

CONFLICTING PRIORITIES, CONFLICTING SCALES: URBAN FORESTRY IN ACCRA  
BETWEEN HOUSEHOLD (RE)PRODUCTION AND GLOBAL SUSTAINABILITY

by

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## ABSTRACT

Accra Metropolitan Assembly intends to plant 100,000 trees to mitigate the effects of *global* climate change. The Environmental Protection Agency investigates the durability of tree-shaded road surfaces to alleviate the *national* budget. John Yetsowodo, an Accra resident, is selling coconuts to put cash in *his* pocket. This thesis is about both the blessing and curse of multi-functional urban trees that ameliorate urban living conditions in Accra, but also cause conflict over management priorities and actual decision-making. When stakeholder aims diverge, decision-making power becomes decisive. Such power produces urban forests that are neither random nor neutral, and tree species and planting site choices which more often reflect national budgetary and global sustainability concerns, than a preoccupation with the lives and livelihoods of city inhabitants. Yet, incorporating public participation in urban forest interventions, especially by private land and tree owners, facilitates more effective, better integrated and more equitable city-wide planning processes and management outcomes. As part of a mixed methods research design, I combined tree inventories, archival research, stakeholder interviews, a sample household survey and selected household case study ‘biographies’ (Feb. 2016–Aug. 2017) to analyse Accra’s urban forest changes over time and across space. I further examine current urban forestry management systems and assess planned and proposed future interventions. Centring residents’ use strategies and priorities within an emancipatory approach, the thesis demonstrates how a focus on individual and household level benefits of urban trees can contribute often absent but potentially indispensable knowledges to urban forest planning and management.

In particular, I outline the lasting imprints on Accra’s urban forest left by historical events and processes. As such outcomes cannot be changed without understanding the factors which contribute to their existence in the first place, I also analyse the effects of previous land use or city planning decisions as part of my scrutiny of current and proposed interventions for their likely

socio-environmental impacts. While numerous public stakeholders plan and manage (parts of) Accra's forest, their effectiveness is impeded by a lack of resources and written documentation for assigning tasks and responsibilities in clear and unequivocal ways. Additionally, selected key government stakeholders continue to focus on educating and sensitising the public, resting on the misguided belief that Accra's residents are neither aware of, nor particularly interested in, the trees' benefits. However, based on my household survey and case study, I refute this assumption as respondents undoubtedly understand and appreciate the city trees' multiple functions. At the individual and household level, tree products are consumed for subsistence and sold for cash. These products, when gifted or exchanged, also create and reinforce social and cultural capital, while tree shade provides a pleasant outdoor environment for enacting the interactions in question.

My research thus furthers our understanding of how natural vegetation resources in cities contribute to livelihoods, highlighting how diversifying management objectives can benefit the wider community, especially those living in arduous conditions. Nonetheless, current urban tree-related events in Accra continue to prioritise higher scale benefits, exacerbating existing injustices regarding available and accessible trees and their benefits, with various government stakeholders failing to utilise urban forestry's potential to promote secure livelihoods, especially for marginalised and disadvantaged city residents.

In sum, I contribute to a people-centred, emancipatory and explicitly political reading of urban forestry, which challenges simplistic explanations that assign blame to seemingly disinterested and ignorant city residents for low and/or diminishing tree cover. In place of the latter narrative, I emphasise the pervasive structural mechanisms that affect how urban forests are configured and consider possibilities for incorporating meaningful popular participation in redressing the structural imbalances implied.



## **DEDICATION**

*~ Für Oma und Opa, weil ihr meine Vergangenheit seid ~*

*~ Für Liliana, Rafael und Miriam, weil ihr meine Zukunft seid ~*

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## **LIST OF ACRONYMS**

AMA	Accra Metropolitan Assembly
DBH	Diameter at Breast Height
DPG	Department of Parks and Gardens
EPA	Environmental Protection Agency
FC	Forestry Commission
FORIG	Forestry Research Institute of Ghana
GPS	Global Positioning System
GYEM	Ghana Youth Environmental Movement
(H)HH	(Head of) Household
IMF	International Monetary Fund
LUPMP	Land Use Planning and Management Project
MEA	Millennium Ecosystem Assessment
MESTI	Ministry of Environment, Science, Technology and Innovations
MLGRD	Ministry of Local Government and Rural Development
MMR	Mixed Methods Research
NGO	Non-Governmental Organisation
PPI	Progress out of Poverty Index
PPP	Public-private Partnerships
PRAAD	Public Records and Archives Administration Department
SAP	Structural Adjustment Program
SD	Standard deviation
SGBA	Sustainable Greening and Beautification of Accra
SL	Sustainable Livelihoods
SWOT	Strengths, Weaknesses, Opportunities, Strengths
TA	Thematic Analysis
TCPD	Town and Country Planning Department
UK	United Kingdom
UN	United Nations
US(A)	United States (of America)
USDA	United States Department of Agriculture
Y4GG	Youth4GreenGhana
YEA	Youth Employment Agency



# 1 INTRODUCTION

“I think there is a paradigm shift now worldwide, and we are talking about globalisation. So Accra is not an isolated place, we are battling with resilience [...], and greenery is an important aspect of it. [...] the green is very, very important to us and we want to really revitalise Accra with respect to greenery, and I have told you the mayor’s vision is to make sure that all the open spaces we develop it into greenery and also trying to plant and nurture trees along the streets in the communities. So that is the vision. So greenery is very, very important.”

