas by multiple actors and stakeholders, including members of the community, requires a careful analysis of the network of activity systems associated with the practice. The purpose of this chapter was to detail a typical tree planting initiative that is implemented in a low-cost housing area through an activity systems lens across three case studies, where each case study focused on a singular initiative.

The activity systems generated in this study highlight three emergent characteristics of participatory urban tree planting activity systems in low-cost housing areas, which are closely aligned to the first three core principles of CHAT presented in Chapter 2, namely, activity systems as a unit of analysis in CHAT, the multi-voicedness of activity systems, and their historicity. Activity systems are dynamic and complex, and are susceptible to change (Kain and Wardle, 2002), characteristics that can be said of low-cost housing areas too. Coupled with the dynamics of the daily realities prevalent in South African low-cost housing areas (Chapter 1), these themes account for why tree planting in these areas can never be a simple case of digging holes and planting trees in either the private or public spaces, but requires certain levels of engagement with various stakeholders while also navigating a system where tree planting is barely a priority. These themes highlight the multi-voicedness, dynamism, agency, and historical legacy of low-cost housing areas in relation to urban tree-planting that has historically been perceived as a practice for the elite.

6.4.1.1 The object-oriented activity system

Human activity does not occur in isolation, but is influenced by the social relationships of the broader social systems in which human activity is embedded (Engeström, 1987). Within the context of this study, the social system of the South African low-cost housing context, that of individual municipalities, and that of individual residential areas, had considerable influence in the activity systems associated with tree planting in the different case studies. This can be seen in the respective elements of individual activity systems and how these mediated the fulfillment of each object, especially the community, rules, and mediating artefacts and tools. This emphasizes the uniqueness of each activity system and how, as put forward in Chapter 1, participatory urban forest governance models cannot simply be adapted from one

context to the other. While the researcher came into the activity systems with a defined agenda to encourage tree planting in low-cost housing areas, each object in each central activity system across case studies was collectively constructed and refined by participants. The subject in the Extension 10 Greening Group (Grahamstown) was further explicit in excluding the municipality in their object. The result of this “explicit exclusion”, where the message of tree planting in this activity systems was not widespread, emphasizes the importance of participation of multiple stakeholders in urban greening initiatives. Only the participants and a pre-school, of their choice, were able to benefit from the initiative.

The participation, or lack thereof, of municipalities in the case studies also influenced the fulfillment of the object and added to the complexity in the activity systems and the individual initiatives. The limited involvement of local municipalities in two case studies demonstrates their reliance on external agency to fulfill some of their mandates, specifically with regards to tree planting. Municipalities the world over do rely on the services and assistance of external agencies (Foo, 2018; Nesbitt et al., 2018). However, tree planting is their legislative mandate as it forms part of service delivery. In its urban greening strategy, the DAFF states that the mandate to implement urban greening initiatives lay with local municipalities (Chapter 3). In the same light, the constitution of the country and Municipal Systems Act (2000) both encourage consultation and public participation in development projects undertaken by the government and local municipalities, hence the IDP process (Everatt et al., 2010). The local municipality in Grahamstown contributed trees to the initiative, although no personnel from the municipality were present. This was not the case in Tsolo, where the municipality was not involved or present in any way. This non-participation may also speak to lacking capacity in many municipalities, as reported by Chishaleshale et al. (2015) and Gwedla and Shackleton (2015). As such, community participation was crucial in advancing the agenda for effective tree planting in low-cost housing areas in the Grahamstown and Tsolo cases. However, limited agency among residents of these areas, which was characterized by their reluctance to act and their reliance on other institutions, limited how much could be achieved. The involvement of the district municipality in the Tsolo case study improved the prospects for tree planting in the area, as their support increased the reach of the initiatives

Activity systems are also generally open systems which interact with other neighbouring activity systems, as depicted in the third-generation of activity systems (Engeström, 2001). The activity systems generated in the case studies in this study embody this, as seen in the various neighbouring activity systems that interacted with the central ones. For example, the municipality activity system in Matatiele interacted closely with the central activity system, while the Tsolo Residency JSS interacted closely with the central activity system in Tsolo. Similarly, the central activity system in Grahamstown interacted closely with the neighbouring ADC activity system.

6.4.1.2 Complexity and multi-voicedness

Taken together, the three case studies revealed how complex the social dynamics in low-cost housing areas are, and how different they are. At the broader scale, this complexity can be observed across the

geographical landscape of the country and how low-cost housing areas are situated against this geography. Complexity also plays out within the socio-political dynamics of various low-cost housing communities which shape the rules and mediating artefacts and tools of the various activity systems. In essence, this complexity is shaped by the numerous actors who are interested and engaged in tree planting, their different and changing expectations and those of the broader community, as well as power dynamics, all of which contribute to the multi-voicedness within the activity systems. Multi-voicedness in an activity system refers to the multiple viewpoints and perspectives that exist and which can operate to create a platform for varied engagement, and presents possibilities for both conflict and innovation into an activity system (Gretschel et al., 2015). The activity systems generated in this study were characteristic of multi-voicedness as participants sought better ways of engaging and brainstorming opportunities for sustained tree planting in their residential areas. The conflicts, such as those between residents (subjects) and municipalities (neighbouring activity systems) were the main sources of heterogeneity, although some were implied rather than experienced.

The multi-voicedness may account for why the initiatives reached a certain degree of implementation while others did not. Put together, the actors involved in tree planting in the various case studies include residents from low-cost housing areas, local and district municipalities, the DAFF, educational institutions, and an NGO. These actors all had different roles to play, including providing training in the form of demonstrations, hosting participants, providing trees, and planting the trees. Many tree planting initiatives are generally composed of multiple actors and role-players who all play varied roles. For example, Roman et al. (2015) reported on urban tree planting initiatives across the USA that involved a variety of stakeholders, including NGOs and volunteers. The success of these initiatives was also attributed to the contributions and involvement of a variety of actors other than just the NGOs. The most common actors in this study were the residents, although they also played varying roles in each case. While this may be commendable, it cannot be deemed a generic pattern regarding actors in urban greening initiatives because this study was set up to encourage residents' participation in particular from the beginning. However, the role they played cannot be overlooked, especially in the Matatiele case where the initiative was more accomplished than in other cases. True community engagement and participation in urban forestry and tree planting has been characterized as a "two-way process between experts/managers and the public", and should not be confused with the "one-way flow of information in public relations exercises" (Shepherd et al., 2017). The former was to an extent evident in Matatiele, with the involvement of the residents, the local municipality, and the DAFF. Furthermore, the tree planting initiative was more extensive and active in Matatiele than in other cases.

The actors and local contexts of the activity systems presented in this study are not static, and that is the very nature of activity systems (Olvitt, 2010). This was also representative of complexity and multi-voicedness because the constant changes in who was present and what their presence meant, who was willing to participate, and the local power relations at play that normally dictate what decisions were made and implemented impacted the activity systems in each case study. Actors in any participatory initiatives

change with time as different people become interested and others lose interest. The duration of initiatives also plays a major role in this. This was evidenced in all cases in this study, especially when it came to resident participants. Furthermore, different stakeholders and role players joined the research process at different times. For example, the ORTDM in the Tsolo case study was only involved for approximately two weeks and solely for the tree planting awareness event. In Grahamstown, the contribution of trees made by the municipality, for example, impacted the object of the Extension 10 Greening activity system as defined by the subject because it meant that the subjects could no longer make decisions about the tree species to be planted, but to accept those donated by the municipality as they had no other means of getting the trees they would like.

Ambiguous and shifting roles among actors and role-players are not unique to the activity systems and initiatives presented in this study. Foo (2018) found that a tree planting initiative in Boston, USA, was characterized by ambiguous and shifting leadership as a result of protracted disagreements about the rules through which partnerships would operate, which forced the partnerships in this initiative into dormancy and led to its eventual demise in 2013. Decision-making processes in any participatory environment are complex, especially when large amounts of actors and stakeholders are involved (Lawrence et al., 2011). This can also be exacerbated by constant changes in who is present, as decision-making contexts can be shaped by actors setting the agenda and/or controlling the socio-cultural environment (Lawrence and Dandy, 2012). Decision-making was constrained regarding where trees could be planted in all case studies because although the participants may have been aware that there should be by-laws dictating the practice of tree planting, those by-laws were not readily available for them to be able to make such decisions. As such, they were confined to decide on private space tree planting. The presence of ward committee members and those who had previously been part of local governance did not remedy the situation as none of them was able to speak regarding these by-laws. This could mean that ward committees are not living up to their full potential (Everatt et al., 2010).

The subjects in all case studies were residents from low-cost housing areas. However, they all had different expectations for themselves and for the initiatives, some of which were not easily attainable. While Engeström (1987) posits that the subject acts on a common object, this was not necessarily the case in this study as individual subjects and members of the community element started with other objects additional to that of tree planting. However, in the end, the object that was acted upon by all subjects as a collective was that of tree planting, across all cases in the central activity systems. This is related to actors having different expectations for participating in initiatives. This is a common phenomenon in initiatives and programs that have multiple stakeholders because each of them has their own reasons for participating and varied contributions to make in the initiative. Furthermore, it is acceptable that stakeholders and actors have varying expectations based on the contributions they make. Disagreements, varying viewpoints, or different expectations among the subjects of an activity system are normal and create opportunities for the subjects to define their own object as per their need. I present these disagreements or varying viewpoints as contradictions in Chapter 7. Regardless of the differing viewpoints, the creative

potential of any activity system is closely related to the subjects' capability to construct and redefine their object (Engeström, 1999), and in their commitment to transform the activity system.

6.4.1.3 Agency

Actors in participatory initiatives use means of action to influence their social and physical environment, action that Onyx and Bullen (2000) refer to as agency. Different people and communities react to stimuli for action with varying degrees of urgency and types of response (Ling and Dale, 2013). Marginal communities particularly differ significantly in their capacity for action; individual agency may be more fungible, and investment is needed in building long-term, stable relationships and networks, as communities achieve agency through a dynamic mix of bonding, bridging and linking ties (Newman and Dale, 2005). While agency may exist in various and unexpected forms, it is a long-term phenomenon that takes time to achieve, and there can be no agency without power (Dietz and Burns, 1992). According to Harvey (2002), agency refers to the capacity of persons to transform existing states of affairs. Similarly, Onyx and Bullen (2000) describe agency as the capacity of the individual to plan and initiate action. Individuals have key roles to play in bringing about transformations in activity systems, and their agency can contribute to a sustainable future (Westley et al., 2013), which in this case relates to sustainable human settlements (Chapter 1), and any kind of transformation requires a type of agency (Olsson et al., 2008). Agency is the key indicator of a group's ability to respond and identify cohesive solutions to sustainable development challenges (Newman and Dale, 2005), and it has an important role to play in shifting from top-down to more flexible, integrated, and localised approaches to the management and governance (Westley et al., 2013) of the urban forest. CHAT focuses on human agency and its transformation of the world, although agency may be enabled or constrained by the same societal and material structures that give rise to it (Roth et al., 2009).

Agency is a vital component of transformation, and speaks to the capacity of people in a social-ecological system to create a new system when the ecological, political, social, or economic conditions make the existing system untenable (Walker et al., 2004). Proactively-acting agency, or transformative agency, is required to initiate and steer changes in an activity system (Haapasaari et al., 2016). Most residents do not recognise their own agency, and this was apparent across all three case studies. While some of the objects communicated by subjects in the various activity systems suggested the will for action, the case studies indicated that the residents were not aware of their own agency to advance tree planting in their areas. For example, there was too much reliance on the researcher and the municipality to get things done, as opposed to residents trying things out on their own and approaching the relevant authorities to communicate their needs with regard to trees. Gwedla (2016) previously reported that 68 % of residents in selected towns in the Eastern Cape believe that the responsibility to plant and maintain trees in urban areas lay with the municipality. This could be one of the reasons why participants in the present study failed to recognize their own agency to successfully champion a tree planting initiative. Furthermore, the expectation that tree planting is somebody else's responsibility could have hindered from recognizing that it could be possible if they champion it. Agency is the force behind social action, and actors must be

aware they possess agency and believe they can make a difference through exercising it (Ling and Dale, 2013). Social action can therefore only occur if individuals and communities have the intent or will, time, skills and self-efficacy (Dale and Sparkes, 2010) that enable them to see problems, identify solutions and motivate themselves and others to pursue change (Ling and Dale, 2013).

Some level of agency was evident in Matatiele. This can be deduced from the various roles the participants volunteered to take during the planning of a tree planting awareness day event, and their commitment to telling their neighbours about tree planting. Ultimately, the event in this case study was a success in the sense that it took place, residents attended, its objectives were met, and the participants continued to engage in tree planting activities even after the departure of the 'change agent'. Residents in the GreenChamps-M activity system also elected a few individuals who would act as leaders of the group and liaise with other stakeholders on their behalf. This proved fruitful as some of these leaders were able to engage in municipal platforms. Tarver (2015) concluded that leadership is important for advancing a comprehensive city-wide urban forestry agenda and continuity, as leadership influences decision-making.

On the other hand, participants from Grahamstown appeared to be cognisant of their own agency to successfully implement tree planting in their residential area because of their insistence to carry out a project without the municipality's intervention. However, a close look into their option to exclude the municipality indicates their mistrust, frustration with, and contempt of the municipality. Williams (2006) argues that participation as a rational, open, and empowering democratic practice entered into by subordinate participants who are often unfamiliar with the forms and meanings of deliberative discourse and hidden transcripts is often undermined as participants do not trust government and its institutions. This is related to the legacy of poor service delivery by municipalities in small towns, and participants were inclined to be motivated by this.

Agency can also be associated with perceived power to make a difference. Poor communities, which are traditionally limited in economic and mainstream knowledge resources, are commonly less powerful, and in some instances, urban regeneration initiatives can try to address power relations directly and explicitly – for example through the notion of community empowerment (Lawrence and Dandy, 2012). However, the partnerships created by these initiatives can be tokenistic in this regard (MacLeavy, 2009). Local initiatives may be blocked by existing power structures, some of which are perhaps subconscious, but others are more obvious to those facing them (Lawrence and Dandy, 2012). It is to be appreciated that while there was at least one member of ward committees in each case study, their powers were not pronounced and their presence did not silence anyone. Instead, it raised hopes that their presence may legitimize the process and attract the municipalities' more than it would, had they not been present. However, this was not evident in any case study, which assisted in fulfilling the aim of getting residents at the forefront of tree planting.

6.4.1.4 Historicity

Activity systems are shaped by a history because an activity itself is in a historical context (Roth et al., 2012). The historicity of an activity system refers to the history that is present in the activity systems within the individual participants and within the mediated tools and rules existing in the activity system (Engeström, 2001). The historical aspect of CHAT highlights the inseparable influence of our histories on our actions and how this history shapes how we think and do things (Gretschel et al., 2015). According to Virkkunen and Kuuti (2000), human development activities take place in contexts of “historically developed collective practice”. Therefore, activity contexts can be understood in light of their past, and history influences and shapes the nature of an activity system. The activity systems generated in this study demonstrated the historicity of typical tree planting initiatives, both at the scale of the social context of low-cost housing areas, and at the scale of individual activity systems that are shaped by various and differing rules.

The legacy of apartheid in South Africa, and how that has encouraged or suppressed a culture of tree planting in poor communities can be the starting point to the history of understanding activity systems associated with tree planting in poor and low-cost housing areas because it presents a unique and relevant example of how historical legacies can be a basis for improving the current status quo and preparing for the future in relation to tree planting and the championing of environmental issues in general. The historical legacy of apartheid in this country needs to be understood and appreciated by any external role-player if they are to facilitate or catalyze real change on the ground. A characteristic of poor service delivery for townships, which to an extent can be linked to the legacy of apartheid and how this was the case at the time, was one of the conceptual mediating artefacts to the object of tree planting specifically in the in the Grahamstown case study. This was evidenced by their hostility towards being part of anything they perceive to be for the benefit of the affluent and white people. To an extent, this limited their experience of participating in a residents-led initiative, which would have been beneficial for them as they implement tree planting in their residential area. I pointed out in Chapter 1 that low-cost housing areas are characterized by a number of institutional and systematic socio-economic, socio-cultural, and socio-political dynamics that render them essentially different to other types of residential areas, and are mostly a consequential legacy of apartheid. Therefore, the everyday and real-life dynamics of low-cost housing areas may shape the systematic success or failure of initiatives aimed at their development and improvements, including urban greening initiatives. These dynamics may include, for example, i) limited social cohesion, ii) crime and iii) education levels, iv) unemployment and poverty rates, v) and the participation of residents in local governance.

The contested legacy of a domineering state, which makes people feel voiceless, dependent and passive recipients of what government offers was apparent in different forms across all three case studies. In the first two instances (Grahamstown and Tsolo), the local municipalities (local governance) took a step back and were barely present in the activity systems. This can be interpreted in two ways: this was either because they would be able to dictate how the initiatives unfold and would not invest resources into an

initiative they had no stake in, or because it was not their idea, they did not fathom the need for their presence—simply an interpretation of “it is not my project so I do not have to be involved”. In the third instance (Matatiele), the municipality exercised its dominance in the assistance and permissions they granted to the subjects of the central activity system. Thus, the municipality exercised power, which is described as the ability of a structure, or an individual, to influence the will of the various stakeholders, including community members (Han et al., 2014), to dictate the object of tree distribution and the way it should be done, to the subjects of that activity system. Masuku and Molohe (2019) assert that power relations are determined by how groups or individuals relate in specific settings, in terms of how those with power exercise it over those without it.

A domineering state may lead to mistrust. Mistrust of the government and municipalities is prevalent in local governance. Everatt et al. (2010) found that the low participation rates experienced in IDP processes of some municipalities can be attributed to deeper problems that seem resistant to logistical improvements and innovations, where communities may not ‘see the importance of participation any more’ because the bonds of trust between residents and the state are frayed, and the prevalence of disharmony and distrust between actors and structures that are meant to be collaborating closely. Coupled with lack of confidence in the respective local municipalities, the subjects of central activity systems across all case studies exhibited their mistrust on the institution. This mistrust was typically associated with the experienced history of poor service delivery in many small towns and municipalities. Specifically, Grahamstown presented the remnants of the legacy of apartheid, as expressed by participants, who emphasized that because the local municipality prioritized the former “white” areas more than the predominantly black townships and low-cost housing areas, they would like to be left to their own devices as they navigate their activity system. This came from a place of hostility, which then to an extent altered the object of the activity system to one that aims to prove that residents can do something independently of the municipality because they do not receive the necessary support anyway. Thus, in their participation as subjects of an activity system, residents from Grahamstown used the participatory space as a site of resistance and protest (Williams, 2006).

6.5 Conclusion

This chapter focused on detailing the processes and activities surrounding typical tree planting initiatives that were piloted in three different low-cost housing areas, championed by local residents, with assistance from other stakeholders, as suggested by open co-governance in urban forestry, including government, municipalities, and community-based institutions such as schools. These actors all played varying roles to achieve the object of tree planting in all case studies. This was done through the use of activity systems, where the first three principles of CHAT applied, to understand the processes and experiences that characterize the participatory introduction of trees and the potential success or failure of a tree planting initiative in a low-cost housing area context.

The activity systems in this study show that while broader contexts may be similar, they vary broadly when it comes to the implementation of participatory initiatives. Specifically, the activity systems generated in this study were similar but differed greatly within the nuances of each element, differences that were largely attributed to the actors and the roles they played in each activity system. The emergent lessons from these activity systems centre on the complexity and heterogeneity, dynamism, agency, and historical legacy of the individual and collective nature of low-cost housing areas in relation to the implementation of an initiative that has historically been perceived as a practice for the elite. In two case studies, the respective local municipalities, as the intended implementers of urban forestry and urban greening (Chapter 3), were not extensively involved in the initiatives. However, this did not deter the continued support from residents. Ultimately, this provided evidence for the potential success of an initiative with multiple stakeholders such as NGOs and community-based institutions, and residents.

Although residents supported the participatory process leading up to the tree planting, evidence from the activity systems of all case studies indicates that most residents do not recognise their own agency. Notwithstanding this, it needs to be appreciated that agency takes time and may, with the continued inclusion of residence in participatory local governance, improve. In addition, the historical legacy of apartheid, that of poor service delivery especially in most towns, and that of a domineering state need to be appreciated and understood by any external role-player if they are to facilitate or catalyse real change on the ground, as per the argument of CHAT.

Chapter 7

Sources of tension and contradictions in urban tree planting



A member of the Extension 10 Greening Group explaining an aspect of tree planting to one of the CWP supervisors in Extension 10 during a tree planting event organized by the group at a local pre-school (Picture taken by researcher, 2018).