**Mr Yeboah, Department of Town and Country Planning (TCPD)<sup>1</sup>**

## 1.1 Introduction

Freshly harvested coconuts have been loaded into the trunk of a taxi cab in Accra, the capital city of the Republic of Ghana in West Africa (Fig. 1).



**Figure 1 Freshly harvested coconuts in the trunk of a taxi in Mamobi**  
Own picture

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<sup>1</sup> See Section 3.3.4 for a complete list of interviewees and dates.

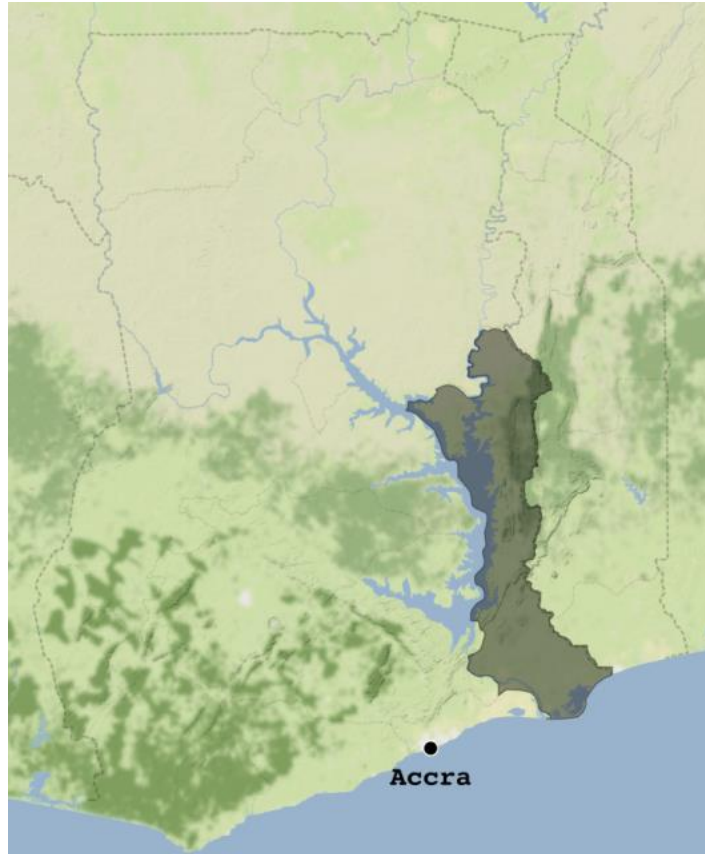
Neither the coconuts nor the cab in and of themselves would normally attract much attention; both are familiar sights in the city. Their concurrence in place and time, however, embodies the duality of cityscapes, in particular, how ‘nature’ assumes an intriguing double meaning in references to ‘the nature of cities’. The image is both thought-provoking and serves as a visual introduction to, and representation of, the subject matter of this thesis: urban society-nature relations and the role of context that both shapes and is in turn shaped by these relations. This introductory chapter thus presents the rationale for this project; outlines its aims, objectives and research questions; and discusses the overall research approach. Finally, it summarises the original contributions of this work.

First, however, I narrate how the coconuts ended up in the taxi’s trunk as but one example of stories I was told and events that I witnessed. These anecdotes should be given due space as they illustrate otherwise easily overlooked society-nature interactions in cities and the urban trees’ multiple functions. Coconut palms are of slender growth but can easily reach heights of 20 metres or more. In a low-rise neighbourhood like Mamobi, located in Accra’s centre, they are visible from afar as they grow above even the highest walls and fences. I spotted the man in the palm tree before walking through the gate leading into the compound of one of the households (HH) that had agreed to participate in my case study (see Section 3.3.5). I paused and admired how the man was able to hold onto the tree trunk with just his bare hands and feet while comfortably cutting off ripe coconuts with his cutlass several metres above the ground. I watched him harvest coconuts from a few more trees as the tree owner, John, also observed from the foot of the tree (see Section 6.3.2).

By sheer good fortune, I had arrived on a day when it was possible to observe coconut harvesting in progress and talk about it with the tree owner and the coconut harvester/roadside seller. In addition to the fruits, the coconut picker also cut off some of the old, dry fronds which he threw,

just like the coconuts, to the ground where John, who is also the compound's landlord, assembled them in piles. The fruit picker stopped when about 35 fruits lay on the ground and, having returned safely to the ground, started to trim bits of stalk from the tops of the fruits. John left but returned shortly after with a large metal washtub in which he placed coconuts he had selected to keep for himself. After the harvest was divided up between the tree owner and fruit picker, the latter disappeared, and John sat down on a bench to provide more information about his palms and the coconut sale.

Coconut sellers regularly visit his compound to obtain fruits which they then subsequently sell to buyers along the roadside. While three of his clients are repeat buyers, most of the people he sells to are one-off visitors who enquire about the possibility of buying fruits when they notice the palm trees in his compound as they walk by. Some of the roadside coconut sellers who buy from him harvest the fruits themselves, while others hire experienced harvesters. Either way, the owner told me, the decision about which fruits were ready for harvesting was entirely up to the coconut picker, who is experienced enough to identify ripe fruits. He explained how it had been his father who originally planted the land with about 90 coconut seedlings, not all of which have survived. His father had brought them from his home village in the Volta Region, where his grandfather grew palms on cleared forest land (Fig. 2). His father transported the seedlings on a bus, wanting to raise them to produce coconut oil which his wife, the landlord's stepmother, extracted for sale. Additionally, the palms were helpful in establishing claim to, and demonstrating ownership of land, while the fronds were used as fencing material. In the late 1990s, after inheriting the land from his father, he cut down many of the palms to make space for accommodation that he wanted to rent out. He and his wife would also discontinue the production and sale of coconut oil as selling the coconuts as fresh fruit was more convenient. They also installed a low-maintenance metal fence to replace the palm frond fencing a long time ago.



**Figure 2 Location of Volta Region (grey)**

Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL

A couple of minutes after we finished talking, the coconut picker returned in a taxi and filled its trunk with the fruits he had harvested earlier. The car drove off and took him to his vending cart from which he sells the coconuts to the city's inhabitants. This story not only illustrates the multiple types of human–tree interactions that we can encounter in urban settings but hints at the various functions of trees and their benefits as an essential component in many human–human interactions as well. Furthermore, this example also highlights the importance of concepts like ‘time’ and ‘space’ for understanding ‘the nature of cities’.

## 1.2 Problem Statement

The world's urban population is projected to increase from 55 % in 2018 to 68 % by 2050 (United Nations (UN), 2019). As a growing proportion of people reside in town and city environments, it is essential to understand urban living conditions and experiences. Trees have always been a component of human settlements (Konijnendijk *et al.*, 2006; Hauer *et al.*, 2017). Like trees in rural areas, urban trees are valued for their multiple ecosystem services and the resulting benefits that humans can obtain from them (Nowak and Crane, 2002; Sullivan *et al.*, 2004; Tyrväinen *et al.*, 2005; Yang *et al.*, 2005; Nowak *et al.*, 2006; Lin and Lin, 2010). They help to reduce heat stress, air pollution, or flooding events (Mage *et al.*, 1996; Gabriel and Endlicher, 2011; Rain *et al.*, 2011). These problems are often especially pronounced in cities with their specific configurations and characteristics, such as compacted and sealed soils or exhaust fumes from vehicles and factories. Research predicts climate change's adverse effects to worsen (Intergovernmental Panel on Climate Change, 2013), creating increasingly challenging urban living conditions, especially for already disadvantaged groups who often reside in the most hazardous areas (Dionisio *et al.*, 2010; Amoako and Inkoom, 2018; Mehrotra *et al.*, 2018). While urban trees may provoke allergic reactions or litter the ground with their leaves (Lohr *et al.*, 2004; Escobedo *et al.*, 2011; Gómez-Baggethun and Barton, 2013; Lyytimäki, 2014), careful decision-making and appropriate species-site matching can reduce or altogether avoid these disservices. Maintaining existing trees and incorporating them into future developments is, therefore, a viable option in attempts to create living conditions conducive to the mental and physical health of city residents.

As a global scale concern, the ecosystem services of urban trees, which can mitigate climate change's adverse effects, have essentially rendered invisible the trees' (re)productive functions at the more local scale, like the provision of food and medicine. There is thus a definite need to investigate how urban trees and their benefits fit into the broader system of individual and household production and social reproduction. This perspective draws attention to the provisioning



benefits of a city's trees and their potential value, especially to residents of lower socio-economic status, a topic which has recently received attention in South Africa (Shackleton *et al.*, 2014; Kama and Shackleton, 2015; Shackleton *et al.*, 2015). Generally, a more detailed understanding of tree usage priorities and management approaches related to the privately-owned proportion of the urban forest, which often constitutes the larger part of the total urban forest 'estate', is desirable (City of Alexandria, 2009; City of New Westminster, 2015). While not empirically or 'scientifically' established during this study, extensive anecdotal evidence obtained during data collection in Accra indicates an ongoing reduction in the city's green cover and the associated decline in its tree population. It is, therefore, necessary to situate urban forestry within broader processes of urban and regional planning and development and to analyse its relation to neoliberalism, globalisation and climate change adaptation in recent decades.

### **1.3 Aims and Objectives**

In this research project, I aim to generate a comprehensive account of the history of urban forestry in Accra, investigating the form and functions of the city's trees over time. While I identified first descriptions of Accra's trees dating back to the early 18<sup>th</sup> century, information for the 19<sup>th</sup> century and later is more widespread and, therefore, the focus of my work.

I further seek to challenge current policies and associated planning and management priorities, using a scale- and place-sensitive approach that demonstrates how present activities reinforce existing social disparities. Thereby, urban forestry in Accra forgoes the opportunity to more effectively utilise urban trees' multiple benefits to simultaneously improve individuals' well-being while addressing pressing issues of global scope, such as the harmful effects of climate change.