Overview

In Chapter 6, I presented the various activity systems associated with tree planting in low-cost housing areas of three case studies to illustrate what characterizes a tree planting initiative where residents are key participants. CHAT expands on activity systems to analyze contradictions and tensions that arise from external forces and as subjects engage in an activity. Thus, this chapter presents an analysis of the contradictions that surfaced within and between the activity systems for tree planting described in Chapter 6. In doing this, I ask the following question:

- a) What opportunities exist for innovation in the effective greening of low-cost housing areas?

7.1 Introduction

Urban tree planting is not a simple task. Therefore, an intervention in that regard is also almost always challenging. I demonstrated in Chapter 6 that the case studies indicate a complex context for tree planting, where it is not as simple as arriving at a place and starting to plant trees. It is a process that needs extensive support for it to be successful. Using a third generation CHAT framework, this chapter examines how contradictions within and between interacting activity systems influence the successful planting of trees, and implementation of initiatives in that regard, in low-cost housing areas. It reflects on how, across three case studies, contradictions and surfacing tensions between the interacting activity systems for tree planting influence the practice of tree planting in a context that is characterized by a host of challenging socio-economic, socio-political, and socio-cultural dynamics.

The activity systems presented in Chapter 6 comprise a multiplicity of views, traditions and cultures which, when misaligned, give rise to contradictions within and between neighbouring activity systems (Engeström, 1987). Historically emergent contradictions and tensions are important sources of potential learning and development in an activity system (Engeström and Sannino, 2011), and these conflicts are inevitable in interactions within and between human activity systems (Weaver, 2019). Contradictions are recognised as the main drivers of learning and change because actors respond to disturbances (Olvitt, 2010); for example, a municipality might advocate for the inclusion of urban greening in their plan based on numerous requests for trees from residents when that behaviour was previously not common. In another instance, incidences of increased damage to trees (Chapter 5) or theft by people may prompt municipalities to consider the areas without trees and make plans to provide them with the trees, considering that they already do so in other parts of the town.

One of Engeström's (1987) original motivations for developing the activity systems model was to allow researchers and practitioners to identify the inner contradictions that impose tensions on participants' work settings and help them change the nature of an activity to overcome those tensions (Yamagata-Lynch and Haudenschild, 2009). Virkkunen and Kuutti (2000) define contradictions as "fundamental tensions and misalignments in the structure that typically manifest themselves as problems, ruptures, and breakdowns in the functioning of the activity system". It is important to note that contradictions should not be interpreted as problems or conflicts, but rather as "historically accumulating structural tensions within and between activity systems" (Engeström, 2001: 137) that manifest through the introduction or adoption of a new element from outside of the current system. As indicated in Chapter 2, human activity systems have four levels of contradictions depending on their positions in the network of activities (Virkkunen and Kuutti, 2000), namely: i) primary, ii) secondary, iii) tertiary, and iv) quaternary contradictions (Engeström, 1987; Roth and Lee, 2007).

7.1.1 Primary contradictions

Primary contradictions represent conflicts or tensions *within* an element of an activity system (e.g., competing interpretations of goals by individual subjects within a community) (Engeström, 1999). In any tree planting initiative involving multiple actors, each of the role players has their own goals in mind to fulfill, which may be more important to them than the tree planting itself. According to Virkkunen (2009), when the activity and its context change at this level, the system moves from a relatively stable state first to an unarticulated "need state" and then to a stage of increasingly acute secondary contradictions between some of its elements.

7.1.2 Secondary contradictions

Secondary contradictions represent conflict *between* two or more elements of an activity system (e.g., conflict between subjects, tools and object or between tools and division of labour) (Engeström, 1999). These contradictions tend to push the system farther away from a stationary equilibrium (which would have been a state characteristic of a primary contradiction), to a bifurcation point that would necessitate a

solution (Virkkunen, 2009). This increased instability within an activity system “leads the actors at some point to a need state, and to making conscious efforts to analyse the causes of the problems and to find a new object for the activity that would meet the need created by the evolving inner contradictions” (Virkkunen, 2009: 150), and a new object of the activity, which promises to resolve the secondary contradictions, emerges.

7.1.3 Tertiary contradictions

Tertiary contradictions result from the introduction of a new model which may have emerged from the secondary contradiction (Virkkunen, 2009), and represent changes in activity over time (e.g., evolution of an activity such that later versions conflict with previous versions) (Engeström, 1999). These contradictions usually emerge between the new and the old elements of the activity (Virkkunen, 2009), and are typically between the object/motive of the dominant form of the central activity and the object/motive of a culturally more advanced form of the central activity (Engeström, 1987). In resolving these tertiary contradictions, the new model is also gradually replaced by another new one, firmly grounded in practice through the resolution of the contradictions between the given new and the existing forms of the activity, which then also leads to quaternary contradictions (Virkkunen, 2009).

7.1.4 Quaternary contradictions

Quaternary contradictions represent conflicts between two competing activities (e.g., one group’s objective directly conflicting with the intentions of another) (Engeström, 1999) and occur between the central activity (which may have emerged from tertiary contradictions) and its neighbour activities (Engeström, 1987). In essence, these contradictions arise when the effects of attempts to resolve tertiary contradictions are felt in neighbouring activity systems (Foot and Groleau, 2011).

In change efforts and interventions, contradictions are manifested and constructed in patterns of talk and discursive action with the help of which actors try to make sense of, deal with and transform or resolve their contradictions (Engeström and Sannino, 2011). Contradictions in activity systems manifest in the form of i) dilemmas, ii) conflicts, iii) critical conflicts, and iv) double binds (Engeström and Sannino, 2011). A detailed discussion of these is provided in Chapter 2, Section 2.3.5.5.

Much like activity systems are not static, surfacing contradictions in them are not static too. While an analysis of contradictions to identify opportunities for transformation and innovation is useful, especially in participatory tree planting, there may be some challenges, some of which were apparent in this study. There still needs to be clarity on whether or not the explanation of contradictions’ occurrence is directly applicable in practice (Kim, 2012). Although Engeström (1987) posits that the third level of contradiction takes place between a central activity and another culturally-advanced activity, it is still difficult for researchers to identify precisely what the culturally-advanced activity is. It may be more useful for researchers to consider the activity as one of the neighbouring activities that surround the central activity (Kim, 2012).

I reiterate the limited studies on urban forestry or environmental programs that utilize CHAT as an analytical tool. Furthermore, I note the relationship between the barriers to, and enablers of, tree planting, and the contradictions that surface in the various activity systems as they illuminate the disconnections between various components associated with tree planting, as well as the points of opportunity and transformation. Understanding the emergent contradictions in activity systems associated with tree planting is important for planners, researchers, and practitioners to be able to identify potential areas that need more attention than others, and areas that can enhance tree planting. This chapter relates with the barriers to, and enablers of, urban tree planting because it highlights areas of focus in the successful planting of trees, as well areas of opportunity to advance the practice. In surfacing contradictions in the three main activity systems for tree planting in low-cost housing areas, I hope to identify how to mitigate the constraints to tree planting at an operational level and highlight opportunities that exist for innovation in the effective greening of low-cost housing areas.

7.2 Methods

The study areas and methods used in this part of the study are similar to those described in Section 6.2 (Chapter 6). The analysis of surfacing contradictions is based on the activity systems generated in Chapter 6. The data used to generate the activity systems in Chapter 6 were simultaneously interrogated for apparent contradictions. Activity systems are characterized by contradictions and tensions, which present opportunities for development and transformation (Foot, 2014). Contradictions in activity systems are challenging to capture in empirical studies (Elmberger et al., 2018). However, their manifestations can be recognized in individuals' accounts and constructs of words and action (Engestrom and Sannino, 2011). Therefore, I employ individuals' accounts and constructs of words and action in this section of the study to organize findings and identify sources of contradictions within and between activity systems previously described.

7.3 Results: Surfacing contradictions in selected activity systems

The activity systems described above are characterized by contradictions and tensions which offer opportunities to change prevailing practices. This is especially relevant for an urban forest in a low-cost housing context, which faces multiple barriers to the establishment of trees (Chapter 5). The surfacing contradictions are explored across activity systems of case studies presented above (Section 6.3.1-Section 6.3.3).

7.3.1 Surfacing contradictions in the Matatiele case study

The GreenChamps-M activity system was characterized by a number of primary, secondary, tertiary, and quaternary contradictions. Figure 7.1 provides a heuristic representation of the positions of these contradictions. Red arrows represent primary contradictions, yellow represents secondary contradictions, blue represents tertiary contradictions and green represents quaternary contradictions. Neighbouring activity systems interacting with the central activity systems are shaded in grey for optimal visualization.

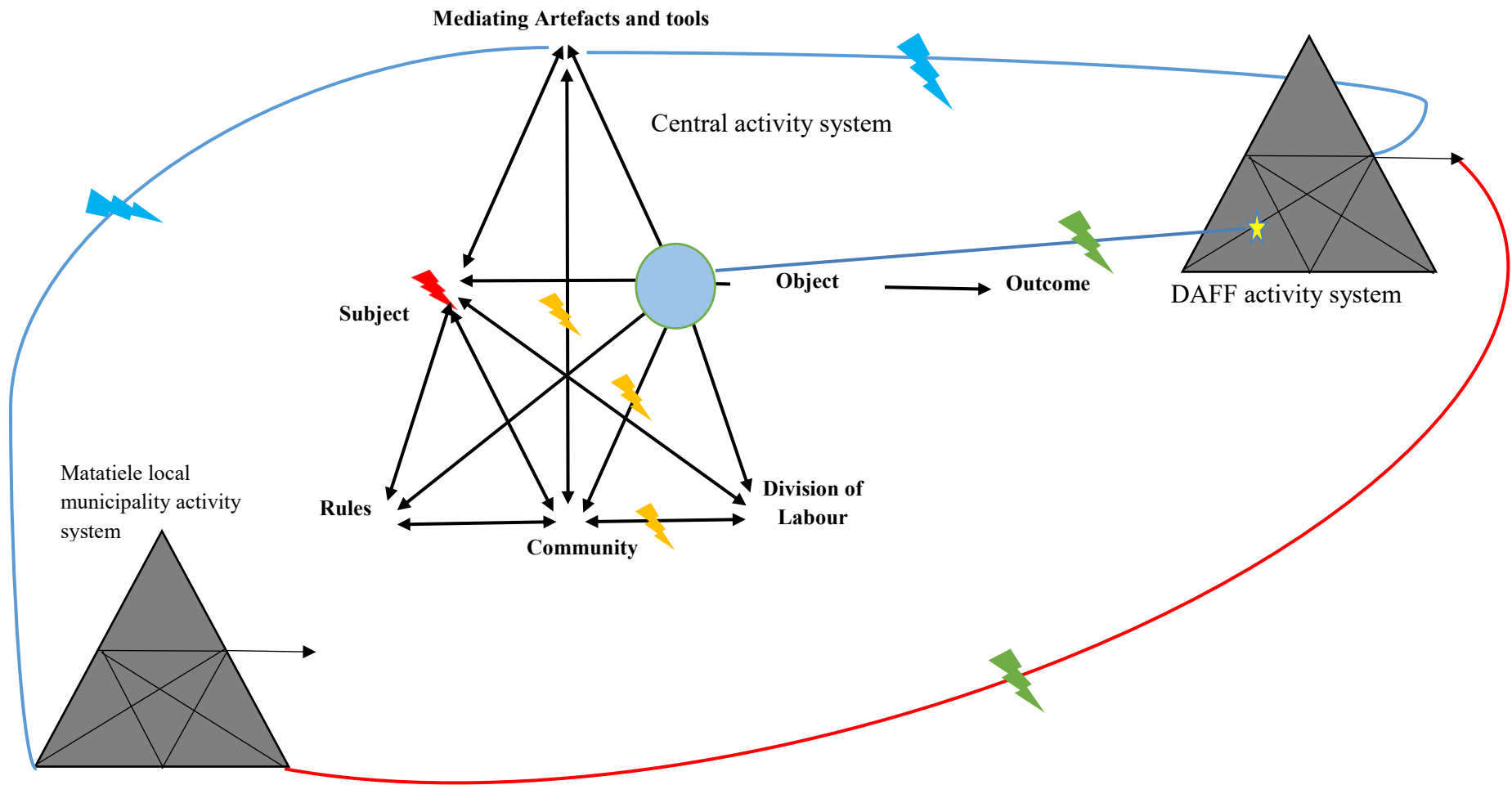


Figure 7.1: Representation of the positions of these contradictions. The interaction between two nodes, i.e. object-rules interaction is denoted by . Different colours on connections (lines) mean that there is no relationship between any intersecting lines, the source of contradictions is just the same, and similar colours do not depict a form of relation.

Primary contradictions

There was evidence of contradictions within the subject of the GreenChamps-M activity system, pertaining to the physical mediating artefacts and tools needed for the object and where these will come from. This contradiction was largely influenced by the secondary contradictions described below (for GreenChamps-M) wherein participants agreed that they are responsible for tree planting in their private yards, but still look to the municipality to support them in that regard. The participants said:

Researcher: *Ok. So, let's talk about the responsibility to plant trees. Who is supposed to plant trees in our homes? When we talk about private space, we are talking about our yards.*

Participant 6M: *When we talk about private space, it is my responsibility as the owner of the house/as the occupant because I am the one who occupies the property and it belongs to me. For example, it is my responsibility to ensure that my home stays intact and is not blown away by the wind. To do that, I need to plant trees myself.*

Participant 2M: *It is my responsibility to plant. The municipality can just give me the trees and I will plant them myself in my yard.*

Researcher: *Why should the municipality give you trees when your yard is your responsibility?*

Participant 10M: *Is it not part of service delivery? I cannot afford to buy the trees and I am not even sure where I would buy them.*

Participant 3M: *The municipality also has knowledge and they also have people who know, people from agriculture who know what types of trees should be planted in the yard and on the street so they have to be involved somehow.*

Researcher: *In that case then, can one not just go to the municipality and inquire about suitable trees but still source those trees themselves.*

Participant 3M: *The municipality should be at the forefront of tree planting. In all circumstances.*

Another primary contradiction surfaced in the object of the central activity system, where some participants indicated that their reason for participating in a tree planting activity was to get a certificate, while others were more interested in just having trees planted throughout the suburb. A background look into those participants whose object was to get a certificate is that they had participated in many projects before, and had received certifications for doing so. However, nothing else, according to them, came from those projects besides the certificates. Consequently, another participant explained that certificates do not mean anything, because he had collected so many of them over the years and they do not amount to anything. Now, he just wants to do something practical instead of just sitting at home with certificates. The exchange below illustrates this contradiction:

Participant 5M: *Since you are from Rhodes University, I am sure that at the end of all of this we will get a certificate. It would be really great to get a certificate that says we did a tree planting course.*

Researcher: *Well, I am not sure how that would work, but I will have to find out because what we are doing here is not really a course...*

Participant 12M: *Many of these projects do give out certificates at the end that say you did abc or participated in abc.*

Researcher: *I hear you. I would have to speak to my supervisors and see if there is no way for you to do the actual course that my department normally offers and is related to urban greening. But that will all depend on how the research process unfolds.*

Participant 7M: *I have so many certificates at home because I have participated in everything that comes to Matatiele that says community members must attend. However, those certificates have not done much for me because I am still unemployed. Maybe it is time for us to just do something for another reason besides getting compensation either with money or certificates.... [Murmuring in the room]*

Secondary contradictions

A secondary contradiction relating to tree planting in the private space and the municipality's influence in that surfaced. This contradiction was between the community (homeowners/residents), material/physical artefacts and tools (trees, holes) and the rules (town plan, property rights and land tenure) of the GreenChamps-M activity system. This contradiction manifest itself as a conflict, and unfolded as follows:

Researcher: *[...] before you even make the decision to plant a tree in your yard, are you not supposed to be granted permission to do so?*

Participant 4M: *I see no need for me to ask for permission to dig and put a tree from anyone because this is my house.*

Researcher: *Does the municipality feature anywhere in your private space?*

Participant 8M: *No, it is none of their business.*

Participant 4M: *My private planting does not concern the municipality because they have already given you space and boundaries for your own yard. What happens in my yard is my business.*

Participant 6M: *I would like to contradict that a bit. The yard is yours yes, but you got it free from the municipality and there is a site plan. That site plan contains a view of where municipal pipes go. Because of that, you need to consider that plan because if you do not, you might be planting right on top of a pipe.*

Participant 4M: *You will consider the pipes yes, because the municipality will have told you where they are when you go there and ask.*

A resolution to the above conflict was found through consulting with the municipality to find out where their pipes are situated within a homeowner's yard. This can be seen in Participant 4M's statement at the end of the conversation.

Another secondary contradiction, which also manifest itself as a conflict, was between the division of labour and the rules of the GreenChamps-M activity system, wherein participants were conflicted about whose responsibility it is or should be to plant trees in public spaces such as the street. Others thought the residents should be doing it, while others were of the opinion that it is the municipality. In finding a resolution for this conflict, one of the participants suggested that tree planting in the public space should be done by the residents, with the municipality being a mediating activity system to assist with mediating artefacts such as funds for trees. In response to whose role and responsibility it is to plant trees in public spaces, the participants said:

Participant 6M: *Tree planting on the streets is supposed to be done by the community. I will have done it in my home, my neighbours will see what I have done, then we can all take it to the street, together.*

Participant 7M: *If you look, there has to be trees on the street because when it rains, the soil will be eroded. We will all be affected by that as the cracks may spread to our homes. To avoid this, we should all take a collective action as a community to have trees along the pavements.*

Participant 1M: Another thing, it is important that we work together as a community in the public space because when the trees have been planted, they will have to be taken care of. So, if I do it by myself then no one will care what happens to the trees, and even if they see goats grazing on the trees they will not care.

Participant 9M: I have another view. First of all, as a community, we have nowhere to get the trees. Another thing, all this has to do with money. The municipality has the money and can buy the trees. They will have a way of how to get the trees. I would want to say the responsibility for tree planting on the street lies with the government and the municipality.

Participant 10M: The municipality will buy the trees for us.

Participant 1M: Let me assist here. I still stand by the notion of the responsibility being that of the community as suggested earlier. As a community, we can also be able to get funding for trees when we have done the research of what trees to plant and whether the soil is conducive or not. We can get trees without depending on the municipality. The municipality might just come in as a donor, and we do tree planting as a community.

Participant 5M: I think we cannot do this as a community because we might plant trees in the wrong places and the municipality will come along and tell us that they had reserved that particular space for something else.

Participant 9M: Another thing, if the municipality plants, trees need to be taken care of and watered. As a community with nothing from the municipality (such as payment), we will be lazy and not take care of the trees properly. However, if it is the municipality then they will employ people to do that. They might even take some of the people like us who are championing tree planting and employ them for such.

Participant 3M: All this means then is that the municipality should come and work with the community. We have the power as the community. We have the ability to ensure that things are done faster than when we do not intervene, we just do not have the resources. The municipality must bring the resources.

Participant 9M: At the end of the day, tree planting is for the community, so the municipality needs to depend on the community in terms of how they can assist.

A secondary contradiction surfaced in the municipality activity system between the object of service delivery in the form of trees (because tree planting is an aspect of service delivery), and the municipal IDP (rules) which stipulates what municipalities could prioritize in terms of service delivery. According to an official from the municipality, residents do not propose tree planting during consultative meetings for the IDP, which means that the municipality is unlikely to plant trees in the 2018/2019 financial year. This contradiction posed a critical conflict of being silenced and having no motivation to advance urban greening in the low-cost housing community because the contradiction is unsolvable by the subject of the municipality activity system alone. A resolution to this from one of the subjects was for the municipality to engage in more educational and awareness activities, and to raise urban greening during community meetings. A first step in this resolution was taken by one of the subjects of the municipality activity system by inviting selected learners from a local school and one teacher to the tree planting awareness day, where they received five trees to plant in the school yard and to report back to the rest of the school.

There was a secondary contradiction in the DAFF activity system between the community, division of labour and outcome of formulating a greening strategy and implementing the greening plant with the municipality. The municipality did not feature in the community of the policy activity system. At a finer scale of the research process, there seemed to be a disconnection between the community services department of the municipality and the regional DAFF office when it came to contributing in the research

process. This is further exacerbated by no effort from the municipality to assist with leading the facilitator to the right person or office. According to an official from DAFF,

“not being part of the municipality gives me very little, if any opportunity, to participate in anything and in any capacity. All I can do is wait to be invited and then advise”.

This statement, together with the one from a municipal official suggest that there does not seem to be an established plan in place or proactive consideration and relationship between the two entities when it comes to urban tree planting specifically. These statements both indicate a dilemma where DAFF would like to be more involved in the process with municipalities, but their ‘hands are tied’. On the other hand, the municipality would like to do more or to assist, but they have limited expertise and deem DAFF as the entity with the ‘experts’.