To achieve these aims, my objectives were as follows:

1. Analyse archival documents to produce a coherent account of the history of urban forest policy and practice in Ghana, with particular reference to Accra.
2. Conduct a tree inventory and canopy cover analysis to document the structure of Accra's contemporary urban forest and its connections to both historical and current events and processes.
3. Interview and survey key actors and stakeholders to analyse planning and management approaches and their effectiveness concerning identified strengths, weaknesses, opportunities, and threats (SWOTs).
4. Observe and enquire into human–tree relations to document the well-being and livelihood functions of urban trees in present-day Accra, with particular reference to residents in neighbourhoods of modest means or low(er) socio-economic status.
5. Analyse contemporary urban forestry interventions for their (likely) effects on socio-environmental conditions.

This research will generate previously unavailable information on neighbourhood-level canopy cover and the urban forest of Accra that can act as baseline information in future planning and management activities. In exposing the legacy effects of historical events and processes on the present-day structure of the city's urban forest, I hope to achieve two connected goals. First, initiate a discussion that will lead to a re-evaluation of the perpetuated narrative that marginalised population groups are unaware of and responsible for existing intra-city variations of canopy cover and its ongoing decline. Secondly, I suggest that practical urban forestry activities should be adapted to address how current approaches systematically disadvantage particular categories of individual citizens and groups. A more nuanced understanding of the multiple functions of urban trees, including for human well-being and livelihoods, is not just relevant to Accra but also to the broader discussion of urban lives and the role that natural elements and resources might play in it.

## 1.4 Research Questions

In line with the above aims and objectives, the research questions that I address focus on four broad themes/topics. First, I investigate the contextual background of urban forestry in the city to answer the following question:

1. How have contextual factors affected the structure of Accra's urban forest over time and across space?

This section consists of an analysis of the key historical and contemporary state and non-state policy interventions, as well as other social, legal, political, environmental, and technical variables, including both one-time events and longer-term processes. As the process of 'doing urban forestry' is integral to urban/city place-making, I will locate this analysis within the wider context of urban and regional planning and development. This information can then be related to data collected on the structure of Accra's urban forest, including its spatial and temporal variation.

Second, I focus on currently dominant views on urban tree management and use, as well as the policy and other interventions they inform, in answering the following research question:

2. How do individual actors and different stakeholder groups use and manage Accra's trees, with a view to identifying strengths, weaknesses, opportunities, and threats?

This section starts by identifying major actors and stakeholders and eliciting their views on the purpose(s) of planning, managing, and ultimately using the urban forest. It compares and contrasts the opinions and actions of these groups and individuals, in addition to identifying the nature of the interactions between them. Central to this part is an explicit focus on the (unequal) distribution of decision-making power and its effects on urban forestry and its practitioners in the city.

Third, I concentrate on and emphasise the perspective of individuals and households in investigating the question:

3. To what end do residents in unplanned high-density, low-income neighbourhoods manage and use public and private trees?

Here, I analyse the multiple well-being and livelihood functions of Accra's trees for the city's residents, one of the principal groups of stakeholders and, where they grow trees on their private land, not just stakeholders but also actors. To answer this research question, I investigate both their perceptions on management and use as well as practical activities, mirroring research question two. The section also contains a comparison between four case study stakeholders/actors, drawing attention to the heterogeneous nature of this group. Findings from the previous section will be integrated to highlight discrepancies of opinions and approaches.

The first research question investigates how past events and processes have shaped Accra's contemporary urban forest structure. In this section, I seek to close the circle and investigate contemporary and proposed interventions and their potential future impacts. Thus, I ask:

4. How will current and proposed interventions and developments affect people's ability to use urban trees within a livelihood context?

After introducing five of these current and proposed interventions, I discuss their likely impacts on individual and household capacity to benefit from a changing urban forest. I purposefully selected these interventions to cover a range of actors and stakeholders, tree types, and stages in the planning and management cycle. Based on the projected effects, I then offer suggestions as to how tree planting might be facilitated and done in a way that may reduce tree cover disparities and provide accessible trees to all, rather than further intensifying intra-city disparities.

## **1.5 Research Design**

Based on the above-stated aims, objectives, and research questions, I have opted for a mixed methods approach that combines qualitative and quantitative data collection and methods of

analysis in a single study (Tashakkori and Teddlie, 2003; Creswell and Plano Clark, 2007). I use qualitative information from stakeholder interviews, archival research, and a household case study component to complement quantitative data from canopy cover analysis, a tree inventory, and household questionnaire survey. I align my project with Donna Mertens' transformative paradigm (2008) in which the axiological belief – “enhancement of social justice, furtherance of human rights, and respect for cultural norms” (Mertens, 2010, p. 470) – is the foundation upon which ontology, epistemology, and methodology are built. As such, the research explicitly focuses on uneven power relationships that can be related to economic status, race/ethnicity, gender or age (Mertens, 2012) and how they affect whose reality is privileged or normalised.

According to Mertens, the task of the researcher is not just to recognise existing inequities and injustices, but “to challenge the status quo” (Mertens, 2007, p. 212), a position which is reflected in my intention to critically examine both the dominant view(s) of urban forestry and their differentiated material and other outcomes in Accra. Mertens' transformative paradigm, combined with the conceptual framework I develop in the next chapter, made me adopt urban political ecology as the main theoretical framework for this thesis. Through this transdisciplinary ‘lens’, researchers seek to investigate “who produces what kind of socio-ecological configurations for whom” (Heynen *et al.*, 2006, p. 2) to challenge common, apolitical narratives (see Chapter 2, especially Section 2.4).

## **1.6 Original Contribution**

In this research, I move beyond intra-city comparisons of green space or tree cover and outline the history of urban forestry in Accra. I thereby identify the lasting effects of previous events and processes in creating current unequal spatial and other configurations in Accra's treescapes. As such, the study's findings raise important questions about the adequacy of the currently favoured

narrative of some key state actors. Several of these actors suggest that canopy cover variations between neighbourhoods simply reflect how people ‘value’ urban trees – a ‘cultural’ preference that can be influenced or countered via education and persuasion. However, combining several methods of data collection, I generate results, which suggest the need for re-contextualising such views. I demonstrate how residents in lower socio-economic neighbourhoods are neither unaware nor lack knowledge of the benefits and importance of trees. Thus, they are not indifferent to planting, protecting, and maintaining them, but have often found themselves having to prioritise other livelihood pursuits instead. As a result, this research challenges both common stereotypes, as well as the efficiency, appropriateness and responsiveness of government institutions’ interventions designed to focus inordinately on ‘public’ education and information campaigns.

The findings from my case study with four households further extend our knowledge of urban human–tree interactions and the well-being and livelihood functions of the city’s urban forest. Tangible tree products not only strengthen human capital, such as through the health benefits of consuming fresh fruits or accessible medicinal products but also play a central role in gifting and exchange situations. As part of these, tree products are an integral element in creating and maintaining social capital, a type of resource that can serve to increase livelihood security. These tangible products, however, are not the only tree benefit of use in producing social capital as the plants themselves, and most commonly the pleasant environment they create through their shade, act as ‘place-makers’ in which social interactions can take place. I suggest that these insights add to our understanding in a novel way and require further investigation in diverse contexts to generate information capable of challenging basic tenets and widely-held assumptions, which have long functioned as drivers of urban forest planning and management.

## **1.7 Thesis Structure**

In the next chapter, I use the existing literature to construct a conceptual framework and introduce the relevant theories which have informed my analysis. This framework then serves as a starting point to review previous research, demonstrating the gaps in our current knowledge and the research questions that I, therefore, ask to address these gaps. Chapter 3 outlines my research methodology, demonstrating why, based on the research questions, I have opted for a mixed methods research (MMR) approach. This chapter also includes a comprehensive discussion of the individual methods adopted. The discussion Chapters 4 to 7 are devoted successively to the four different research questions identified earlier (see Section 1.4). In Chapter 4, I trace the history of urban forestry in Accra, linking it to the present-day structure of the city's trees. This chapter is a modified and extended version of a previously published paper (Hosek, 2019). The following chapter focuses on how various actors utilise and manage Accra's forest, using an analysis of identified strengths, weaknesses, opportunities and threats to create a more comprehensive and connected picture of urban forestry in Ghana's capital. Chapter 6 includes a detailed analysis and discussion of individual and household-level tree interactions and relations. In Chapter 7, I introduce five current and proposed urban forestry-related activities and their expected effects on the city's residents. The concluding chapter integrates the insights from earlier chapters, highlighting the need for further research and proposing an actionable plan to evaluate current urban forest planning and management activities and potential adjustments.

## 2 CONCEPTUAL AND THEORETICAL FRAMEWORK AND LITERATURE REVIEW

“[T]raditionally, the focus of Ghana’s Forestry was on timber production. And much of the focus was on forest in the hinterlands, in the forest reserves, in the off reserves. However, the trends are changing, and people are beginning to study other components of the environment, other than just timber, and so urban forestry is fairly new in the system.”

**Researcher, Forestry Research Institute of Ghana (FORIG)**

In this chapter, I develop a conceptual framework that illustrates how events and processes at multiple scales directly and indirectly affect urban forestry (Fig. 3, left side of diagram). The resulting urban forest structural and functional configurations then determine who benefits where, when and how, as the right half of Fig. 3 indicates.