Tertiary contradictions

There was evidence of previous tree planting in Matatiele prior to this research process. According to participants, they had received trees to plant in their yards from the municipality. Unfortunately, only a few people benefitted from this, as indicated by the participants. In this activity system, the participants or residents had not been involved in the process leading up to trees being delivered, and some did not even know where the trees came from. As a result, they believe that the trees they were provided were not suitable. In the conversation below, the participants highlight their cultural beliefs (rules) and how they were manifest in the trees they got, and the unsuitability of the trees they received (mediating artefacts), leading up to unintended consequences and ultimate disposal/sale of those trees (outcome).

Participant 3M: People were just given trees donated by the municipality to plant in their yards.

Researcher: What types of trees did a person get, and how many?

Participant 11M: You chose the tree you want

Participant 14M: The trees that were there were not appealing, as a result people took those trees and later sold them.

Participant 9M and Participant 1M: There was a variety of trees, and others seemed like they would grow very big.

Participant 1M: They never told us what types of trees they are.

Participant 5M: I thought those trees they gave us were not good. This is because the municipality harvests any trees for us, even those that are not supposed to be planted in among homes. I was told mine is a poverty bearing tree.

Researcher: That is interesting. So, did the trees really bring you poverty?

Participant 1M: The one I got was also apparently a poverty tree. I cannot really say yes or no because I do not know how my life could have been. But, a big part of me wants to believe that maybe it did.

Participant 3M: The municipality selected those trees using whatever criteria they used. We had no choice but to take them if we wanted trees. You were just told to take a tree and move on. It is possible that they just took any trees from the forest. Forest trees are not supposed to be among people, hence the poverty reported.

This contradiction, which emerged from the rules, mediating artefacts and outcome of the old activity system, caused tension with the object of the new activity system, manifested itself through a critical

conflict where participants now recognize the importance of the tree species when planning to plant because they now realize that they should ask questions about trees before they accept them. In the new activity system, participants used lessons from the old activity system to ensure that this time they choose trees that will serve a particular purpose for them. This was emphasized during a demonstration workshop, as evident in this extract:

Demonstrator: *There are five different types, but only two of them thrive successfully here. One of them is the *Searsia lancea*, and the other is the yellowwood. I have with me the *Searsia lancea*. It is a fast-growing tree, and its roots do not spread but grown downwards. This tree does not need much maintenance and is very easy to grow on its own, as long as you keep watering. This *Searsia lancea* is not a "dungamzi tree", which is a tree that brings bad luck to the home.*

Participant 12M: *Specifically, what do the yellowwood and *Searsia lancea* help with because I think now it is important for us to know what each tree is useful for, so that we avoid planting "dungamzi" without knowing it?*

Demonstrator: *These two trees are mostly for beautification. Other people use them as wind buffers, in which case you need to plant at least five trees because these trees do not grow to be very big. Other people plant them for the shade.*

Participant 9M: *What about the *Olea africana*? Does it not thrive here as well because it is quite significant and I know many of the people who have planted have chosen it?*

Demonstrator: *Yes, it is an indigenous tree and it should grow quite well here because it is a frost and drought resistant tree. You get frost here.*

Participant 5M: *It would be a very good idea to have the *Olea africana* and maybe a fruit when we do our planting. People also say that this tree protects against being struck by lightning.*

A new activity system, which was the mediating activity system from DAFF through the demonstration and represented a new and advanced method to achieve their object, was introduced to counter this contradiction through a workshop and discussion. The GreenChamps-M activity system therefore adopted a new element of practical knowledge from a neighbouring activity system. During this discussion, an opportunity for participatory expansion arose, as a tree had now been planted and looked after. This manifest through a double bind where more than one person volunteered to look after the planted tree. This led to a resolution of "we will take turns looking after the tree", as expressed below:

Demonstrator: *Now, with this tree that we will plant as a demonstration, we need someone who will volunteer to take care of it, preferably someone who lives close to here. If we do not have such a person, we could speak to the municipality and ask them for one of the EPWP people water it every now and then when they are working in this vicinity. Or even the cleaners.*

Participant 12M: *I will assist by just checking up on the tree and making sure it has enough soil on it every now and then because I always exercise this side.*

Participant 3M: *I can commit myself to watering this tree because I am always available next door.*

Participant 13M: *I will make sure that it is pruned when needed. I can do that myself. I think we have the pruning shears at home.*

Furthermore, the perceptions and preferences expressed during discussions about the species to plant during the planting stage were taken into consideration, and the *Olea africana* and the *Prunus persica*

species were identified as the most ideal species. According to participants, the *Prunus persica* is the most abundant and thriving fruit species in the Matatiele area.

Another tertiary contradiction emerged between the GreenChamps-M and the municipality activity systems, which had to do with the division of labour in the GreenChamps-M activity system, and the conceptual/mental artefacts and tools, and rules in the municipality activity system. This contradiction comes about because residents expect the municipality to be planting trees on the street (and in the case of Matatiele, being assisted by the municipality), while the municipality insists that everything they do in terms of service delivery is dictated by the residents through the IDP. For example, the municipality looks to the IDP to roll out priority services, and residents rarely, if at all, ever speak about tree planting for their streets or even the establishment of parks. This manifests itself as a double bind, where the municipality now needs to acknowledge the residents' limited knowledge about tree planting and lack of enthusiasm for it which leads to them not recognizing its importance. This opens up the opportunity for municipalities to invest in education and awareness campaigns. This was also recognized by municipalities as a possible enabler of tree planting in Chapter 5.

Interactions between the GreenChamps-M activity system and the municipality led to the emergence of another tertiary contradiction. This tension arose between the mediating artefacts of the GreenChamps-M activity system, the rules and division of labour in the municipality activity system. During the tree planting awareness day event, the municipality committed to organizing (division of labour) the venue (mediating artefact) where the event would be held, and the agreement was the community hall in the low-cost housing area. Unfortunately, the municipality decided to allocate a venue that is in town and far from the residents. This meant that many people who would have attended the event suddenly couldn't because they did not have the means to get to town. The participants in the focus group did not understand this, and expressed their frustration, as evidenced below:

Participant 5M: *Do you now see how this municipality works? What did they say to you when they called you in that private meeting? Why did they decide to give us the hall in town instead of this one [referring to the hall we held focus group discussions]?*

Researcher: *They called me in to explain to them what the event is about and I was told that was the venue that could be secured.*

Participant 1M: *There is nothing happening here next week otherwise we would know. They did it deliberately. They want this event for themselves even though it belongs to us.*

Participant 3M: *This does not look good at all. But we will see. If only they could provide transport for the people at least.*

During the distribution of invitations to households, the most highlighted query was the venue and why the event would be held in the town hall rather than the community hall. Our response was that it was the venue the municipality offered for us to use. Highlighting this during the event, the Community Development Worker (CDW) said:

"Let me first say this to the municipality, I am a very jealous person. The residents of Ward 20 did not take kindly to you taking the project away from them and bringing it to town."

The expected this event to be held closer to them. That is a ward where most poor people live. Now for you to expect them to travel and come to you was not the best thing to do. The government says, since we are leading wards with indigent people, the government and municipalities must go to the people, not the other way around. This event was supposed to be held in Area C, where it began”.

This tension manifested itself as a conflict because one group (central activity system) felt negatively affected by another group (municipality activity system). In turn, this tension became a source of development and change, where the message of tree planting now reached another group of people who are not from Area C but other surrounding areas. These are the people who attended the event out of curiosity because they were already in the business district. One of these people, from a newly developed subsidized middle-income residential area said:

“Why did you only choose to work with people in the RDP area? We also want trees. I am sure you have seen the new houses on your left on the way to Area C. Which direction did you come from? We also do not have any trees there, and I know the people living there would appreciate a program like this. Maybe you should also consider us going forward”.

Finally, there was a tertiary contradiction in the central activity system which resulted from secondary contradictions in the municipality activity system. This pertained to the municipal by-laws regarding where residents are permitted to plant trees and what the procedure is when residents want to plant trees on the street for example. Participants were under the impression that there may be a by-law in that regard, and the municipal official also stated that there is a by-law that dictates where residents can or cannot plant trees. However, a thorough search for such a by-law yielded no results, which suggests that such a by-law does not exist in writing. The document available which contains all by-laws of the municipality made no mention about urban trees, tree planting or any related issues. Therefore, there was no by-law to mediate the object of planting by residents.

Quaternary contradictions

There was a quaternary contradiction between the object-intended outcome of the DAFF (as an interacting and neighbouring activity system) and the object of the municipality (another interacting and neighbouring activity), and this had impacted the GreenChamps-M activity system. This contradiction became more pronounced during the tree planting awareness event and demonstration workshops. One of DAFF’s motives as a custodian of forestry is to focus urban tree planting initiatives towards low-cost housing and township areas and pair them with community education, and to assist municipalities with greening strategies and implement these. On the other hand, the municipality is more concerned about service delivery and this has not come with an awareness or education initiative, at least when it comes to

urban tree planting. Furthermore, the DAFF is concerned about the processes and rules of the municipality, while the municipality does not abide by DAFF's intentions and requirements. This was evident when the municipality kept trees that had been donated by DAFF during the Arbor Month launch for more than six months, and there was no evidence to suggest that any of the trees had been distributed at any time before the awareness day organized as part of this research process. Those trees (the remaining ones that looked healthy) were only distributed during the tree planting awareness day, after it had also become apparent that the municipality did not have the funds or resources to contribute towards the event.

Another quaternary contradiction emerged between the object of the GreenChamps-M activity system and the intended outcome of the municipality. This surfaced during a meeting with a representative from the community activity system and representatives from the municipality activity system where the latter told the former that the trees available on the day of the awareness event should be planted in selected homes of the elderly and sick, and also in some schools. While this was a noble idea, it was not the object of the community activity system. As such, it created a conflict between the activity systems, which was resolved with a suggestion that the next activity (which would be the 67 Minutes for Mandela Day) should focus on the homes of the elderly and sick, and some schools. Informal telephonic communication with the CDW confirmed that indeed, the municipality was now planning an event on 24 September 2018 where trees would be distributed to some households. Furthermore, one of the participants confirmed that the municipality had invited two of the participants in this research process to a meeting where they were introduced as stakeholders and custodians of a tree planting project (as representatives of the residents who participated in the focus group discussions and tree planning awareness day) (Appendix). The CDW was part of this and took it upon herself to engage and plan the proposed event with the participants.

A quaternary contradiction between an evolving DAFF activity systems and the Green-Champs-M activity system also surfaced, which resulted from a tertiary contradiction in the DAFF activity system where a new element was added to the fulfillment of its object. According to participants in the central activity system, DAFF had once provided them with trees and they had not asked for them. Therefore, participants assumed that they could just approach the department as individuals and ask for trees. However, the DAFF activity system had evolved and changed over time, having implemented a rule that trees can only be procured through an application process. These two activity systems were no longer in alignment. Furthermore, the DAFF representative mentioned that the department no longer gives trees to individuals, but to groups of people through a formal application. This contradiction led to participants now emphasizing the importance of working together as a group in fulfilling their object, and ensuring that everybody benefits rather than an individual. This was the spirit that was carried into the organization of the tree planting awareness day, and the participants insisted that DAFF be part of that event to explain some of these details to the rest of the community. A summary of these contradictions is presented in Table 7.1.

Table 7.1: Summary of surfacing contradictions for tree planting in the Matatiele case study.

Level of Contradictions	Description of contradiction
Primary Contradictions	Subject of the GreenChamps-M activity system: the physical mediating artefacts and tools (trees, equipment, etc.) needed for the object of tree planting and where these will come from.
	Object of the central activity system: participants indicating various reasons for participating in a tree planting initiative- certification, having trees planted throughout the suburb.
Secondary Contradictions	Community (homeowners/residents), material/physical artefacts and tools (trees, holes) and the rules (town plan, property rights and land tenure) of the GreenChamps-M activity system.
	Division of labour and the rules of the GreenChamps-M activity system: participants were conflicted about whose responsibility it is or should be to plant trees in public spaces such as the street.
	Municipality activity system: between the object of service delivery in the form of trees (because tree planting is an aspect of service delivery), and the municipal IDP (rules) which stipulates what municipalities could prioritize in terms of service delivery.
	DAFF activity system between the community, division of labour and outcome of formulating a greening strategy and implementing the greening plant with the municipality. The municipality did not feature in the community of the policy (DAFF) activity system.
Tertiary Contradictions	Cultural beliefs (rules) and how they were manifest in the trees received by residents, and their unsuitability (mediating artefacts), leading up to unintended consequences and ultimate disposal/sale of those trees (outcome).
	Mediating artefacts of the GreenChamps-M activity system, the rules and division of labour in the municipality activity system regarding the venue for the tree planting awareness day event.
	Municipal by-laws regarding where residents are permitted to plant trees and what the procedure is when residents want to plant trees on the street.
Quaternary Contradictions	Between the object-intended outcome of the DAFF (as an interacting neighbouring activity system) and the object of the municipality (another interacting neighbouring activity), and this had impacted the GreenChamps-M activity system.
	Object of the GreenChamps-M activity system and the intended outcome of the municipality activity system: Instruction on where trees should be planted.
	DAFF activity systems and Green-Champs-M activity system: a new element was added to the fulfillment of the DAFF object.

7.3.2 Surfacing contradictions in the Tsolo case study

The New-Chris activity system was characterized by a number of primary, secondary, tertiary, and quaternary contradictions. The heuristic representation of the positions of these contradictions is provided in Figure 7.2. Red arrows represent primary contradictions, yellow represents secondary contradictions, blue represents tertiary contradictions and green represents quaternary contradictions. Neighbouring activity systems interacting with the central activity systems are shaded in grey for optimal visualization.

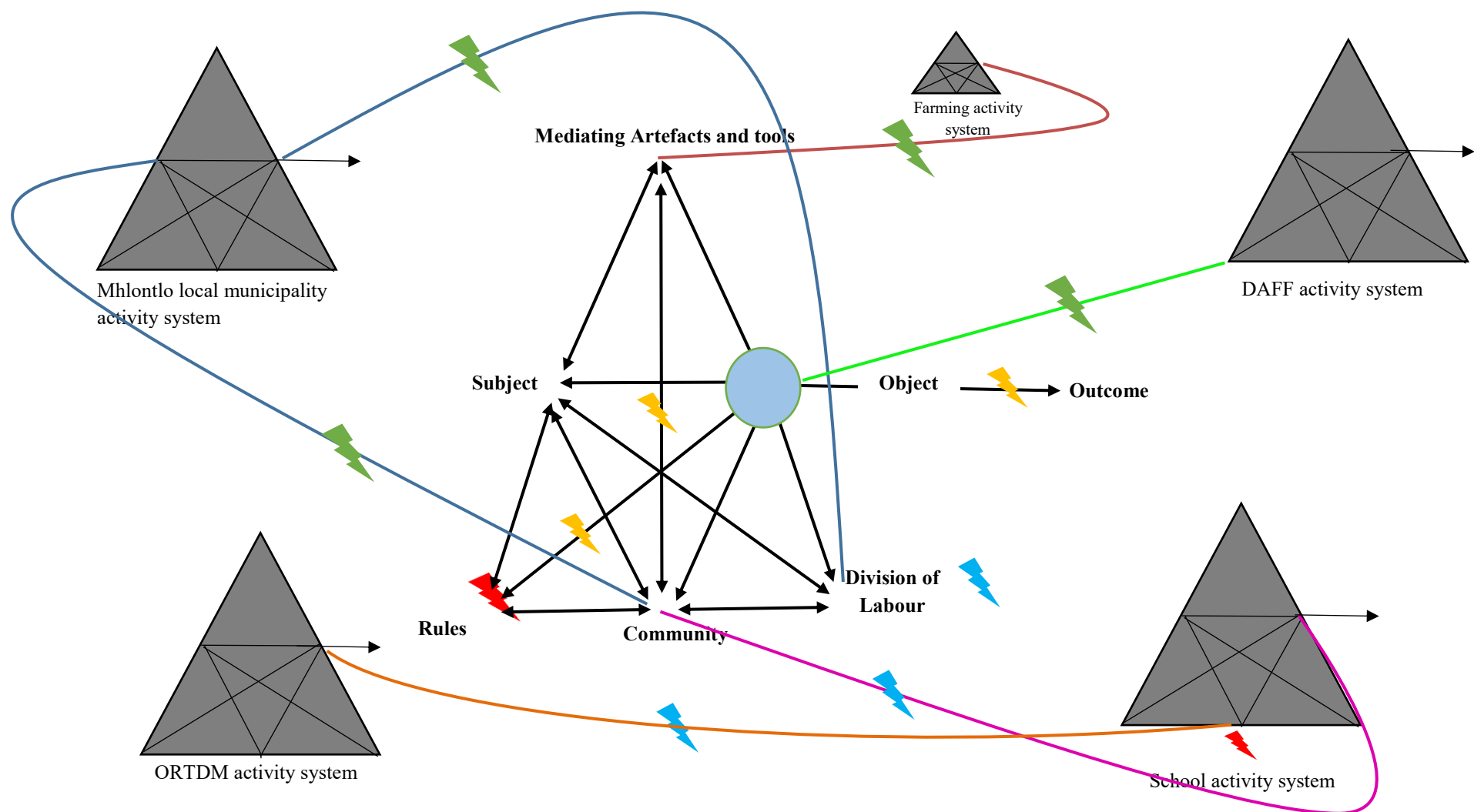


Figure 7.2: A representation of surfacing contradictions associated with tree planting in the Tsolo case study. Different colours on connections (lines) mean that there is no relationship between any intersecting lines, the source of contradictions is just the same, and similar colours do not depict a form of relation.

Primary contradictions

A primary contradiction surfaced within the subject of the New-Chris activity system that is associated with some members or families keeping animals, as is the norm in many families the town, and another within the rules in the municipality activity system where the municipality is not enforcing by-laws. This rule is associated with the municipality's by-laws related to the keeping of livestock and their confinement to the commonage. However, this by-law is not enforced and this causes a disturbance to the fulfilling of the object of the New-Chris activity system. This contradiction also leads to a quaternary contradiction, where the municipality is not enforcing its rules, thereby causing a disturbance to the neighbouring central activity.

The school activity system also experienced a primary contradiction in the community element. This was largely influenced by the diversity in the learner population regarding where they live and how that may affect the distribution of trees among the learners. This is because the school enrolls learners from many parts of Tsolo, including rural areas. However, the school did not want to exclude those learners from participating in tree planting initiatives and activities. Highlighting this, the principal said:

"I understand that you are focusing on the RDP area with your handing out of trees, but I am not sure how this will work because these children come from various backgrounds. Many of them come from the rural areas. You cannot now not involve them because it will be discrimination. The School Governing Body (SGB) will fight with us."

The critical conflict nature of this contradiction meant that the initiative would be confined to just the school space, and learners would be provided with information pamphlets to take home so that parents will be aware of where to go should they require trees. This was also mediated by the emergence of a new activity system from the district municipality, whose object is *"to make valuable contributions to the improvement of global climate challenges for improved food and livelihood security for future generations in the district by engaging children and communities in tree planting activities in urban and rural areas"* (ORTDM, 2017). This presented an opportunity for expansion and development, where the object of the New-Chris activity system transcended beyond just the low-cost housing area but to other parts of the town too, through the learners and teachers. The object of the ORTDM mediated the New-Chris activity system through a quaternary contradiction.