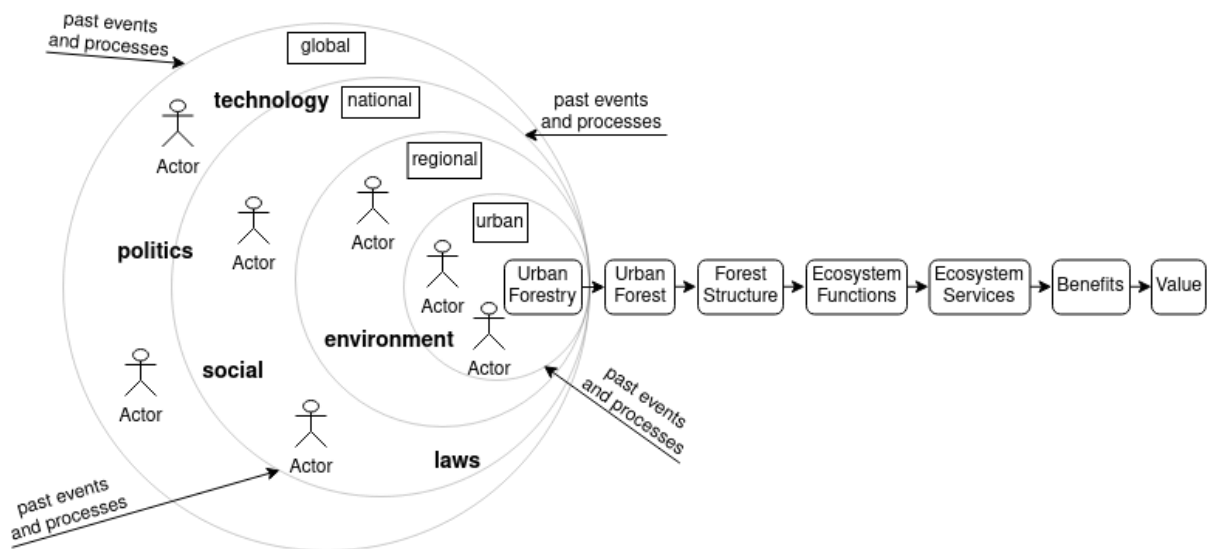


Figure 3 Conceptual framework

It differs from other frameworks used to discuss ecosystem services in two ways. First, it is urban forestry specific and, second, explicit about ecosystem management’s human dimension. Starting



at ‘urban forestry’, I trace the path from urban trees, an inherently natural resource, to their societal benefits. After that, I again start at ‘urban forestry’, this time to focus on management aspects. Here, I consider actors and stakeholders, their roles, and the broader context in which they operate. I then combine both components to illustrate why a political ecology lens is suitable for this project. Finally, I utilise five components of the framework to review the relevant literature, thus identifying gaps in our knowledge and demonstrating how my research questions address these.

## **2.1 Urban Forestry**

Urban forestry is no curious contradiction in terms but recognises the hybrid nature of cities where trees are as present as brick and mortar. Referring to the process of managing urban trees, its professional origin has been traced back to the late 1800s (Konijnendijk *et al.*, 2006) though trees have been planted in cities since ancient times (Hauer *et al.*, 2017). Historical overviews exist for countries such as the United States (US) (Johnston, 1996), Ireland (Johnston, 1997a), Britain (Johnston, 1997b; Johnston, 1997c), Canada (Rosen, 2015), Singapore (Webb, 1998), or regions like Europe (Lawrence, 1993; Forrest and Konijnendijk, 2005). Though non-exhaustive, this list reflects the geographical foci of urban forestry research. Different local approaches and professionals from various backgrounds have caused inconsistent terminology (Konijnendijk *et al.*, 2006), thus generating multiple definitions of ‘urban forestry’ (Hauer, 2005; Brown, 2007). A popular definition considers it to be the “art, science, and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic, and aesthetic benefits trees provide society” (Helms, 1998, p. 193). I use this definition as it refers to both the theoretical and applied components of urban forestry, its natural and social science base, and arboricultural maintenance. To achieve holistic planning and management, these elements need to complement each other. Furthermore, it asserts the existing relationship between trees and people, with the provision of services to society regarded as the fundamental

purpose. This link must be examined in detail to specify what ‘managing’ the trees involves (Fig. 4).



Figure 4 Framework – Part I

## 2.2 Zooming in

### 2.2.1 The Urban Forest

What constitutes an urban forest has been defined in various ways, not least due to the ambiguous nature of the two contributing words. Some entertain a broader approach, defining the urban forest to consist of all open and green spaces containing woody vegetation (Pütz *et al.*, 2015). Others contain a stronger tree focus, suggesting it includes forested stands like the ones in rural areas, but also “trees found along streets, in residential lots, in parks, and in other land uses” (Nowak, 2016, p. 37). Though in both perspectives, the urban forest is formed by the same trees, I suggest that the definitions differ and likely evoke distinct management approaches and research questions. Trees in cities, undoubtedly, form part of a comprehensive green network, including grasslands, herbaceous, and other vegetation covers. In this study, however, a tree-focused approach permits investigating their specific roles and functions, many of which other forms of greenery do not offer (Fig. 5).

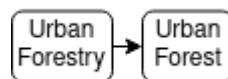


Figure 5 Framework – Part II

The urban forest manager or researcher faces no shortage of tree-centred definitions of what exactly they try to manage or research. I chose the definition of Miller *et al.* (2015, p. 4) as it illustrates two critical aspects. They state that the urban forest is “the sum of street trees, residential trees, park trees, and greenbelt vegetation”, but specify that “[i]t includes trees on unused public

and private land, trees in transportation and utility corridors, and forests on watershed lands”. This highlights that urban trees grow on both public and private lands, a conceptually vital distinction (see Section 2.3.2). Furthermore, “[s]ome of these trees and forests were willfully planted and are carefully managed by their owners, while others are accidents of land-use decisions, economics, topography, and neglect” (Miller *et al.*, 2015, p. 4). The urban forest, therefore, is created by multiple interacting variables. In this research, I use the term ‘tree’ in a deliberately broad sense to include plants with a tree-like habit, such as *Arecaeae* (palms). Though they differ anatomically, palms commonly grow in Mediterranean and (Sub)tropical cities and are functionally similar enough to actual trees to be included in this project.