Secondary contradictions

Participants in the New-Chris activity system narrated that trees had been planted along the town main road in the past, and as far as they knew the municipality may have planted them. Those trees were, according to an official from the local municipality, planted by the district municipality. However, they pointed out that those trees were not there for long due to vandalism. This was a direct

contradiction between the residents (community), the houses or land (physical mediating artefacts), the object, and the outcome which lead to people showing no interest in tree planting. Because of their frustration with a neighbouring activity system (local municipality), they vandalized those trees. In their account, the participants said:

Participant 1T: *Trees have been planted in this town before, not so?*

Unanimous response: YES

Participant 1T: *There were trees planted on the main street in town. Those trees were not even eaten by cows, people just dug them out and vandalized them.*

Participant 3T: *Let me tell you why those trees were vandalized. At the time when those trees were being planted, people desperately wanted houses and the municipality kept saying that they do not have money. So, people hated that and questioned why the municipality would be planting trees instead of building houses when they say they do not have money. According to many people, they were just wasting money planting those trees instead of building houses for people.*

Participant 1T: *But that is strange. Which means plans for planting trees are a waste of time then because even now, we are still poor and unemployed. Does that not then mean that if those trees get planted people will still ask how it is that trees are planted while people are hungry and unemployed?*

Participant 3T: *Listen, my beloveds, those trees were only vandalized because people had been promised houses but were then later told that there was no money for houses. They were told that money had arrived in June, but soon after that trees were planted in town, so they assumed that the money that arrived in June bought those trees. In this case, no one is promising anybody food or a job. And the good thing is that this has very little to do with the municipality. People would have to be real hooligans if they were to vandalize something so good.*

Participant 2T: *But also, I do not think people would vandalize the trees.*

Participant 3T: *Maybe because we are the ones who want the trees and will be championing the idea of them being planted ourselves.*

Participant 2T: *I am saying they might not vandalize the trees because they will have received their houses. By now most people have received houses.*

Participant 6T: *But they are hungry and have no food in those houses. You solve one problem, but there will also be another one following that.*

The manifestation in this contradiction came as a double bind where participants considered an alternative solution to achieve the object. This meant considering the private space as the best place to start. The extract below expresses this:

Participant 1T: *I hear all of this, but I think then the best way to avoid that would be to ensure that someone first plants in their own properties before trees are planted on the street or in the public space. That way, you can look after it. By the time it is possible for them to be planted on the street, people will have been used to the idea of having trees and maybe might not have the urge to destroy them. The neighbour can even see your beautiful tree in your house and also want to have one.*

Participant 3T: *Yes, when they see it in your home they will also want to have it planted in their yard. That is how people can be gradually introduced to the normality of having trees.*

Participant 1T: *You could even keep planting, make sure that there is a tree in every corner of your yard. Then watch and see if your neighbour will not also plant their own. It is very likely that they will.*

Tertiary contradictions

There was conflict between the old school activity system which was part of the community element in the New-Chris activity system (before tree planting was introduced) governed by the Department of Education, which sets the rules and the curriculum of schools as well as the timetable of the school, and the tools and object of the new activity system (after tree planting was introduced) were in conflict. This had to do with what will happen to the trees during vacation when the learners are not there to water them. Fortunately, the availability of a caretaker mediated this conflict as he availed himself to look after the trees and water them during vacations. Furthermore, this contradiction also surfaced when teachers now had to incorporate tree planting and maintenance into their schedule of teaching a particular learning area, even though they have not been trained to do so. Even on the tree planting day, they had to stay for another hour at school to attend the talks and demonstrations by ORTDM. This led to a tension that manifest itself two-fold, through a critical conflict where some teachers now expressed their excitement of having stayed on for the program because they also learnt new things and are excited about this new venture in their school, and through a dilemma where they now had to figure out a way of communicating tree planting to learners even though that is currently not part of the curriculum. Responding to this, the following exchange ensued during an informal (because it was not part of an interview schedule) conversation:

Teacher 1: I wonder how we will incorporate this in the classroom. It is very important and I think the LO teachers can take a lead on this one.

Principal: We will figure out something. I need to check with the teachers first how much the natural environment is covered in their lessons and we can take it from there. We will figure it out.

An additional advantage to this dilemma was the workshop and demonstrations by the ORTDM. Both learners and teachers were present, and participated in all activities during the demonstration.

Quaternary contradictions

There was a contradiction between the DAFF activity system and the central activity system where unlike in the GreenChamps-M case study, the DAFF did not fulfill one of its objects of providing educational and information pamphlets regarding tree planting to the residents. Instead, the researcher prepared these and distributed them to the residents, learners and teachers. As such, members of the New-Chris activity system did not get as much information as those from the GreenChamps-M activity system. However, this did not deter their enthusiasm or commitment to their object.

There was a contradiction within the conceptual/mental mediating artefacts and tools in the New-Chris activity system and a neighbouring activity system of farming. The majority of residents in this activity system come from a rural background, and thus keep livestock, even though they live in residential areas not designed to accommodate livestock. This results in a conflict between keeping animals (rules) in the residential area, and the object of having a treed residential area (secondary contradiction). Describing this contradiction, the participants said:

Participant 4T: ... the reality is, none of us are from the urban area. We all came from the rural areas and were fortunate enough to benefit from the government by getting houses. We came here with our cultures and norms from rural areas, and that includes bringing our livestock. For many of us, that livestock is a form of livelihood. It cannot be that easy to tell people to get rid of their cows and goats to protect trees.

Participant 1T: We really need to speak about these cows. They even brush themselves on our walls. The livestock here is not looked after. Any trees or plants we plant will never survive. The cows roam around the entire township. You see at night, there are cows everywhere. People have even stopped planting vegetables because the livestock owners or shepherds let them out. Sometimes they are deliberately left to graze in someone's yard.

Researcher: Who do these cows belong to? Where are their owners?

LAUGHTER!

Participant 3T: The owners are there. You will sometimes find that you left your gate closed but when you get back there will be cows in your yard and the gate still closed. Which means somebody deliberately opened your gate for them.

Participant 5T: Sometimes they even use a pliers to cut your fencing to let their cows in.

Researcher: But, that is criminal activity. Yho!

This contradiction is a direct conflict with the recommendation for the double bind manifestation identified in the secondary contradiction described earlier. This created a critical conflict where residents realized that their suggestion might not work because of the illegal element attached to the grazing livestock. In this case, a mediating activity system of the Community Services department of Mhlontlo Local Municipality will be crucial. This is the department that deals with, among other things, livestock impounds, public parks and amenities, and waste management. Tree planting and/or protection is accommodated within these sub-sections.

Tension also surfaced in the municipality's object of enforcing by-laws regarding the impounding of livestock, and the rule mediating the object of the New-Chris activity system. In this contradiction, the municipality's failure to enforce its by-laws compromises the successful planting of trees in public spaces. Furthermore, the subject of the municipality, in their capacity as providers of service delivery, did not avail themselves as part of the community in anything that had to do with tree planting during the research process. This led the subject of the New-Chris activity system to conclude that the municipality was not interested in the town having trees. This served as motivation for them to champion the practice in their town.

Another contradiction between the New-Chris activity systems and the municipality surfaced with regards to the municipality's object of service delivery (tree planting being part of it). The municipality in this case study was not involved at all in the research process, despite attempts made to include them. However, between the ward councilor and an official in the municipality, it was made clear that the municipality does not plant trees in residential areas, and no one was available to participate in such activities. Furthermore, the representatives from this municipality were not engaging with the Municipal Systems Act (2000) with regards to community development programs, their role and relationship with the residents or community at large. This contradiction was apparent in the rules of that activity system and what the municipality actually does or does not do on the

ground. This breakdown in municipal functioning had a direct influence to the object of the New-Chris activity system which could have meant that more people are reached in both residential areas. While the district municipality was there, their role is mostly to support the local municipality and cannot be expected to be as familiar with the residential areas and their dynamics more than the local municipality does, and their presence does not substitute the local municipality. Table 7.2 presents a summary of these contradictions. In summary, tree planting in the central and neighbouring activity systems in the Tsolo case study was characterized by primary, secondary, tertiary, and quaternary contradictions.

Table 7.2: A summary of surfacing contradictions in the tree planting activity systems in the Tsolo case study.

Level of contradiction	Description of surfacing contradiction
Primary contradictions	Subject of the New-Chris activity system: livestock-keeping by some residents and subjects.
	Rules of municipality activity system: municipality is not enforcing by-laws regarding the keeping of livestock in urban areas.
	Community element of Residency JSS activity system: the diversity in the learner population regarding where they live regarding the distribution of trees- the trees cannot only be given to learners from low-cost housing areas.
Secondary contradictions	Community-Physical mediating artefacts-Object-Outcome of New-Chris activity system: associated with the vandalism of trees previously planted elsewhere because of frustration with the municipality for not providing houses.
Tertiary contradictions	Between old school activity system and new school activity system: Rules in old activity system where rules and the curriculum of schools as well as the timetable of the school are set by the government, and the tools and object of the new activity system where learners cannot water trees during vacation breaks.
Quaternary contradictions	DAFF activity system and New-Chris activity system: no provision of education material by the DAFF to the subjects and community of New-Chris activity system as per the guidelines set by the department.
	Conceptual/mental mediating artefacts and tools in the New-Chris activity system and a neighbouring activity system of farming: Residents in central activity system come from a rural background, and thus keep livestock, even though they live in residential areas not designed to accommodate livestock.
	Municipality's object of enforcing by-laws regarding the impounding of livestock, and the rule mediating the object of the New-Chris activity system.

7.3.3 Surfacing contradictions in the Grahamstown case study

The Extension 10 Greening Group activity system was characterized by primary, secondary, tertiary, and quaternary contradictions. The heuristic representation of the positions of these contradictions is provided in Figure 7.3. Red arrows represent primary contradictions, yellow represents secondary contradictions, blue represents tertiary contradictions and green represents quaternary contradictions.

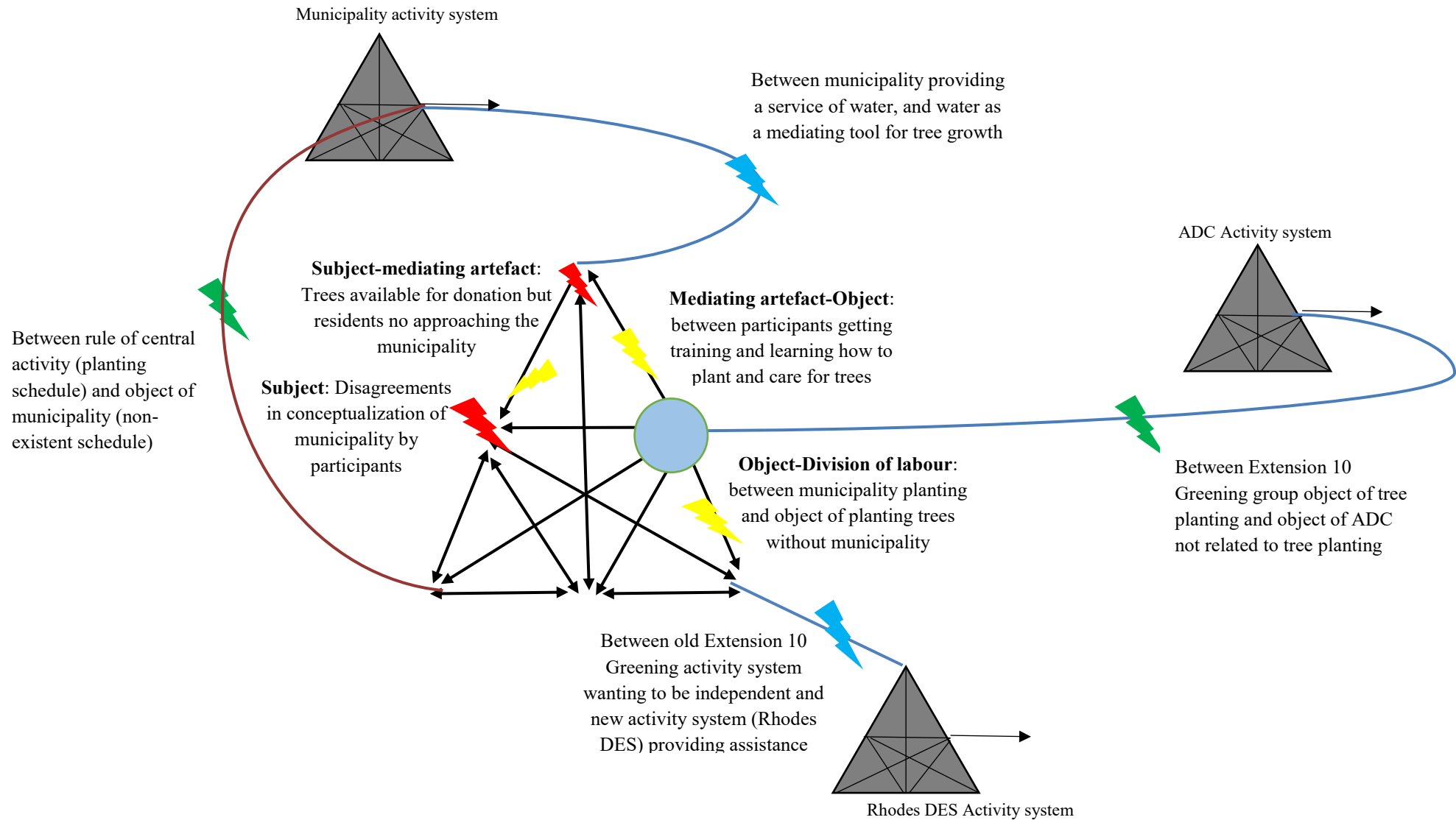


Figure 7.3: A representation of surfacing contradictions associated with tree planting in the Grahamstown case study. Different colours on connections (lines) mean that there is no relationship between any intersecting lines, the source of contradictions is just the same, and similar colours do not depict a form of relation.

Primary contradictions

In assigning tree planting responsibility for the private space, a primary contradiction emerged from the subject regarding who the municipality is, thereby creating some uncertainty about whose responsibility it is. In this description, some participants saw it as an institution that can act as a mediating artefact, while others saw it as a combination of everybody (including the subject) in the respective geographical area. In this regard, the following engagement ensued:

Participant 3G: *Everybody should plant trees.*

Researcher: *What do you mean everybody?*

Participant 3G: *Everybody is me, and it is you. The municipality is made up of me and you, and anything that is meant to be done by the municipality is supposed to start with everybody. I think that the municipality is everybody. It does not just become the municipality out of the blue. A child is born. Then there is a family. From that family comes a village, and ultimately the nation. A municipality begins with one person then it becomes everybody. The municipality starts from the grassroots. There is no municipality without you and me.*

Researcher: *I agree with you. The municipality was put in place because there is you and me. There are people in this town. So, it plays a governing institution, to govern the people who live in it. It has a mayor, a speaker, a manager etc. That is the kind of institution.*

Participant 3G: *That thing you are talking about comes from the grass roots. It comes from the child and the family and a village then a person.*

*****some agitation and restlessness in the room*****

Participant 2G: *This is going nowhere. We are talking unnecessary politics now. Let us move on.*

Participant 1G: *Can I not explain this, but rather put it like this- the municipality is the one who should be beautifying this town in all spaces whether private or public, but especially on the streets. They are failing dismally at it. Now, what I think would be best for us to fully answer this question is to ask: What else do people think can be done and by whom, considering that the municipality is failing, to make our town and suburb look the way we want it to look like? I hope I am clear enough. How can we get trees planted in this town and suburbs?*

Participant 6G: *In all honesty, we cannot expect the municipality to plant trees for us in our yards. How does the municipality benefit from that? We know how selfish they are so they would not just do something unless it benefits them somehow. I have a garden at home and I make the effort to plant, even though some of my trees have died, I have a new one now and I am sure that the skills I get here will help me protect. We should not expect everything from the municipality. I can show you how my garden looks like and you can take some tips.*

This contradiction manifest as a conflict, where the first resolution came from one participant modifying what needs to be discussed (See Participant 1G at the end). This resulted in a more engaged discussion that then led to the emergence of a secondary contradiction connected to the supply of physical mediating artefacts and tools. A second resolution came from Participant 6G who encouraged people to plant trees in their gardens themselves, and invited other participants to visit her home and see the garden.

The dire lack of resources, including trees, and the subject's inability to mobilize the resources without intervention from any entity was a contradiction within the material/physical artefacts and tools of the Extension 10 Greening Group activity system. This contradiction manifest itself as a critical conflict as participants now had to admit the need for assistance elsewhere. Participants expressed that they could

not afford to buy trees, and another participant suggested that they could approach the municipality and not have to pay for them. This was evidenced in the following extract:

Participant 11G: *I have a question, if myself (sic) does not have money to buy a tree, whose responsibility does it then become to plant the tree? I want the tree but cannot afford it, what then?*

Participant 1G: *I hear you. But still, I do not remember a time when people could not get trees when they went to ask for them from the municipality. For example, in this pre-school next to the post office, they did go to the municipality to ask for trees. They realised that the people at the municipality who are meant to be giving them the trees were not available. But at the end, they did get some trees even if it was after a long time. When you go the municipality, you have to meet with someone there who will know which trees to give you. Even if you want to borrow the trees for a day to decorate in an event, they give you.*

Participant 11G: *I hear you saying that the trees are freely available in the municipality. That is you talking. Now I am talking for myself as just a common citizen who does not know anyone in the municipality and is not known. If I go to that section that has the trees and I am told that there are no trees or we do not give away trees for an individual. I have heard that trees are hardly given to an individual person but a group. If I do not get the tree, I will be discouraged from planting.*

Secondary contradictions

A secondary contradiction surfaced between the mediating artefacts and object. Participants indicated that they need to learn through demonstrations how to plant and care for trees. However, before those could be carried out, some participants complained that they had been talking too much and they just want to get trees and plant. This was evidenced in the following extracts from two discussions:

Participant 1G: *I am very happy that you are here now to teach about trees because it means that we will understand why we should have the trees and learn how to plant. At least now that we know our municipality does not care, we have someone to help us*

Participant 3G: *You know, things rarely succeed in this township. It is because of all this talking. We have been talking and talking non-stop, but we are not planting. We came here to plant trees, and I think that is what we must do.*

Researcher: *But there are so many things we still need to go through, and we have not even invited someone to show us how to plant yet.*

Participant 9G: *We should not waste time. We need to show the municipality that we can do this ourselves.*

This contradiction also manifest itself through action, where the participants did not allow for the thorough planning (by them) of an Arbor Month celebration which they suggested to host. The consensus among them was that a school needs to be identified as soon as possible where trees will be planted and show the community that we are really planting trees. As a researcher, I followed their direction.

This activity system also exhibited a secondary contradiction between the object and division of labour. In their description of whose role it is to plant trees, participants did not differentiate between the public and private spaces. Consequently, they attached the role for tree planting to the municipality. However, they also said their object is to carry out a tree planting project independently of the municipality. This is evidenced in the extracts below:

a. Extract 1: municipality responsible for tree planting

Participant 1G: *I think tree planting is the responsibility of the municipality.*

Researcher: *Why do you say so?*

Participant 1G: *Firstly, the municipality is government and they are responsible for the upkeep of this town. Tree planting is part of the upkeep of this town so they must do it.*

Participant 3G: *I do not think it is the municipality or government alone. I am inclined to say "nobody", wherein to reverse that it is nobody's role, but everybody's responsibility.*

Participant 2G: *I fully disagree with this notion of everybody. The municipality has a duty without the involvement of NGOs and the community, to beautify their town. There are competitions for such, and some municipalities even get prizes for that. The municipality has a duty to protect its legacy as well. Back in 1998, our town won an award for being the greenest and most beautiful town. Grahamstown is an important town in all of South Africa. There used to be trees planted here in many places. However, that situation has changed because our municipality does not care and it is dysfunctional. It is their duty. As the community, we can put in an effort here and there, but ultimately, it is the role of the municipality.*

Participant 4G: *I wanted to support the notion of everybody because for there to be trees, it will be planted and maintained by a person. The municipality can plant, it will not really have anyone to maintain because they will be planting for us. They plant for us because we do not know which trees to plant or where to plant them. The municipality knows.*

Participant 1G: *I am still saying it is the duty of the municipality because at the end of the day, if we can all notice our municipality does not care about this town as a whole. They only focus on a certain few areas. For example, the areas closer to the hospital are well greened, but as you get into Grahamstown from the township it is just ugly and bare. Instead of trees being planted, the trees are being cut down. What I see is that the very municipality that is meant to take care of our town is very selective of which areas to take care of. Same applies with the trees.*

Participant 7G: *I also say that it is the municipality. They are doing it in those white areas close to town, so they should be doing it here too. You cannot be telling me that all those people there thought they should each plant trees. I am sure somebody did it for them. The person who can do that is the municipality.*

b. Extract 2: Suggestion to plant trees without the municipality

Participant 1G: *Our municipality is useless if we want to speak the truth. If we would go to them now and tell them about this tree planting thing, they will steal that idea if it makes sense to them and make it seem like someone who works at the municipality came up with it. I do not like that. What we need to do as members of this community is to stand together and agree that no municipal official will come here and disrupt us. We can do this on our own. Take for example the ward councilor. If he was interested in anything that has to do with us as a community, he would be here with us right now, or at the very least making regular visits here to find out how far we are and what have we done, but none of that is happening. He is not interested in us or whatever it is that we are doing.*

This contradiction was manifested through a double blind, where participants acknowledged the shortfall of the current structure that is supposed to be planting trees. As an alternative to that, the participants put themselves forward as a solution, proposing to do tree planting as a community without intervention or assistance from the municipality.

Tertiary contradictions

According to participants, the arrival of an intervention (mediating artefact) from Rhodes DES in their 'plight of not having trees' was a welcome intervention in the existing activity system. This came as an

admission that while the participants would encourage residents to embrace tree planting on their own without intervention from the municipality, they acknowledged that they would need help in this regard, and Rhodes DES and Umthathi training project (division of labour) would provide this help. Therefore, this became a tertiary contradiction that manifests itself as a conflict, wherein participants initially criticized a neighbouring activity system and wanting to do everything on their own, but later found a compromise and suggested assistance from elsewhere. One of the participants communicated this saying:

Participant 1G: *I think with all the failure of the municipality and everything happening in this town and the lack of trees in our suburb, we have found someone who has thought of our situation and wants to help us plant trees. It will then be that person who will have to see how we get those trees.*

Participant 10G: *There is also Umthathi up there. I am sure they too can help here and there.*

Grahamstown has been known to experience problems with water supply for a long time. Residents in low-cost housing areas are especially affected by this. As a result, tension arose within the mediating artefacts, of the prospect of planting trees which will need to be taken care of and watered regularly, and the scarcity of water which is part of a neighbouring activity system's object of service delivery. According to the participants:

Participant 1G: *There is never water in this area. Every single day we wake up to dry taps. Sometimes when we wake up the water is there, but later on in the day it disappears.*

Researcher: *Do you pay for this water or it is provided by the municipality for free?*

Participant 2G: *no one pays for water here.*

Participant 9G: *This water is also sometimes dangerous because of all this consistent cutting off because some people work and when they come back their homes are flooded after the water came back.*

Participant 2G: *Sometimes the water is closed off for two weeks without any communication. Imagine that situation now? The trees will be dead by then.*

Researcher: *Then what do you do in those instances?*

Participant 1G: *We have to go get water with buckets from the dam. We cannot use that water for anything else besides cooking, drinking and bathing. Sometimes we even have to be carrying 2L bottles everywhere you go because of this water issue. Some people might even think we are carrying holy water.... [Laughter in room].*

The conversation above presented me with an opportunity to discuss some water use and saving tips with the group. These were associated with using grey water, especially from bathing, to water the trees, and that trees do not have to be watered every day, as we would soon learn during a tree planting demonstration. This was a tertiary contradiction as a new 'technology' or way of doing things was suggested to achieve the object. Responding to these points, the participants said:

Participant 11G: *If the municipality would just do their job properly, we would not even have to put such measures in place. Using dirty water for anything is not desirable even though it might be good. They should check themselves.*

Participant 10G: *I disagree with you Nhana. Even if trees do not need to be watered every day, they still do need some special care and watering in the first 2-3 weeks of planting because they need to firmly grow their roots and be intact with the soil. To do that, the roots must grow and they need water.*

Participant 5G: *At least we have someone here with us who can teach us about planting trees and not wait for someone from outside.*

Quaternary contradictions

Quaternary contradictions surfaced between the Extension 10 Greening Group as a central activity system and the object of the ADC. The object of the ADC is focussed on skills development for entrepreneurship and business for young people. However, through their commitment to working with the Grahamstown community they were able to let us use their facilities for something that was not related to their business. This created opportunities for passers-by to be aware of a tree planting initiative currently under-way, as led to conversations about the importance of trees between the participants and the EPWP workers assigned to the ADC.

Another quaternary contradiction arose between the rules of the central activity system, and the object of the municipal activity system that is concerned with developing a schedule for tree planting and maintenance around the town. This prompted a contradiction because there is no such schedule on paper or on the ground, and it seems like the current procedure in tree planting in the town has to do with residents' complaints about certain trees, or individuals' requesting for trees. Unfortunately, these are also only experienced in the more affluent areas and not the low-cost housing areas. Furthermore, the tree planting schedule is supposed to be mediating the activity of the central activity system, but it is not mediating anything because it is absent in reality, creating a gap in the activity.

Similarly to the Tsolo case study, the municipality in the Grahamstown case study was barely engaged in the research process. They donated some trees (these were not offered by the municipality, the researcher approached the municipality on behalf of the participants despite the municipality's knowledge of what was happening and prior conversations that suggested that the municipality is interested in the research) and demonstrated the process of tree planting to the participants, but nothing beyond that. However, the local municipality has been going through a series of problems over the last few years and there have been recent calls for it to be put under administration. Table 7.3 presents a summary of the contradictions surfacing in the Grahamstown case study. In summary, tree planting in the central and neighbouring activity systems in the Grahamstown case study was characterized by primary, secondary, tertiary, and quaternary contradictions.

Table 7.3: A summary of surfacing contradictions in the tree planting activity systems in the Grahamstown case study (continues on next page).

Level of contradiction	Description of surfacing contradiction
Primary contradictions	Subject: disagreement on the responsibility to plant in private and public spaces.
	Mediating artefact and tools: Lack of resources and residents' inability to source those resources.
Secondary contradictions	Mediating artefact and tools, and object: residents wanting to learn as an object, but not willing to learn to mediate the activity.
	Object and division of labour: carry out tree planting independently of the municipality, but also attach responsibility to

	the municipality.
Tertiary contradictions	Mediating artefact and tool from neighbouring activity systems and object of central activity: intervention from Rhodes DES for object of tree planting.
	Tree planting and water scarcity
Quaternary contradictions	Central activity system and object of neighbouring activity system: object of ADC not related to tree planting but accommodating the central activity system.
	Rule of central activity system and object of neighbouring activity system: a tree planting schedule that is a rule the central activity systems needs to consider, but the non-existence of the tree planting schedule as one of the objects of the municipality activity system.

7.4 Expansive transformations across case studies

The contradictions that surfaced across case studies prompted an expansive transformation cycle which highlighted potential areas of development. Altogether, this study represents the first two phases of the expansive learning cycle (highlighted) which begins with questioning (Fig. 7.4), and this chapter signals the second phase of the cycle that is concerned with the analysis of contradictions.

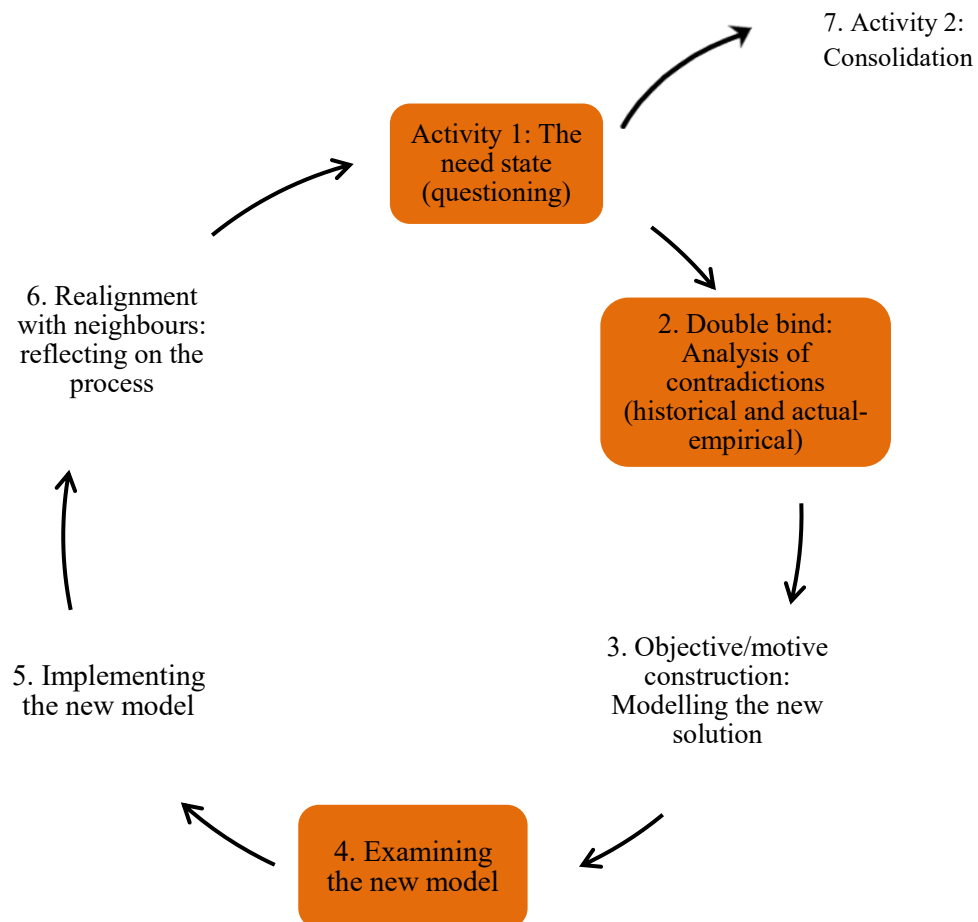


Figure 7.4: The expansive learning cycle represented by this study signaling the potential for future research in tree planting for low-cost housing areas.

The manifestations of contradictions highlighted across case studies present possible resolutions to tensions characterizing the planting of trees. Although this model appears to be sequential, that is not always the case in real-life, and this was evident in this study. In attempting to be role-players in tree planting for their suburbs, the subjects of the central activity systems across all three case studies brainstormed a model for tree planting where they would champion the practice in their respective residential areas, regardless of the barriers and surfacing contradictions highlighted. This was in response to how community participation can contribute to the effective greening of low-cost housing. In the excerpts below, the subjects of central activity systems expressed their suggestions for how a model for tree planting involving residents would work in a real situation.

Excerpt 1: Matatiele case study

Participant 9M: *The best thing to do if we are to be involved in tree planting for the public space like the street is that people should work in groups and be grouped by the streets they live in.*

Participant 3M: *That is very important and I second it because I also need to make sure that I am there to see everything that happens to the tree or trees. If I am then involved in a street that is not mine it will be very difficult to monitor what is happening to that tree.*

Participant 2M: *That is more possible because it will help in the long list of things that need to be done during tree planting, and different people will be assigned different duties and the tasks will be split.*

Participant 5M: *I hear you guys, but the thing is, some people do not know about this. What we can do first is set aside a day where we as a group could go from house to house telling people about trees and tree planting as a start. When we get there, we introduce ourselves and find out from them if they are aware of this project and these meetings. We would then tell them about the vision we have of planting trees in this suburb and enquire about their interest in the matter, while also encouraging them to support the venture either by being present or through whatever contribution they can make. By the way, that is where we will also be able to gauge interest within the entire community where we would note down the households that would like to fully participate or contribute in what ever way. That will also give us an idea of what proportion of this community is open to having trees planted in the public and private spaces, and that information will assist greatly in the formulation of how we do it, going forward. Some people really do not know that there is something going on such as this in their residential area, so the door-to-door will also serve as awareness for them.*

Participant 9M: *But we must also be careful when doing that because its success also depends on whether we tell them more about what they will be getting out of it than anything else. People are interested in results rather than the process. They are always in something in order to benefit from it.*

Participant 1M: *Sometimes there are people who are in support of certain programmes and those who are not. In many cases, those who are not in support it is usually because they have limited understanding of what is going on, and once a programme starts rolling out they come on board and admit that they are coming because they can see that it is happening. So it really has to do with information and people knowing the details of what is going on. They can mostly know by seeing trees planted. So, we need to show them so that they can mimic something they see. That is how we get people to do what is needed.*

Participant 9M: *I support the one of door-to-door the most. The issue with spreading the message by doing will take so long and there is really no guarantee that your neighbour will ask you anything. The trees take forever to grow so they might not see it immediately. Also, other people who are not your immediate neighbours might not see it.*

Participant 1M: *Yes, trees take forever to grow, but if for example we could all in this room each plant a tree for ourselves, there will definitely be a neighbor who will ask*

about it and maybe as for a tree too. That will mean two people now have trees, and then it spreads. We need just a few people to plant, and the message will spread to the broader community.

Participant 12M: I also think that by virtue of the communities we live in and the fact that most people living here are indigent, we qualify for services that do not need us to pay to get them. Tree planting can be classified as one such service. We need someone with the best expertise to help us develop a culture of tree planting in our areas. We cannot do it alone. The government and municipalities need to work with us to help us get that. Our reality is that we were never exposed to that culture, now that we are we need to be assisted to develop it. I am sure there is a government department that can help us. Even if universities can send their students to come and do their practicals in our communities it would make a difference. The students will also gain experience as much as they are here to help us. We can even do the digging ourselves because we have been taught, and maybe plant some for a few people too.

Participant 6M: No, I disagree. There is also the reality that we cannot do stuff for people who work and have jobs. I have no job and I would never plant a tree for someone with a job who will not pay me to do so. For the old and sick, we are obliged to help them. It is Ubuntu.

Participant 12M: Those who have learnt and attended workshops should teach those who did not. We can do this by showing them through us first planting- for myself and my granny neighbor.

Participant 12M: Well, this can work because at the end of the day this will have been a collective project where everyone is part of, which means everyone is responsible for the upkeep of the trees too. If really everyone is in it, then we should be able to have maybe 100 trees surviving after a month.

Excerpt 2: Tsolo case study

Participant 3T: With all the cows in this area and how rural everybody is, I think it would be best to start small. Unlike in other big cities, tree planting for our streets and homes will take a very long time here. You must remember that we are all very rural.

Participant 1T: But what does rural have to do with anything? There are trees in rural areas too and people are familiar with them.

Participant 4T: I think what mam Thandi is saying is that we have many more challenges than the bigger towns. Like we cannot tell people not to keep their animals, but also the same people defeat us because they are criminals and do not take care of their animals.

Participant 1T: In that case then maybe we can start by asking for a piece of land around here, there are many other stakeholders that may come on board which will enable for the initiative to expand. Schools can fit perfectly in this. We can involve school kids to be part of the garden especially those that do Agricultural Sciences, then the schools could be stakeholders.

Participant 6T: That piece of land by the graves where people dump rubbish would work. We can do something like a park or a garden there. There is no way that the municipality will not help us if they see that we are working hard and we are working on something that will benefit everybody.

Participant 9T: I also think it would be successful because we would be the ones planting the trees.

Researcher: So would we have to be the ones doing the cleaning of that area and planting the trees? Are there any guarantees that people will like what we do?

Participant 9T: There is no other way because at the end of the day we are the ones trying to introduce something new to the people, and we want the trees to grow ultimately.

Participant 1T: That goes back to the man we watched in the movie the other day. That man did not go around planting trees for people but planted in his own yard and it was beautiful. Now that it is so beautiful the neighbours have also bought into the idea and are planting their own. That is the effect our garden or park will have. People will see it because they pass through there everyday. The difference now is that they will not be

fearing for their lives or shutting their nose because of the smell, but may just sit under the tree and relax.

Participant 6T: Yes. Also in support of mama, when those trees have been planted and that garden established, there will be people who will want to visit it. Tourists will definitely want to go see it, and it can be one of the landmarks in our town. What would then be more special about it is that it will be a beautiful garden in the middle of a low-cost housing area, something that hardly happens. That way, even the project itself would grow and more gardens would be established.

Excerpt 3: Grahamstown case study

Participant 7G: I think the focus should first be just about us planting in our own yards. We can all agree that our municipality is useless, but I am sure that at the end of the day the trees will be planted. The position does not matter. It can even be possible that the municipality might step in and take care of their streets when they see us as community members doing something about our own yards.

Participant 2G: I think what would work both ways, for us and the municipality for the public space is to really work with the municipality. I have no problem with buying the trees from the nursery in the parks department because I think they might even subsidize them so they can appear as though they are also doing something for us here in the township. In that case, we can have something that says to the municipality that since they will be selling us the trees, they should also then look into the infrastructural and spatial plan of this suburb where we can have green areas in the public space. We can then have a system where if I buy one tree for my household, the municipality gives me another one for free. The free one will then be the one where a household can either choose to go plant in that public green area, or just in front of their yard as a street tree.

Participant 9G: That is a very good idea and it could work.

Participant 2G: Afterwards, we come together as this group to bring the community and together explain to them what is going on and what our plan is. The reality is that most people think this is a waste of time and that trees are not really good for us. They do not even believe that the trees will come because we have been coming here every week but we still do not have trees. Once we explain things to them, it will be much easier to get this suburb green. People need to be put in the green light about something that will happen before it even happens. When that is done, they are more likely to embrace what is happening and even be part of it. If they are not told, they will not care for it and see it as none of their business. If you do something without informing the public beforehand, you are inciting anger because people are poor and hungry.

Participant 9G: I have also already told a few people about what we are doing, and one of my neighbours keeps asking me when the trees will be coming. I keep telling him that we are still learning at the moment, and when we are ready to plant we will inform the public.

Participant 4G: I think the best way is if we can try something like an Arbor Day event as I suggested before, like bringing the town to its former glory. I believe this town has once won an award for being the greenest city in South Africa. Back then the Arbor Day celebration was popular. Let us bring that back first as it will attract people, then we can plant trees around schools and maybe the clinics around the township. People will be excited by that, and we can get donations to make sure that we buy trees to distribute to the attendees. The municipality can even supply those trees. It is the least they can do.

Participant 6G: Another thing we need to consider is that some people are not permanent residents in this suburb. Like myself, I am just a tenant where I stay so I am not really invested in things that have to do with the public. In the private space, yes maybe I can make an exception.

Participant 1G: I think in the meantime that the municipality is not doing its job we can approach an NGO to help us. There is Umthathi training project and they deal with plants and crops. I am sure they can contribute to helping us set up an Arbor Day celebration. The Makana Municipality only cares about White people, I do not know why

we pretend like we do not know. They should just see us doing our own thing and they will see that we are tired of asking them to serve us. I also think people will take this seriously when they see that it is driven by us as the community.

Participant 3G: *The mistake the municipality always makes is to make decisions for us. For example, there were trees planted for the 2010 world cup, and they were vandalized. It is not that people do not want trees. They do. Their behaviour is fueled by the nepotism that goes on in this municipality. You cannot just come to us and plant trees in our area without informing us or employing anyone from that community. We will definitely deny those trees, and show you by destroying them. We will make sure that your so-called project does not go anywhere, until you come to us and explain what is going on, and you make us a part of whatever it is that is going on. You cannot just come from wherever you came from and bully us here.*

The ideas expressed in the excerpts above point to residents' idea of how the tree planting would work in the real world, even though things did not work exactly like they had been planned. The idea of how the tree planting model would look like in the Mataiele case study involved the mobilization of residents through door-to-door information sharing exercises about tree planting and the importance of trees. The subject also raised a learning-by-doing method where community mobilization would entail a group of people first planting trees and demonstrating the legitimacy of a tree planting initiative where neighbours would then also copy the practice and consequently become aware. The subject in Tsolo was more interested in turning a space that is currently used as a dumpsite and turn it into a garden or park, as a way of communicating the message of tree planting to the broader community. They acknowledged that public space tree planting may not be feasible in their town. Finally, the subjects in the Grahamstown case study brought two suggestions. First, for municipality to subsidise the trees and for each buyer to get another one for free to plant in the public space. Secondly, for the hosting of an Arbor Day event in conjunction with the local NGO where information about trees would be communicated. All these plans evolved and changed with time.

7.5 Discussion

In this study I employed an activity theory perspective to explore the surfacing contradictions in activity systems associated with tree planting in selected low-cost housing areas. I found that tree planting initiatives are characterized by at least three activity systems (Chapter 6), including the residents who are championing tree planting, the local municipality, and a community-based organization or institution, which each exhibit a variety of contradictions that offer opportunities for transformation and innovation. These activity systems vary based on the individual context, and the agency possessed by various stakeholders.

Contradictions, conflict and discoordination are inevitable in the functioning of any system, and represent starting points (Foot, 2014), and overcoming contradictions is key to changing the system (Núñez, 2009). The surfacing contradictions in this study should not be viewed as problems, but rather as opportunities for change as they indicate the potential for innovation (Engeström, 2001) in urban forestry, and tailoring the initiatives to a context where people prioritize other needs such as shelter and food (Gwedla and

Shackleton, 2015) more than tree planting. Firstly, the contradictions emergent in this study suggest that municipalities need to be more intent in their implementation and enforcement of by-laws. Specifically, the by-laws related to urban trees and greenspaces, and those associated with where people can plant trees and where or how they can keep animals apply. Livestock in urban areas poses risk to the successful establishment of trees as they tend to damage them (Shackleton et al., 2017b), and the presence of livestock was a consistent barrier in one of the case studies. Furthermore, by-laws related to urban trees and green spaces barely exist in most municipalities. In terms of locations for planted trees, evidence shows that many municipalities barely have environmental plans that situate tree planting within the general agenda of environmental services to be rendered by the municipality (Chishaleshale et al., 2015). Thus, the setting up of environmental or tree planting plans could be the first innovation, as this will put trees within the agenda of service delivery. Although it may have been an exceptional case, Roman et al. (2015) reported that each of the planting two projects they analyzed in Philadelphia had detailed planting plans, closely supervised planting events, and frequent maintenance post-planting. The implication of this was a high survival rate of established urban trees. The absence of plans and tree planting schedules was also related to a dysfunctional relationship and miscommunication between the municipality and the DAFF regarding urban greening plans, where the municipality put all responsibility associated with tree planting to the DAFF. Young (2011) and Breger et al. (2019) also reported that the development and availability of stewardship plans which outline responsibilities and the flow of communication and resources amongst actors before tree planting commences is an important aspect for successful and sustainable tree planting, especially with regards to stewardship coordination.