### **2.2.2 From Tree to Value**

Urban trees are elements of a socio-ecological system. A biophysical structure or process (such as an urban forest) performs specific functions, thereby creating services that benefit people and can be economically valued (Potschin and Haines-Young, 2011). This connection is generally accepted but deceptive in its seeming simplicity. The underlying terminology is debated as key words are redefined, combined, split up, or replaced by alternatives (Balmford *et al.*, 2008; Fisher *et al.*, 2009; de Groot *et al.*, 2010a). Similarly, some criticise widely used typologies for “mix[ing] processes (means) for achieving services and the services themselves (ends) within the same classification category” (Wallace, 2007, p. 236). Examples of this include pollination, water regulation or photosynthesis, which rarely are management objectives and usually just serve to obtain ‘actual’ services like food or potable water. From an economic perspective, this constitutes a valid argument as double-counting and false trade-offs in decision-making should be avoided (Boyd and Banzhaf, 2007). However, I agree with those favouring coexisting classification systems (Constanza, 2008; Fisher and Turner, 2008) as they need to be specific to the investigated ecosystem and the context in which it is studied (Fisher *et al.*, 2009). To illustrate the path from tree(s) to

value, I now describe, define and link the key urban forestry-related concepts, creating an appropriate framework for this project.

Urban forest managers require detailed information about the current tree stock to develop strategies, monitor the process, and evaluate its outcomes. Attributes such as “number of trees, species composition, tree size, health, tree location” (Nowak *et al.*, 2008, p. 347) and diameter at breast height (DBH) or crown dimensions (Nowak, 2008) describe a city’s forest structure and the spatial distribution of individual trees. This knowledge forms the basis of decision-making, and these decisions will, in turn, affect both specific trees and the forest as a whole (Fig. 6).



Figure 6 Framework – Part III

The trees then perform several ecosystem functions, which are the “physical, chemical and biological processes occurring in ecosystems that are necessary for its self-maintenance” (Dobbs *et al.*, 2011, p. 196). Among others, this includes nutrient and carbon cycling or the regulation of the atmosphere, microclimate, carbon emission, and the hydrological cycle (Ordóñez and Duinker, 2012) (Fig. 7).



Figure 7 Framework – Part IV

These functions, in turn, produce ecosystem services that link the trees’ natural processes to humans and their well-being. While not a new concept, it started to receive increased attention when the Millennium Ecosystem Assessment (MEA) was published in the 2000s. In this report, ecosystem services are, rather vaguely, defined as “the benefits people obtain from ecosystems” (Millennium Ecosystem Assessment, 2003, p. 53) and classified into four categories based on

function. The supporting services include soil formation, nutrient cycling, and primary production. The other three types – provisioning, regulating, and cultural services – produce various tangible and intangible benefits, such as food or recreational places. Like other common definitions (Constanza *et al.*, 1997; Daily, 1997), the MEA also illustrates the difficulties of clearly separating ecosystem functions, services, and benefits and providing self-contained descriptions for each. As I agree with Brown *et al.* (2007, p. 332), who call the difference between function and service “more than semantic”, I follow their approach in distinguishing between these two concepts (Fig. 8). Their definition of function concurs with the above-cited by Dobbs *et al.* – “physical, chemical and biological processes occurring in ecosystems that are necessary for its self-maintenance” – while ecosystem services are “the specific results of those processes that either directly sustain or enhance human life” (Brown *et al.*, 2007, p. 332).



Figure 8 Framework – Part V

Besides the MEA’s typology, ecosystem services are categorised according to functional (de Groot *et al.*, 2002), organisational (Norberg, 1999), or descriptive groups (Moberg and Folke, 1999). For this study, I adapt MEA’s scheme and consider what they call supporting services to be ecosystem functions instead. Despite this change, I consider the remaining groups – provisioning, regulating, and cultural services – adequate categories for this research. However, I want to highlight Norberg’s (1999, p. 185) typology criterion that considers the “level of ecological hierarchy” at which services are produced and maintained. These levels range from the individual through to species, functional group, community, ecosystem, landscape and to the global cycle. Planning the urban forest requires awareness of the trade-offs between these scales and their relation to management objectives.

The urban forest’s provisioning, regulating, and cultural services produce numerous tangible and intangible benefits that help to maintain or increase human well-being. Specific benefits include the provision of food or fuelwood, positive health impacts from reduced temperatures or air pollution, as well as spaces for recreation, education, or religious activities (Fig. 9).



Figure 9 Framework – Part VI

To illustrate the differences and relationships between function, service, and benefit, Escobedo *et al.* (2011, p. 2080) provide a helpful table from which I present some examples (Table 1).