The strongest contradiction apparent in this study was the absence of the local municipality both as a mediating activity system as a whole, and as a contributor to the various elements of central activity systems, such as the allocation of space for planting. This contradiction is synonymous with the alleged municipal incompetence highlighted by households as a barrier to public space tree planting in Chapter 5. Municipal managers are highly influential in the decisions related to urban forests and are responsible for resolving the demands being placed on public urban trees (Ordóñez et al., 2020). Thus, their shortcomings in participating in tree planting initiatives, or continuously championing tree planting in their towns and municipalities compromised the efficient and successful planting of trees to some degree. Generally, municipalities, non-profit groups, and state government agencies devote significant resources toward tree planting initiatives (Pincetl et al., 2013). Such resources were not available in the case studies examined in this study, and the findings demonstrate that tree planting is a marginalized practice where municipalities barely implement plans related to urban greening, or participate in otherwise externally organized initiatives. Evidence of this can be seen in the contradictions within the mediating artefacts and the division of labour in both the central activity systems and those of local municipalities. This is consistent with results presented in Chapter 5 regarding the lack of resources such as funding and equipment as barriers to public space tree planting.

The contradiction regarding the uncertainty of the responsibility for tree planting points to a common dilemma in urban forestry which often sees residents exonerating themselves of such duty and responsibility, especially for planting in public spaces and without an external agent. Zhang et al. (2007) also reported that most people in Alabama considered the promotion and development of urban forestry as the responsibility of the local, state or federal government. This speaks to residents' lack of agency, as discussed in Chapter 6. In this regard, the capabilities humans possess should not be judged, evaluated or considered by the resources they have, but rather their actions in time and space, or what they are willing and able to do to improve their circumstances (Walker, 2005).

With regards to the emerging contradictions associated with culture and norms attached to certain trees, and the scarcity of water, attention needs to be brought to the importance of selecting the correct and suitable trees to plant. In this regard, indigenous trees become the most suitable options. South Africa is naturally prone to drought (Gibberd et al., 1996), and has experienced the combined effects of a severe drought and a strong El Niño event between 2015 and 2016 (Baudoin et al., 2017). However, the shortfalls in service delivery associated with the provision of water by some municipalities also exert pressure on the already limited resource. As such, it may be plausible that some residents would be skeptical of using the little water they have to maintain trees. Gwedla (2016) previously reported that in selecting species for public space planting, horticulturists considered the root system of the prospective species, the eventual size or shape of the species, whether alien or indigenous, the species' adaptability to the climate of the respective town, and its water requirements. The planting of native species is also important to appease residents' cultural preferences. Doody et al. (2010) found that 54% of their sample of residents in New Zealand, were prepared to plant a native species found in a local urban forest remnant in their garden, a pattern that was later corroborated by Shaw et al. (2017). The contradictions associated with culture and water scarcity offered opportunities for learning within the group, which offered suggestions for overcoming the contradictions. This can be regarded as one of the strengths, synergies, and successes (Olvitt, 2010) of engaging residents in a process of tree planting, as opposed to just highlighting tensions, disruptions and problematic areas in a system.

As previously indicated, contradictions allow for transformation and innovation. There were not many contradictions in the Grahamstown case study. However, the few contradictions which surfaced were wide-reaching. The signals in the contradictions of this study were that more actors and stakeholders were needed for a more effective tree planting initiative that would reach the broader community. The URFG framework proposed by Lawrence et al. (2013) highlights the importance of a variety of stakeholders in the effective governance of urban forests. Urban forestry emphasises the importance of communication and collaboration between various stakeholders, ranging from information to participation/power sharing (Janse and Konijnendijk, 2007). The nature of the present actors in the Grahamstown case study did not give the activity system opportunity to grow. For example, while the ADC and Umthathi Training Projects were present organizations, their roles were not as pronounced and their contribution to fulfilling the object of tree planting did not materialize as would be expected.

The emerging contradictions were manifest in various ways, which gave actors opportunities to resolve the contradiction. The resolution of contradictions does not necessarily mean that something needed to be fixed. Rather, it means that actors were able to find alternatives to reaching an agreed goal. For example, a tertiary contradiction regarding the conflict of venue for the tree planting awareness day event being far from people meant that one group, which was the residents, felt negatively affected by another group, which was the municipality. In turn, this conflict meant that more people from other areas besides those intended were also able to benefit from the tree planting initiative. However, it also gave the actors from the municipality activity system an idea of the implications of their actions to the residents, giving them an opportunity to address this contradiction in future programs.

This study presents the potential for an expansive learning process. Expansive learning (Engeström, 2015) distinguishes itself by its focus on learning within and between activities in society at large, beyond the confines of a school, goes beyond the acquisition of well-established sets of knowledge and participation in relatively stable practices (Sannino et al., 2016). The learning and deliberations that took place across activity systems between the various subjects and communities was instrumental in resolving most surfacing contradictions, most of which were consequent of differential power relations both between institutions and between actors.

The contradictions associated with residents vandalizing previously planted trees in response to not having houses which surfaced in the Tsolo case study, together with residents desperately wanting to do things on their own without the municipality which surfaced in Grahamstown speak to the broader societal response to perceived lack of access to basic services, which is protest action (Chapter 1.1.5.1). According to Wafer (2020), the ability of the urban poor to claim the status of citizenship resides not in their ability to extract concessions from local gate-keepers for access to basic services not on the basis of their rights, but on their ability to make demands through protest and other forms of civic action. In this instance, residents in Tsolo believed that the municipality was failing to provide them with homes but instead wasted resources on planting trees along the street. Protests have become a recurrent feature of South Africa's political culture since 2004, and the protests against poor service delivery are exacerbated by the growing inequality and poverty in South African societies (Chikulo, 2016). In the Grahamstown case, the protests were in the form of boycotting the municipality and opting to do something on their own, and the perception that the municipality only serves the elite proportion of the Grahamstown population, which included the residents that live in affluent areas characterized by leafy-green streets and public spaces such as parks.

The first step of the expansive learning cycle in this study catalyzed an identification of the surfacing contradiction between and within various activity systems associated with tree planting in various case studies, which provided a platform to for various subjects to begin learning actions in their quest to fulfill the object of tree planting. This cycle began with a questioning of current practices associated with urban tree planting, the distribution of trees, and why that distribution is as such. This phase of the cycle

assisted in turning focus to the root causes of the problems that are preventing transformation from occurring (Lindley and Lotz-Sisitka, 2019), which in the context of this study is urban forest development in low-cost housing areas. This analysis of the problem led to a quest for a learning action of deeply analyzing the cultural and historical origins of current practices following onto more detailed and better articulated questioning of the existing practices, through the identification of contradictions and tensions associated with mediating the activity of tree planting, a process where new opportunities and more informed practice potentially begin to emerge (Lindley and Lotz-Sisitka, 2019). The implication of this for tree planting is that new forms of sustainably retaining trees in low-cost housing areas, through collaborative efforts between stakeholders and role players, can be realized.

7.6 Conclusion

Activity systems are historically evolving systems that are characterized by contradictions. In analyzing these contradictions, focus was put on the central activity system and how it is affected by actions, or lack thereof, in neighbouring activity systems. This study presented contradictions surfacing at the primary, secondary, tertiary, and quaternary levels across all three case studies. The most common contradictions alluded to the failure of neighbouring activity systems (the municipality, and the DAFF activity systems) to mediate the activity for tree planting because of non-existent plans such as tree planting schedules, lack of educational material as per the object of the neighbouring system, uncertainty about the responsibility to plant trees considering that they are an aspect of service delivery, and the failure to enforce by-laws. This provided evidence that the historic development of rules and mediating artefacts and tools associated with tree planting within and between interacting activity systems influences urban forest development and consequently governance (Olvitt, 2010). The process of analyzing surfacing contradictions has led to a better understanding of the processes that may affect the success or failure of tree planting initiatives, and how the actors and their actions affect such initiatives.

PART III CONCLUDING DISCUSSION

Chapter 8

Synthesis, implications, reflections, and recommendations for further research



Members of the GreenChamps-M group with attendees of the Tree Planting Awareness Day event held in Matatiele as part of this study. Picture taken by the Communications Department of the Mtataiele Local Municipality (2018).

8.1 Introduction

Low-cost housing areas in South Africa generally lack green infrastructure, including urban green spaces and trees in the private and public spaces such as streets (Gwedla and Shackleton, 2017; Kuruneri-Chitepo and Shackleton, 2011; McConnachie and Shackleton, 2010), which offer a host of benefits and contribute to the sustainability of urban areas. Thus, a better understanding of the constraints to and opportunities to be explored in having trees planted in these areas is crucial. Who is mandated to plant trees in urban areas of South Africa? What is the extent of tree abundance in the public and private spaces of low-cost housing areas? What are the barriers to, and enablers of, tree planting in the private and public spaces of low-cost housing areas? What processes, experiences and activities characterize the participatory planting of trees in a low-cost housing context? These are some of the questions that have been addressed in Chapter 3 to Chapter 7 of this study. Drawing this thesis to a close, I remind the reader of the key findings as presented in the empirical chapters, reflect on the research process and significance of my research, and conclude with recommendations for policy, practice, and future research related to participatory tree planting for South African low-cost housing areas.

This study set out to contribute to a better understanding of what constrains tree planting, and what best practices can be considered to enable it both at household and at neighbourhood scales. This was to fulfill the aim of theoretically and practically investigating the existing or new participatory learning approaches

to address barriers to, and enhance enablers of, tree planting in low-cost housing areas of small to medium-sized South African towns. To do this, the study set out to:

1. Compare and assess the characteristics of tree planting programmes initiated in low-cost housing areas in South Africa within the last 5-10 years;
2. Outline the perspectives of residents from old and new low-cost housing areas and municipal officials regarding the distribution and need for trees in their suburbs, and their willingness to change the status quo;
3. Investigate the barriers to, and enablers of tree planting in low-cost housing areas from residents' and municipal officials' perspectives;
4. Design and test means of engaging local residents and other stakeholders in participatory urban tree planting for low-cost housing areas.

8.2 Key findings

8.2.1 Urban tree planting landscapes in South Africa

Based on Objective 1, Chapter 3 delineates the urban tree planting landscapes in South Africa, with focus on whose mandate it is to plant and maintain urban trees, the stakeholders typically involved, and the channels through which they are involved. This was illustrated using ten examples of tree planting programs that had been initiated in low-cost housing areas by different entities, including governmental and non-governmental entities.

The results show that tree planting in public spaces (roadside verges, boulevards, along streets, parks) primarily takes place through two different entities, namely the government (national and provincial departments, parastatals, and municipalities) and civil society (residents, CBOs, NGOs). The DAFF is the custodian of forestry in South Africa, and by extension urban forestry, and key sector departments, including the national and provincial departments of Education (DoE), Health (DoH), Human Settlements (DHS), and the former Department of Environmental Affairs (DEA) play supporting roles and collaborate with DAFF in various tree planting initiatives, depending on the scope and nature of initiatives.

The DAFF also collaborates with and supports broader civil society in tree planting initiatives, specifically for private space planting. Individual homeowners (residents) mainly drive private space tree planting, generally in accordance with municipal rules and by-laws. The Arbor Month celebrations are the highlight of urban tree planting in the country, and trees are dispensed to public institutions and urban residents. Formal tree planting in low-income housing areas is not widespread. This was evidenced by the general lack of programs and projects dedicated to tree planting in public spaces of low-cost housing areas in most municipalities across the country. An analysis of the 10 tree planting programs revealed five broad themes, including 1) the general overview of programs, 2) the locations for tree planting, 3)

community engagement, consultation and decision-making process before and during the programs, 4) the nature of residents' participation and involvement, and 5) the general outcomes of the initiatives.

A key message in this chapter is the importance of multiple actors and stakeholders in the planting of trees, and the importance of the residents' voices in the decision-making process. All the reviewed programs had multiple stakeholders involved. However, a recurring theme is the exclusion of residents in the decision-making regarding the need for trees, the species to select, or where to plant the trees. This could have contributed to the damage to trees expressed by representatives of the lead entities. The various outcomes from the initiatives also demonstrate the multi-faceted contributions urban greening initiatives may make to the community, including job creation, food security, environmental education, and skills development, among others.

8.2.2 Perspectives on the distribution of urban trees in public and private spaces of low-cost housing areas

Chapter 4 reveals the patterns of urban tree distribution in the public and private spaces of selected old and recently developed low-cost housing areas. Key results indicate a general lack of trees along streets of both the new and old low-cost housing areas. The results were consistent with Kuruneri-Chitepo and Shackleton (2011) and Gwedla and Shackleton (2017) who reported a general lack of street trees in low-cost housing areas. An assessment of the distribution of trees in private spaces revealed that most households reported having at least one tree in their yard. These patterns of tree distribution, specifically in the public space, were corroborated by municipal officials. They also resonate with Hungerford and Moussa (2017) who found that poorer neighbourhoods in Niamey, Niger, do not have trees along streets, but rather inside household spaces.

The results further show that in the face of the current distribution of trees, most respondents had also never participated in a tree planting program outside their yards. Simultaneously, municipal officials could not ascertain prior involvement of residents in tree planting initiatives, and indicated that their municipalities do not host such programs. Despite this, the majority of respondents indicated that they would be willing to participate in a tree planting program in their residential area in the future. In their willingness to participate, the most preferred activities include planting, maintenance and care of planted trees, other activities such as recruiting people to the activities, and digging holes.

Without the provision of a pre-populated list of reasons to respondents, the most popular reasons for willingness to participate included the desire to beautify the suburb, having little else to do, to get the benefits of trees and learn more about trees and planting, and to gain work experience. The desire for benefits of trees had previously been reported by Armstrong (2000) for residents in New York, and Locke et al. (2015) found that residents from New Haven, USA, ranked aesthetics as the most important reasons to plant trees. On the other hand, the most popular reasons for unwillingness to participate included the unwillingness to work without pay, old age and ill health, having a job and hence little time, and hardly

available. Brady et al. (1995) also noted similar reasons in their conceptual model on reasons not to volunteer. The unwillingness to participate because of no pay is also not surprising considering the poverty and unemployment realities of many residents in low-cost housing areas.

Given the general lack of trees and residents' willingness to participate in tree planting, there was no indication of previous conversations between the municipality and the residents regarding the inclusion of tree planting in the municipal IDP. However, a review of the municipal IDPs revealed that at least two municipalities had reported on tree planting, but only one had it as a plan for the future. Additionally, some officials indicated that they are hardly involved in the IDP process, and thus have no way of motivating for the inclusion of tree planting in the plans.

8.2.3 Barriers to, and enablers of, tree planting in low-cost housing areas

Chapter 5 outlines the barriers to, and enablers of, tree planting in the private and public spaces of low-cost housing areas. Key results reveal that in addition to limited space for planting, resource barriers, including lack of funds, are the most prevalent for both private and public space planting, while municipal incompetence was identified as a key barrier to public space planting. Municipal officials were more concerned about lack of space in private spaces, limited funds for public space planting and the lack of communication between various departments within municipalities. These barriers are consistent with those experienced elsewhere, e.g. Driscoll et al. (2015) in the Portland- Vancouver metropolitan region, Jim et al. (2018) for compact cities undergoing densification, Kronenberg (2015) in Poland, Ng et al. (2012b) in Hong Kong, Nguyen et al. (2017) in the USA, Ottitsch and Krott (2005) in relation to urban forest policies, Ries et al. (2007) in Oregon, USA.

On the other hand, the availability of funds was identified as a possible enabler of tree planting in the private space by residents, while the enlisting of community skills sets was suggested for public space tree planting. Assistance from communities for tree works is important in both sustained and developing tree planting programs (Stevenson et al., 2008). Municipal officials were in agreement with the injection of funds for both private and public space planting, and suggested that education and awareness could also enable private and public space planting.

8.2.4 Engaging multiple stakeholders in participatory learning for tree planting in low-cost housing areas

Chapter 6 presents the characteristics of tree planting initiatives in low-cost housing areas, through an activity systems lens across three case studies. The central activity system in these case studies addressed the object of the residents and the researcher as they were the ones who set out to champion tree planting. Members of the community element in the activity systems include local municipalities, the provincial DAFF, local schools, the district municipality, and in one case an NGO. These are the institutions that were meant to play a part (and those that did not), in the activities associated with the initiatives. The

activity systems all suggest that the mediating artefacts and tools affect the successful planting of trees, and municipalities as mediators of the object of tree planting are falling short in fulfilling their responsibilities in this regard.

The emergent lessons from these activity systems centre on the complexity and heterogeneity, dynamism, agency, and historical legacy of the individual and collective nature of low-cost housing areas and their residents in relation to the implementation of an initiative that has historically been perceived as a practice for the elite. In this regard, low-cost housing areas are complex and heterogeneous systems, owing to their various social dynamics and everyday realities, as presented in Chapter 1. This complexity influences which actors are interested and engaged in tree planting, their different and changing expectations and those of the broader community, and differential power dynamics. Another key finding in this respect is the lack of agency among many residents from low-cost housing areas, which made them more dependent on external assistance rather than fully championing tree planting independently.

8.2.5 Exploring opportunities for change in prevailing practices related to tree planting in low-cost housing areas

Chapter 7 presents the surfacing contradictions between the various activity systems generated in Chapter 6. Key results indicate that activity systems for tree planting in low-cost housing areas are characterised by primary, secondary, tertiary and quaternary contradictions. Specifically, the majority of contradictions surfaced within the mediating artefacts and tools, and within the rules of activity systems. Contradictions between the central and neighbouring activity systems pointed to one activity system's failure to mediate the planting of trees as it should be one of their objects.

The manifestations of these contradictions and their resolutions meant that opportunities for transformation and innovation were recognized. The various subjects of the various activity systems were at the forefront of offering resolutions to the contradictions, and this assisted greatly in fulfilling some aspects of the respective objects. For example, a participant in the Grahamstown case study offered herself and her garden as an example of a resolution to the contradiction related to municipalities providing the mediated artefact and tools for tree planting in the private space. This served as a lesson for other participants that as individuals, they have the agency to make their private spaces better, and should not always depend on the municipality to do that for them.

8.2.6 Integrating findings: The key message

The key findings from the activity systems in Chapter 6, and the surfacing contradictions from activity systems in Chapter 7 emphasize and relate to the main findings regarding the barriers to tree planting outlined in Chapter 5. Another important and recurring finding of this study across all empirical chapters supports the premise of the Urban Forest Governance framing (Lawrence et al., 2013) that encourages the collaboration of a variety of actors in activities associated with the planting and maintenance of urban

trees. According to Middendorf and Busch (1997) decisions made by a diversity of participants provides for a more robust and informed base, and are inclusive of social, ethical and political values and beliefs, where involving stakeholders in natural resource management and initiatives increases the likelihood that decisions and efforts will be supported (Reed, 2008). Although the implementing entities took all urban forest decisions in the initiatives reviewed in Chapter 3, multiple stakeholders with varying roles and contributions were involved. Chapter 4 further showed that there is a general interest from residents, who are stakeholders in their own right, to change the status quo of the lack of trees in their residential areas, especially for public spaces, after having demonstrated agency for planting in their private spaces. Chapter 5 then highlighted residents' dissatisfaction with municipalities for not performing their service delivery responsibilities of tree planting, and suggested the enlisting of community skills to assist municipalities. Again, this speaks to the need for multiple stakeholders and various role-players in the establishment and governance of the urban forest.

Engagement with literature has shown that while the South African low-cost housing context may be unique based on the various socio-economic, socio-political, and socio-cultural dynamics that characterize them; some of the experiences from these areas are also prevalent in other areas across the globe, and the officials who work in these contexts experience similar challenges, to some degree, to others that work in other countries. For example, the lack of communication and coordination between departments in municipalities is also experienced in some organizations and municipalities in the global north (Breger et al., 2019). The human and biophysical legacies of countries and cities also shape contemporary urban forests in other countries too (Roman et al., 2018).

In Chapter 6 I showed that a typical tree planting initiative requires multiple stakeholders to work together, and a variety of resources to be a success, and Chapter 7 demonstrated the various dynamics and contradictions associated with how the different stakeholders are able to carry out their object of tree planting. These key messages emanate from a context that is characterized by a host of socio-economic, socio-political, and socio-cultural dynamics that are characteristic of South African low-cost housing areas, as discussed in Chapter 1.

8.2.7 The integrated picture

The geography of South African urban areas, the bulk of which have largely been shaped by the legacy of apartheid, and thus currently exhibits a variety of socio-economic contexts, provides an example for how various models for participatory urban tree planting may be better suited for some areas and not others. As such, it may be a little challenging for experiences from other countries, especially from the Global North, to be easily adapted to the South African situation. However, lessons of best practices can be a good starting point.

In Chapter 1 I postulated that while western models (as most literature is based on them) (Ordóñez et al., 2020) of participatory and citizen-led urban greening initiatives have strengths, their weaknesses need to

be carefully examined and considered before modification, adoption and implementation to see how they can be adapted to a developing country context where other basic services are prioritized over urban forestry. The results of this study indicate that there is a need to refine current knowledge and frameworks around participatory urban forest development and governance to account for contexts such as South Africa which has a huge divide between the rich and the poor, empowered and disempowered, resourced and unresourced, phenomena that are also mirrored in the distribution of green infrastructure and green spaces between the wealthier neighbourhoods or towns and the poorer ones. Gwedla and Shackleton (2015; 2017) demonstrated this. This means that the current urban forest governance framework (UFGF) and participatory urban forest management frameworks need to be more cautious in relating best practices to just those areas where urban tree planting is a norm and residents actively engage and participate in such initiatives. Ordóñez et al. (2020) highlight that urban forest governance processes vary among jurisdictional boundaries and cities, and the differences may reflect differences in the characteristics of urban areas, which may include level of development, population density, and population growth. Therefore, most of the results presented in this study are to be expected, and more work needs to be done in communicating the message of the need for green infrastructure across towns and residential areas, regardless of development history and socio-economic status.

8.3 Reflections

This research was driven by the impacts of the historical legacy of apartheid in South Africa which has seen urban greening and tree planting prioritized in certain areas more than others. Specifically, it was a response to the stark and continued disparities in urban tree distribution between the affluent, township, and low-cost housing areas which are a result of the RDP. With the municipality regarded as the entity responsible for urban tree planting (Broussard et al., 2008; Gwedla and Shackleton, 2015), and the expectation that the newly developed low-cost housing areas would create more opportunity for trees to be planted in poorer residential areas (McConnachie and Shackleton, 2010; Shackleton et al., 2014), this study sought to understand why the trees were not planted, what communities feel about it, and what could be done to enhance the planting. Admittedly, municipalities do provide services for residents in poor communities, but seem to be falling short in urban greening. Given that, it became important to test how the situation may change if residents are encouraged and supported to champion tree planting for their various residential areas.

Initially, this seemed like a straightforward process because previous studies had indicated that residents in low-cost housing areas are appreciative of urban trees, would like to have them planted in their areas, and would be willing to volunteer to plant trees in their areas (Gwedla, 2016; Shackleton et al., 2014). Furthermore, Gwedla and Shackleton (2015) alluded to municipal managers' optimism to do more to promote urban greening and tree planting. However, this proved to be more complex as both residents and municipal officials were initially not enthusiastic. Specifically, this study revealed the impatience of

communities with development projects and processes, and officials' disinterest in being part of projects they have not initiated or are not responsible for.

8.3.1 Reflections on my application of Urban Forest Governance Framework and Cultural Historical Activity Theory

The UFGF is an emerging area of study dedicated to understanding what actors are involved in the planning, establishment, development and maintenance of the urban forest, the relationships between these actors, the resources they use during the process, and how these actors relate and interact with the urban forest (Lawrence et al., 2013). By extension and within the context of this study, the CHAT aids in mapping the practical activities associated with tree planting and how the various actors navigate their roles during the process of urban forest establishment and the various regulations that govern how they achieve their goals of tree planting. Therefore, I found them both useful in framing and foregrounding this study.

The success of the urban greening agenda, a dominant aspect of which is the planting and retention of trees, depends largely on the people who make and implement decisions about urban trees (Ordóñez et al., 2020). These decisions typically lie with professionals who work for municipal governments and who make strategic and operational decisions for planting in the public realm (Lawrence et al., 2013; Pincetl, 2010), and individual homeowners in the private realm (Conway, 2016; Kendal et al., 2010). Additionally, community-led greening groups can also influence what, why, and how public trees get planted, protected, maintained, or removed (Connolly et al., 2013). Although various stakeholders and role players participate in making decisions about urban forests, municipal managers play a central role in these decisions (Gwedla and Shackleton, 2015; Ordóñez et al., 2020). Governance helps interpret how people make decisions about what is collectively owned, such as the environment and natural resources in urban areas (Frantzeskaki et al., 2016), including urban forests and trees (Lawrence et al., 2013). According to Konijnendijk (2000), urban forest decision-making describes the process of what, why, and how decisions are made in relation to urban forests, including how trees are planted, protected, maintained, or removed. The central premise of the UFGF focuses on decision-making about the urban forest and situates government, specifically local government, as the central player in urban forestry, and thus embraces the ethos of 'governance with government' where multiple stakeholders and actors are encouraged to participate in urban forest establishment with government (Lawrence et al., 2013). The UFGF adopted in this study helped articulate the governance arrangements typical of urban greening both in South Africa generally, and specific to low-cost housing areas. It helped illuminate the need for multiple stakeholders and role-players who each bring a host of skills and resources that may be useful for the success of tree planting initiatives and urban forestry. It helped highlight the missing ingredients and the various dynamics that influence their availability.

Complementing the UFGF, the CHAT was a useful social theory to understand the various actors, their roles, as well as the socio-cultural and socio-political or socio-economic dynamics that influence their exercise of power in those roles as they navigate a process of planting trees in low-cost housing areas. In my use of CHAT, I classified this research as developmental, and assumed that the process of engaging residents in tree planting would be underlain by some form of learning. Indeed, there was evidence of learning as residents in the various case studies moved from a state of not prioritizing tree planting, to a position of hoping that they would have trees planted in their private and public spaces. However, the process was not as extensive and gave minimal opportunity for me to explore the kind of learning that takes place, how it happens, and who learns (Engestrom, 1999). This was in part because of the enthusiasm I received from the participants who were not very concerned about the process of tree planting, but were only invested in having trees planted as soon as possible. As a result, I was unable to go through the whole cycle of expansive learning.

8.3.2 Reflections on working with communities and municipalities

Local governance in South Africa is designed in such a way that residents can have access to the municipality and can voice their concerns through ward councillors and their committees. However, there seems to be a disconnection between these bodies as there have been numerous concerns relating to the limited effectiveness of ward councillors and their committees with regards to communicating residents' needs and facilitating for them to be addressed (Piper and Deacon, 2008). I reflect on how this structure influenced this research.

The ward councillors were instrumental as gate-keepers in this study, and the process of data collection from Chapter 4 to Chapter 7 required that I engage to some degree with ward councillors and their committees. Throughout this process, I was met with hesitation and reluctance on many occasions related to fear of painting the municipality in a negative light. In some instances, the reception was optimistic and welcoming, with the hope that I would be bringing jobs to the community, and donating resources such as planting trees for everyone in the residential area. These were rather exaggerated expectations, considering my position as a research student and that the ward councillors and their committees were not interested in being part of the research process. This is an important result for my study, but it also illuminates the disconnection between the ward councillors, the community, and projects aimed at community development, specifically when the so-called projects are not financially lucrative for the councillors and their committees.

8.4 Limitations

8.4.1 Limitations of employing multiple methodologies

While the employment of multiple methodologies may serve as the strength of this study, the research process also highlighted the limitations in this regard. This study was large and incorporated multiple

date sets which limited my ability as a single researcher to interrogate and deeply analyse individual data sets. The study would have benefited from an in-depth analysis of the barriers to, and enablers of, tree planting or examples beyond the household surveys. Another limitation, which is more applicable to Chapter 3, was the criteria I used to profile past tree planting initiatives. I may have overlooked some programs because they lacked pertinent information that I needed to present as a profile of the initiatives. Although there were not many programs available throughout the country, there was a sizeable proportion of them that had engaged in tree planting initiatives but with no written records of such or available responsible personnel to speak on behalf of the programs. This means that the data subsequently presented is not entirely representative, because it also does not include those programs that may not have succeeded or that have become defunct. A recommendation in this regard would be an inquiry into past and present tree planting initiatives, including those that may be categorized as having been unsuccessful to get a clearer but broader picture of how tree planting initiatives fare in this country.

8.4.2 Limitations of conducting multiple case studies

I adopted a multiple case study design during the design and testing of participatory tree planting initiatives. While this may have provided sufficient basis for the comparability of the findings of the process, it limited the in-depth focus and exploration of the realities of the study communities that may hinder or support tree planting. This would have expanded the reach of this study. Time constraints and distance between sites also meant engagement with only a few activity systems, which were the central ones. A detailed exploration of the neighbouring activity systems could have enhanced my understanding of the exact objects of those activity systems and the challenges experienced by the subjects in fulfilling those objects. This would have provided me with a more holistic view of the day-to-day functions of the entities mandated to advance urban forestry and urban greening. This also limited the CHAT-related process of this study, and failed to make use of the full potential of the theory. However, I use this experience and note it as an opportunity for further research in Section 8.5.2.

8.5 Recommendations

While preparing and conducting this study, I intended to collect data that would provide both academic and practical contributions to the research and practice of urban greening. The South African low-cost housing area model provided me with the unique context to test ideas in this regard because the policies around their establishment are meant to encourage the development of sustainable human settlements and the participation of local residents in their development. With that experience, I put forward some recommendations for both policy and practice, and further research, which will assist in the sustainable development of new areas where trees and green spaces are incorporated in the design and development of these areas.

8.5.1 Recommendations for policy and practice

This study analysed the context of tree planting in selected low-cost housing areas across the country, and tabled barriers to, and enablers of, tree planting. Together, these provide examples of best-practices when it comes to implementing a tree planting initiative in an area where residents have other pressing challenges. These examples show what might work and what might not, thereby reduce incidences of wasted resources. Furthermore, this study demonstrated the typical activities associated with tree planting, and what opportunities exist to enhance the practice in low-cost housing areas. In light of these, recommendations for both policy and practice are essential.

It is a fact that not everybody would like to be surrounded by trees, but that is not to say they are not essential for liveability and improved quality of life in urban areas. Attitudes towards urban trees in home yards in particular play an important role in management decisions of private residential green spaces with important consequences for urban sustainability and liveability (Olivero-Lora et al., 2020). Therefore, provision to include green infrastructure such as trees in the development of low-cost housing areas needs to be incorporated into policy so that it can be easier to be applied in practice. In instances where the residential areas have already been developed, a crucial aspect that needs to be considered during the implementation of tree planting initiatives in low-cost housing areas is the inclusion of residents in all stages of the process, including decision-making, beyond the confines of the IDP process. While trees are important to have, they may not be a priority to people who still have to navigate various socio-economic, socio-political, and socio-cultural dynamics that render tree planting a low priority. One of the ways that will aid the recognition of trees is when people are part of the process and realize that having the trees planted does not take away from the provision of other services but are an integral part of residential areas. This will mean a revision and amendment of policies related to the development of human settlements, including those of all relevant departments. Specifically, urban green space planning needs to be rigorously incorporated into national, provincial, and municipal policies for urban development.

In a broader sense, this study contributes to research on the feasibility of allocating resources for tree planting in a context where they were previously not seen as a priority and in a context of limited resources where tree planting has been viewed as a luxury for those who can afford to. Therefore, this calls for the incorporation of trees and green spaces during the development of the settlements rather than as an after-thought after all other infrastructure has been erected. That way, the barriers to tree planting such as lack of space and resources to purchase trees can be minimized. Working together, the Department of Human Settlements (DHS) as well as the Department of Environment, Forestry and Fisheries (DEFF), can ensure that a completed house has at least one tree. The DEFF is already investing in the procurement of trees, and municipalities can complement this by establishing nurseries to ensure that there are trees available, that will be adequately protected, to be planted in the newly developed areas.

Shackleton et al. (2014) revealed that there are relatively few policies that deal specifically with and promote tree planting and maintenance in towns and cities of South Africa, and the few that are in place were designed over two decades ago by the then national Department of Water Affairs and Forestry. This is still the case in 2020 and with regards to tree planting in newly developed low-cost housing areas. As such, it makes it virtually impossible for municipalities to implement any kind of tree planting initiatives because they are not supported by any kind of policy in that regard. Therefore, the DEFF, as the custodian of forestry in the country, needs to revisit their policies on urban forestry, and encourage municipalities to take heed of those policies. The Arbor Month provides a good platform for municipalities and organizations to encourage tree planting. Large-scale events need to be organized well in advance so that the message can reach as many people as possible. Specifically, focus needs to be put on advancing tree planting in low-cost housing areas rather than stretching resources to accommodate other parts of town that already have trees. An important consideration in this regard is to plant trees in private spaces first, and then give residents the necessary permits to plant outside their yards in accordance with municipal guidelines. Other municipalities, as demonstrated in Chapter 3, are already doing this and it seems like a best-practice strategy.

In interacting with residents from various low-cost housing areas, it became apparent that food security is a major need, and I considered the opportunity of pairing tree planting with food security. In this regard, incorporating fruit and indigenous trees to food gardens can greatly improve the prospects of having a household planting at least one tree in their yard. Many households are already establishing and maintaining food gardens, and the right tree at the right place within the garden could minimize some of the barriers, such as lack of space, that are professed by residents. This calls for strong collaborations between various departments within municipalities, and national governments such as DEFF, Agriculture, Land Reform and Rural Development, and Social Development as some of these are committed to assisting the indigent with food parcels and seeds to establish vegetable gardens.

Better facilitation of the relationship between municipalities and national and provincial government departments need to be put in place. Specifically, the relationship between the Community Services departments of municipalities and the DEFF need to be strengthened so the process of implementing Greening Plans can be facilitated efficiently. As it stands, evidence from some municipalities in the Eastern Cape suggests that very few municipalities take advantage of the resources provided by the DEFF in assisting municipalities advance urban forestry and tree planting.

The results highlighted in Chapter 4 and Chapter 5 regarding residents' willingness to participate and contribute to urban forestry and tree planting through the enlisting of their skills presents an opportunity for implementing entities like the municipality to consider the social capital available. This enthusiasm from residents has the potential to contribute to a movement for civic ecology practices that equip residents to be champions for tree planting in their towns and residential areas. Tidball and Krasny (2009) describe civic ecology practices as local environmental stewardship actions taken to enhance the green

infrastructure and community well-being of urban and other human-dominated systems, and include community tree planting, natural area restoration, and community gardening (Krasny et al., 2014). The existence of such practices and initiatives could create opportunities for partnerships with municipalities and other interested actors, which could mean more resources are available to support tree planting. One of the municipalities reviewed in Chapter 3 reported on the use of Eco-warriors to help maintain trees. This concept can be further extended to incorporate the planting as well, where the people under the umbrella of Eco-warriors can champion tree planting for their residential areas. The success of such initiatives may require strong partnerships with NGOs such as the FTFA, or with other local NGOs that focus on things like community gardening.

8.5.2 Recommendations for further research

There is a need for an in-depth investigation into the various policies and guidelines for the development of sustainable human settlements and how they relate with the incorporation of green infrastructure, including parks and trees in private and public spaces. The current policy environment in relation to the development of sustainable human settlements does not provide enough detail regarding how these can be achieved. Shackleton et al. (2014) previously illuminated this, emphasizing the dearth in policies that deal specifically with and promote tree planting and maintenance in towns and cities of South Africa, and no national land use or development plan that specifically makes provisions for urban trees or green space planning. In their analysis of national policies, Shackleton et al. (2014) noted that most of the broader development or housing policies in the country refer to the need for environmental sustainability and to minimize the impacts of development and housing initiatives, but these are rarely translated into specific guides, standards or action.

Urban forestry research is action-oriented and should therefore be conducted as such. Furthermore, the context of low-cost housing requires an interventionist approach to the introduction of the practice because houses have already been developed and people need to find ways of incorporating green infrastructure into their current spaces. Similarly, urban forestry as a practice of agency is developmental in nature. Chapter 6 of this study revealed that one of the factors impacting the success of tree planting initiatives in low-cost housing areas was the limited agency of residents. As mentioned earlier, development of agency takes time and sufficient support is needed to assist residents realize their own agency to facilitate an intervention.

More comprehensive learning for urban forest development is crucial. A full Change Laboratory (Virkkunen and Newnham, 2013) process, whose theoretical underpinnings come from CHAT (Morselli, 2019), has the potential to provide practical methodologies and as an instrument for building agency and expansive learning in the implementation of tree planting initiatives. The Change Laboratory is a rigorous, although flexible model, with strong theoretical underpinnings referring to formative interventions designed to trigger cycles of expansive learning (Morselli, 2019). This study serves as the

first step in this process, and further research should be aimed at modelling a new solution to the lack of trees in low-cost housing areas, examining the practicality of that new model and implementing it, and then reflecting on the process. These are three of the phases in the Expansive Cycle of Learning and Transformation (Engeström, 1999). Specifically, the net of research could be widened to investigate the interacting and neighbouring activity systems such as the local municipality and DAFF activity systems to get a detailed picture of these interactions in practice. For example, a look into the local municipality activity systems could probe the various departments in the municipality that have an influence in the department responsible for tree planting, the budgets allocated to this department, and probe the overall support and stance of the municipality to tree planting and extending it to areas in the urban periphery, including low-cost housing areas. In another instance, the DAFF activity system could focus on the ways the department works with municipalities, if at all, to implement the Greening Plans designed by the department, and the process followed in the design of these plans. A Change Laboratory process could enhance and highlight the learning processes involved during tree planting initiatives, an aspect this study could not extensively interrogate.

8.6 Concluding thoughts

This study represents a first attempt in understanding tree planting and urban greening in the low-cost housing context of South Africa, and what has hindered urban forest development in these areas through participatory governance and activity systems lenses. It contributes to theory and practice of urban tree planting in a low-cost housing context in South Africa in three ways. First, evidence from empirical chapters posits that urban forest governance, and by extension management, is a participatory practice that needs to involve a variety of stakeholders who each bring different skills and resources. Collaboration, partnerships and participatory governance seem well suited in developing countries, especially in the South African context where there are limited resources, weak civil society, growing inequality and high informality (Simone, 2014; Fuseini, 2016), and the specific barriers to tree planting faced by municipalities and residents in these residential areas. Second, this study highlights that tree planting in low-cost housing areas goes beyond the digging of holes and putting trees into the ground, but is largely dependent on the co-operation and willingness of multiple actors, and the understanding of the societal context in which the trees need to be planted. An understanding of this context contributes in the design and tailoring of programs that are best suited to respective contexts and will minimize incidences of wastage. Low-cost housing areas are characterized by a host of unique challenges and daily realities that greatly influence the success or failure of urban greening initiatives, and should therefore not be ignored during the planning of methods to roll-out green infrastructure in these areas. Finally, this study highlights the potential for activity theory to assist in understanding what entails a typical tree planting initiative in a context where tree planting was not previously prioritized, and presents points of disconnection and opportunity that may enhance the successful planting of trees. My expectation is that

the findings presented in this study will provide a first step to the design of Change Laboratory research methodology in the implementation of urban forestry in marginalized residential areas and communities.

In conclusion, this study has shown the extent of urban trees in low-cost housing areas using selected examples, and demonstrated residents' willingness to change the status quo with regard to tree distribution and abundance. Furthermore, it presented the factors that are hindering tree planting, and the opportunities that could be explored to advance it. The review of past programs and initiatives implemented in low-cost housing areas, as well as the activity systems analysis of participatory tree planting initiatives of different case studies serve as 'real-life' representations of typical initiatives in a low-cost housing context and can contribute as examples of best practice by offering lessons for future initiatives. The various roles and resources needed for successful tree planting can be mapped using activity systems, which help in identifying what is missing and which aspects require more attention and resources.

SUPPLEMENTARY MATERIAL

Appendices

Appendix 1: Household Survey Consent Form

Residents' perspectives regarding the need for trees and their experience of planting trees

My name is Nanamhla Gwedla, a student at Rhodes University in Grahamstown studying for a PhD in Environmental Science. I am conducting research on the barriers to and enablers of tree planting in low-cost housing suburbs. The objective of this work is to determine what hinders residents from planting trees and what opportunities they can explore in planting trees. This research is attempting to address the disparities in tree distribution within suburbs by developing a participatory learning model that can be effective in the successful introduction and care of trees in low-cost housing suburbs in rapidly urbanising, small, South African towns. This model will be designed by the residents, for the residents.

Your household was randomly selected from a municipality map/aerial photograph of this suburb and your participation is highly valued. All the information you give will be protected and treated with confidentiality. No harm will result to your household and its occupants for answering questions in this interview.

None of the results which identify you or your household head will be shared with anyone else including the authorities, but may be used in follow up research for purposes of recruitment. You are still free to withdraw from this interview or the project at any time, even after giving consent and after the project commences.

This questionnaire contains three sections, Section A is looking at the trees planted or removed in your homestead and the motivations for this, as well as your desires to have trees and your previous exposure to tree planting. Section B focuses on your perceived barriers to and enablers to tree planting both for your private homestead and your suburb at large. Section C contains questions related to the household profile and these variables will be used for statistical purposes only in understanding particular patterns in the study. This interview will not exceed 20 minutes. I would also like to see the trees in your garden (if any) and record what trees they are.

Would you like to answer the questions in this questionnaire? Yes [] No []

If you have any further questions about this project, please contact the principal project supervisor:

Prof. Charlie Shackleton

Tel: +27-(0)46-603-7001

Signature

Date

Appendix 2: Household Survey

Date _____ Start time _____ End time _____ Sample no. _____ Town _____

Suburb _____ Street name _____ House no. _____

SECTION A: HOMESTEAD TREES

1. Do you have trees in your yard/garden? ☐ Yes ☐ No
2. If yes, what types? _____

3. How were they established? (Tick *one or more* of the following):

☐ They were there when we arrived ☐ We planted them ☐ They just grew on their own (self-seeded)
4. If you planted them, what motivated you? _____

5. If you planted them, where did you get them from? (Tick *one* of the following):

☐ Bought ☐ Donation ☐ Neighbour ☐ Harvested elsewhere
6. If no, why do you not have trees? (Tick *one* of the following)
☐ I do not like them ☐ There is no space ☐ I removed them ☐ I cannot afford them
☐ Other (Specify) _____
7. If you removed them, what motivated you to do that? _____

8. Where would you prefer to have trees? (Tick *one* of the following):
☐ In your garden ☐ On the street ☐ Both ☐ Not anywhere
9. Why? _____

10. What type of trees would you like planted in your desired location? _____

11. Please indicate your level of agreement or disagreement with the following statement:
“Trees are important for quality of life in towns.”
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree
12. Why? _____

13. What benefits offered by trees do you prioritise? (Tick *one or more* of the following):

Goods and services	Tick	Goods and services	Tick
1. Protection from strong winds		8. Stress relief & mood improvement	
2. Temperature reduction		9. Increase property value	
3. Home for birds & small animals		10. Attract new business to our suburb	
4. Air purification		11. Enhance community appeal	
5. Beautify my home		12. Provide fruit and medicine	
6. Cultural & spiritual fulfillment		13. Provide fuelwood	
7. Environment for children to play		14. Other (specify)	

14. What negatives associated with trees do you dislike? (Tick *one or more* of the following):

Disservices	Tick	Disservices	Tick
1. Dead tree leaves block the drains		9. Roots destroy my house	
2. Make my yard look messy and dirty		10. Hide the sun too much	
3. Cause allergies		11. Interfere with lights/electricity lines	
4. Attract insects & other scary animals		12. Branches sometimes fall on people or cars	
5. Host bad spirits		13. Other (specify)	
6. Attract lightening		14. Other (specify)	
7. Use up of space		15. Other (specify)	
8. Criminals hide behind them		16. Other (specify)	

15. Have you ever participated in a tree planting programme (besides planting at home)?

☐ Yes ☐ No

16. If yes, what programme was it? _____

17. When did you participate? _____

18. What was your role in the programme? _____

19. Why did you participate? _____

20. If no, had you heard of the programme before? ☐ Yes ☐ No

21. Why did you not participate? _____

22. Would you be willing to participate in a tree planting programme? ☐ Yes ☐ No

23. If yes, why? (Tick one or more of the following):

Reason to participate	Tick
To beautify my suburb	
To enjoy the benefits of trees	
To learn more about trees & planting	
To be well integrated in my community	
To interact with other people	
I have nothing else to do	
To gain work experience	
To be useful and involved in community projects	
Other (specify)	
Other (specify)	

Other: _____

24. In what capacity would you like to participate? (Tick one of the following):

Capacity	Tick
Hole digging	
Planting	
Watering and other care	
Other	

Other: _____

25. If no, why would you not want to participate? (Tick one or more of the following):

Reason not to participate	Tick
I do not like trees	
I do not have the time	
I have a job	
I can never work for free	
Tree planting is not my responsibility	
I am sickly/too old	
I do not want trees	
I am not from here	
I know nothing about trees	
I am hardly at home	
I do not enjoy gardening	

26. Whose responsibility do you think it is to provide and plant trees for either your homestead or the street? (Tick one or more of the following):

	Mine	Community	Municipality	NGO	Combination	Nobody
Home						
Street						

27. Why should it be their responsibility? _____

28. Have you ever asked for a tree from this entity? [] Yes [] No

29. If yes, did you get the tree, and if no, what were you told was the reason? _____

30. Would you like to be consulted about any tree planting scheduled to take place in your suburb?

[] Yes [] No

31. Why? _____

32. Would you like to participate further in this study and be part of a focus group which will discuss ways in which trees may be planted and maintained in your suburb?

☐ Yes ☐ No

33. If yes, please provide us with your cell phone number and/or email address: _____

SECTION B: BARRIERS TO AND ENABLERS OF TREE PLANTING

1. What has hindered you from having trees in your homestead or planting more? (Tick one or more of the following):

No space	Municipal restrictions	Financial constraint	No knowledge of trees to plant/ how to	Not my responsibility	Renting property	My parents' property	Rocky soil	No equipment/ resources	Crime	Other

Other: _____

2. If any of the factors changed, would you proceed to plant or would you still not plant trees?

Plant	
Not plant	

3. Why? _____

4. What do you think has hindered the planting of trees on your street?

No space	Financial constraints	Municipality not doing its job	Politics	Crime	Trees would be vandalised	No one to care for them	We do not want trees	Rocky soil	Other

Other: _____

5. What has enabled you to plant trees (if there are trees)?

Finances	Equipment/ Resources	Space in yard	Availability of tree	My love for trees	Soil conducive for tree planting	Other

Other: _____

6. What opportunities do you think could be explored to plant trees for your street?

SECTION C: RESPONDENT PROFILE

1. Gender ☐ Male ☐ Female 2. Age _____ 3. How many people live in your home? _____
4. How long have you lived in this town? _____ 5. --- in this suburb? _____
6. Home language? _____ 7. Highest education? _____
8. Current employment status?
☐ Employed full-time ☐ Unemployed ☐ Part-time/Casual ☐ Retired ☐ Student
9. If you are employed, what kind of work do you do? _____
10. How many other people in your home are employed? _____
11. How many government grants does your household receive?

Old age pension		Disability grant		Child care grant		Foster care grant	
--------------------	--	---------------------	--	---------------------	--	----------------------	--

12. On average, in which of the following four income classes does your household fall w.r.t to monthly income?

☐ <R2,000 ☐ R5,000-R10,000 ☐ R10,000-R20,000 ☐ >R20,000

Do you have any questions for me or anything you would like me to clarify for you? (Note questions)

Appendix 3: Key Informant Interviews (1) Consent Form

Barriers to and enablers of tree planting in low-cost housing suburbs from experts' and municipal officials' perspectives

My name is Nanamhla Gwedla, a student at Rhodes University in Grahamstown studying for a PhD in Environmental Science. I am conducting research on the barriers to and enablers of tree planting in low-cost housing suburbs. The objective of this work is to determine what hinders the planting of trees and what opportunities can be explored in planting trees. This research is attempting to address the disparities in tree distribution within suburbs by developing a participatory learning model that can be effective in the successful introduction and care of trees in low-cost housing suburbs in rapidly urbanising, small, South African towns.

I am interviewing you because you are responsible for tree planting in this town/you are a representative of an organisation that has planted trees in this town before/you are an expert in tree planting and have been involved in aspects of greening in this town, and your participation is highly valued. All the information you give will be protected and treated with confidentiality. No harm will result to your or your department/organisation and its employees for engaging with me in this interview.

None of the results which identify you or your department/organisation head will be shared with anyone except for the purposes of this research. You are free to withdraw from this interview or the project at any time, even after giving consent and after the project commences.

This discussion will touch on your experiences of tree planting in this town and in what capacity you have been involved. We will also talk about the factors you perceive are a hindrance to the successful planting of trees both in the private and public space, as well as opportunities you perceive can be explored more to increase the rate of tree planting. I will also ask you a few questions about your profile such as your job title and your age, which will be used for statistical purposes only in understanding particular patterns in the study. This interview will not exceed 1.25 hours.

I would also like to make some observations of tree planting that is undertaken by your team when they do go out and plant or maintain some trees.

Would you like to participate in this discussion? Yes [] No []

If you have any further questions about this project, please contact the principal project supervisor:

Prof. Charlie Shackleton

Tel: +27-(0)46-603-7001

Signature

Date

Appendix 4: Municipal Officials'/Experts' Discussion Prompt Sheet

Date_____ Start time_____ End time_____ Sample no._____ Town_____

DISCUSSION PROMPT SHEET FOR MUNICIPALITIES

SECTION A: GENERAL TREE PLANTING & EXPERIENCES

- ❖ Personnel responsible for tree planting in town and their various portfolios
- ❖ Personal involvement in tree planting and urban green space management, and in what capacity?
- ❖ Extent of tree cover in the town and satisfaction with this cover
- ❖ Tree planting, maintenance and inspection schedule
- ❖ Tree planting and urban green space establishment in low-cost housing suburbs vs the township and affluent suburbs
- ❖ Removal of natural vegetation during suburb construction and establishment
- ❖ Tree planting and urban green spaces management plan, and the incorporation of tree planting and urban green spaces in urban planning
- ❖ Maintenance of trees and green spaces (current strategies)
- ❖ Tree planting and urban green spaces as Key Performance Areas in the Integrated Development Plan
- ❖ Tree planting and urban greening strategy for the municipality
- ❖ Current or past urban tree planting programmes in town, and organisations involved
- ❖ Residents' participation in the tree planting programmes
- ❖ Tree planting in private spaces
- ❖ Regulations or by-laws regarding tree planting and the use/removal of trees in the private and public spaces
- ❖ Regulations or bylaws regarding the planting or removal of trees *by residents* in both the private and public spaces
- ❖ Barriers to tree planting in the public and private space
 - Current strategies to address barriers
- ❖ Possible enablers of tree planting in the public and private space
 - Current strategies to enhance enablers

SECTION B: RESPONDENT PROFILE

Name of Respondent: _____ Gender [] Male [] Female
Age_____ How long have you lived in this town? _____

Position/ Official designation: _____

Years on the job: _____

Professional background:

1. Landscape Architecture 2. Landscaping 3. Horticulture 4. Nature Conservation

5. Horticulture 6. Nature Conservation 7. Urban Planning 8. Forestry 9. Arboriculture/Tree Care 10. Other _____

What does your job entail?

Appendix 5: Key Informant Interviews (2) Consent Form

Characteristics of tree planting programmes initiated in low-cost housing suburbs in South Africa within the last 5-10 years

My name is Nanamhla Gwedla, a student at Rhodes University in Grahamstown studying for a PhD in Environmental Science. I am conducting research on the barriers to and enablers of tree planting in low-cost housing suburbs. One of the objectives of this work is to compare and assess the characteristics of tree planting programmes initiated in low-cost housing suburbs in South Africa within the last 5-10 years. Overall, this research is attempting to address the disparities in tree distribution within suburbs by developing a participatory learning model that can be effective in the successful introduction and care of trees in low-cost housing suburbs in rapidly urbanising, small, South African towns.

I am interviewing you because you have been involved in tree planting in a low-cost housing context before/you steered the tree planting/you are a representative of an organisation that has planted trees in a suburb in this town before/you are an expert in tree planting and have been involved in aspects of greening in this town. Your participation in this study is highly valued. All the information you give will be protected and treated with confidentiality. No harm will result to your or your department/organisation and its employees for engaging with me in this interview.

None of the results which identify you or your department/organisation head will be shared with anyone except for the purposes of this research. You are free to withdraw from this interview or the project at any time, even after giving consent and after the project commences.

This discussion will touch on your experiences of tree planting in this town and in what capacity you have been involved. We will also talk about the characteristics, such as the type of project and the stakeholders involved, the resources needed/used for the successful implementation of the programme, the trees planted, the monitoring that took place throughout the programme, the trees surviving and their ecological characteristics. I will also ask you a few questions about your profile such as your job title and your age, which will be used for statistical purposes only in understanding particular patterns in the study. This interview will not exceed 1.25 hours.

I would also like to make some observations on the trees that were planted to assess factors such as the types of trees they are, their size and their health. May you please also provide me with some documents where information on this project was recorded. I need these to understand the characteristics of the project at its initiation as well as the characteristics of the trees when they were planted.

Would you like to participate in this discussion? Yes [] No []

If you have any further questions about this project, please contact the principal project supervisor:

Prof. Charlie Shackleton

Tel: +27-(0)46-603-7001

Signature

Date

Appendix 6: Tree Planting Programme Overseer Discussion Prompt Sheet

SECTION A: GENERAL TREE PLANTING PROGRAMME CHARACTERISTICS

- ❖ Name of programme
- ❖ Date initiated
- ❖ Date completed
- ❖ Current programme status
- ❖ Involved stakeholders, their numbers and roles
- ❖ Funders
- ❖ Nature of residents' involvement
- ❖ Consultation and decision-making process
- ❖ Number and types of trees planted
- ❖ Source of trees
- ❖ Resources used
- ❖ Trees planted in the private or public space
- ❖ Monitoring of programme and maintenance of trees
- ❖ Current status of trees
- ❖ General outcomes of programme

SECTION B: RESPONDENT PROFILE

Name of Respondent: _____ Gender ☐ Male ☐ Female

Age _____ Municipality _____

Town _____ How long have you lived in this town? _____

Position/ Official designation: _____ Years on the job: _____

Professional background:

1. Landscape Architecture 2. Landscaping 3. Horticulture 4. Nature Conservation
5. Horticulture 6. Nature Conservation 7. Urban Planning 8. Forestry 9. Arboriculture/Tree Care 10. Other _____

What does your job entail?

Appendix 7: Focus Group discussions and Workshops Consent Form

My name is Nanamhla Gwedla, a student at Rhodes University in Grahamstown studying for a PhD in Environmental Science. I am conducting research on the barriers to and enablers of tree planting in low-cost housing suburbs. The objective of this work is to determine what hinders the planting of trees and what opportunities be explored in planting trees. This research is attempting to address the disparities in tree distribution within suburbs by developing a participatory learning model that can be effective in the successful introduction and care of trees in low-cost housing suburbs in rapidly urbanising, small, South African towns. This model will be designed by the residents, for the residents.

You were selected for this part of the study because you had indicated in the survey earlier that you would like to participate further in the study. Your participation is highly valued. All the information that will be shared in this group will be protected and treated with confidentiality. No harm will result to you or your household and its occupants for participating in the workshops.

None of the results which identify you will be shared with anyone else including the authorities. You are free to withdraw from these workshops and discussion, or the project at any time, even after giving consent and after the project commences.

The focus group discussions and workshops will be done in three phases. The first phase will involve the discussions on trees in general, and a more qualitative discussion of the barriers to and enablers of tree planting, as well as to craft a way forward in addressing the barriers and enhancing the enablers. During this phase, the respondent profile will also be recorded statistical purposes. These sessions will go on for not more than 1.5 hours and will include other members of the community.

Would you still like to be part of this study and continue with the workshops? Yes [] No []

If you have any further questions about this project, please contact the principal project supervisor:

Prof. Charlie Shackleton

Tel: +27-(0)46-603-7001

Signature

Date

Appendix 8: Focus Group Discussions in Case Studies Discussion Prompt Sheet

The purpose of these focus groups is to DEVELOP A PARTICIPATORY TREE PLANTING MODEL/GUIDELINE that can be used in planting trees in low-cost housing suburbs. This will be done by engaging community members in intense discussions on what works and what does not, based on examples from South Africa and abroad which will be presented by the facilitator. Ideally, these focus group discussions will consist of between 7-12 participants, with both genders and various age groups represented. These discussions will not exceed 2 hours a day and will be recorded. Recording will be in the form of videos, voice and note-taking by the assistant.

1. Screening of the video and opinions on the video
 2. What do you like about your town and suburb?
 3. What do you dislike about your town and suburb?
 4. What are the differences in tree abundance between the affluent, township, and low-cost housing suburbs?
 5. Why do the affluent suburbs have more trees than other suburbs and why do some townships have trees and others not?
 6. What is the current procedure with regards to tree planting in this town?
 7. What is “wrong” with the current procedure that it does not reach the low-cost housing suburbs?
 8. Whose role is it to plant trees in suburbs?
 9. What role can communities play in ensuring that trees are planted in their suburbs?
 10. What do residents perceive as barriers to the planting of trees in low-cost housing suburbs? (Base on household surveys and Question 5)
 11. What could enable the successful planting of trees in low-cost housing suburbs? (Base on household surveys and Question 5)
 12. How can community participation contribute to the effective greening of low-cost housing suburbs?
 13. Could communities do all this by themselves? (Optional based on discussions from 12)
 14. How would we go about greening our suburb if we were given that opportunity as a community?
 15. How could this method be more sustainable than the current one?
 16. When would be the most appropriate time to green our suburb and why?
- } Ice-breakers

Appendix 9: Program for the Matatiele Tree Planting Awareness Event

GreenChamps

Greening our low-cost housing areas, one community and one tree at a time

Tree Planting Awareness Day Programme: Matatiele Town Hall

Programme Director: Ms Nhana Gwedla

Prayer: Mrs [REDACTED]

Opening and Welcome: Councillor [REDACTED]

Acknowledgement of event: Councillor [REDACTED]

Entertainment Item

Introduction of event: Ms [REDACTED]

Importance of trees & planting: Mr [REDACTED]

The GreenChamps: Ms [REDACTED]

Ms [REDACTED]

Entertainment Item

Community Services: Ms [REDACTED]

Community Development Officer: Mrs [REDACTED]

Planting demo in Town Hall: Mr [REDACTED]

Closing remarks & tree distribution: Ms [REDACTED] and Ms [REDACTED]

Vote of Thanks: Ms [REDACTED]

Entertainment Item

Refreshments!

Refreshments!

Refreshments!

Refreshments!

Appendix 10: Program for the Tsolo Tree Planting Awareness Event

GreenChamps

Greening our low-cost housing areas, one community and one tree at a time

Tree Planting Awareness Day: Tsolo Residency JSS

Program Director: Ms Nhana Gwedla

Prayer:	Mrs [REDACTED]
Opening and Welcome:	Principal [REDACTED]
Acknowledgement of Event:	Mr [REDACTED]
Introduction:	Ms [REDACTED]
Institutional Support:	Dr [REDACTED]
GreenChamps:	Ms [REDACTED] and Mrs [REDACTED]
Importance of urban trees & planting demonstration:	Mr [REDACTED]
Way forward & Tree Distribution:	Ms [REDACTED]
Closing Remarks:	ORTDM

Refreshments!!

Refreshments!!

Refreshments!!

Refreshments

DOLOPHU OLOFOTSHANE LWE MITHI YOMTHONYAMA EQHELEKILEYO ENO KOTYALWA EZI DOLOPHINI



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood



Ukhokhe (Rosaceae)
Yellowwood

Zigqalelo lomizi yocayo-michi kwi sicalato sakho namhlanje. Xa sibantwana abangazi lukhulu khaonke ukucinqiniseka uba indawo Zethu Zokuhlala Zya bukeka kwase Ziku ngesaxho ophiwulu. Lilungelo, ikwazi lo nokandava kwakho nje ngomhlali.

OkuRumani inkululekazi eziphakamileyo ngemich nango cyalo-hwemichi. ndwendwela eli khazi: <http://pza.sanbi.org/>

Ozaphakamileyo uchwane nomme li wesebe leZolimo, amahlathi, neZokuloba qongene nengingazi yakho nge ngecibiso ekulufeshezi eyona michi ikulungelo ucyalo-hwemichi emakhayeni ethu.

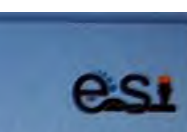
Tyelela umapisa okufuthane nge mogo ukuba ubaba ngemichi abanayo abanoyinika uluntu simahla.

OkuRumani wokwenza izifundo eziphakamileyo ngokwazi lwemichi nezo cyalo-michi ezi dolophini, okanye nalapha na candelo leZindaba jikelele, ndwendwela la makhazi: <http://www.ru.ac.za/environmentalsciences/> <http://www.ru.ac.za/etrc/>

OkuKugqibela Zingca ngendawo dolophi yakho, uzi noye. Futhi uzugciné Zibukeka.



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Isibonisi sokuthi iRhodes University ibandakanya ngokwazi lwemichi nezo cyalo-michi ezi dolophini, okanye nalapha na candelo leZindaba jikelele, ndwendwela la makhazi: <http://www.ru.ac.za/environmentalsciences/> <http://www.ru.ac.za/etrc/>

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