Table 1 Examples of ecosystem functions and resulting services and benefits

Ecosystem Function	Ecosystem Service	Benefit
Primary productivity, biodiversity	Natural areas for human use	Outdoor recreation
Atmospheric deposition, filtering and interception of pollutants	Air quality improvements	Reduced mortality and morbidity related to air quality
Primary productivity, nutrient cycling, pollination, soil productivity, disease regulation	Production of grains, fruits, nuts, and seeds; water availability	Food harvests

Adapted from Escobedo *et al.*, 2011, p. 2080

My framework so far replicates the ‘cascading model’, initially proposed by Haines-Young and Potschin (2010), which depicts the same path from ecosystem structure to benefit. In this model, and its adaptations (de Groot *et al.*, 2010b), ecosystem services are located between what is called ‘ecosystems and biodiversity’ and ‘human well-being’. While the first includes ecosystem structure

and functions, the second refers to benefits and value. It illustrates the more than semantic difference between ‘function’ and ‘service’, but I disagree with the similarly rigid separation between ‘service’ and ‘benefit’. The anthropocentric position from which both ‘service’ and resulting ‘benefit’ are defined (see Table 1 above) closely links the two. An ecosystem service is a ‘service’ precisely due to the benefit that humans can obtain from it, and therefore, I suggest, conceptually more related to the socio-cultural component of the scheme, if not a part of it. This anthropocentric basis has been criticised for disregarding nature’s intrinsic value, instead commodifying it to calculate its economic worth (Schröter *et al.*, 2014) (Fig. 10).

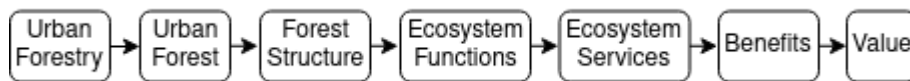


Figure 10 Framework – Part VII

## 2.3 Zooming out

### 2.3.1 Actors and Their Interventions

In addition to zooming in from ‘urban forestry’ to ‘value’, we can also zoom out from ‘urban forestry’, considering the broader planning and management context of this natural resource. Miller *et al.*’s definition has already suggested that some urban trees are ‘carefully managed’, implying that individuals and groups exist who are involved in ‘doing’ urban forestry. These include both state actors, like government departments and agencies, and non-state actors. According to the African, Caribbean, and Pacific–European Union Partnership Agreement 2000/483/EC, also known as the ‘Cotonou Agreement’ (2000, Article Six), non-state actors include the private sector and civil society like religious groups, sport and cultural organisations, Non-Governmental Organisations (NGOs), trade unions, research institutions, or the media. For this project, I also classify individuals and households as non-state actors. While all other actor types consist of these individuals, the capacity in which they serve concerning a specific issue functionally differentiates them. In urban forestry, actors like NGOs provided saplings and tree planting support to indi-

viduals and households (Lipkis and Lipkis, 1990) or local governments (Pincetl, 2010). The media was involved in raising awareness and communicating events (Ottitsch and Krott, 2005), while municipal governments collaborated with the private sector to plan and conduct city greening initiatives (McPhearson *et al.*, 2010). These examples demonstrate how state and non-state actors intervene in urban forestry directly (i.e. planting, maintaining, utilising, or felling trees) and indirectly (e.g. communicating planting events; formulating regulations, laws, plans and policies; or forming partnerships).

Returning to the definition of ‘urban forest’, we can recall that managed trees are located on both private and public lands. This requires a conceptual and practical separation of how various actors can participate in urban forestry on land under different ownership. While state actors can, directly and indirectly, intervene in public urban forestry, they can affect private urban forestry only indirectly through laws and regulations. Land owning individuals and households, i.e. non-state actors, are usually the only type that can intervene directly in private urban forestry. Other non-state actors can indirectly intervene in both public and private urban forestry while their direct engagement in either is contingent on permission from governmental organisations or private individuals (Table 2). Numerous actors combined with varying land ownership types then cause the complex nature of holistic, city-wide urban forest planning and management.

**Table 2 Involvement in urban forestry based on actor type and land ownership**

	Public Land	Private Land
State actors	direct and indirect	indirect (and direct <sup>1</sup> )
Non-state actors – groups and organisations	direct <sup>1</sup> and indirect	direct <sup>1</sup> and indirect
Non-state actors – individuals and households	direct <sup>1,2</sup>	direct

<sup>1</sup> with permission and/or depending on laws, <sup>2</sup> depending on activity, direct involvement may be illegal



The question of land ownership, and often by extension tree ownership, is essential to urban forestry. Though varying between locations, trees on private lands contribute substantially to a city's green cover. In various British towns, an iTree Eco survey (see Section 3.3.1.2) estimated that between 25 % and 79 % of trees were in private ownership (Vaz Monteiro *et al.*, 2020). According to iTree Canopy assessments (see Section 3.3.1.1), private lands contained 61 % of total canopy cover in New Westminster (Canada) (City of New Westminster, 2015) and even 90 % in Alexandria (United States of America) (City of Alexandria, 2009). As private property contains a large proportion of urban trees, state actors require efficient systems to indirectly intervene in private urban forestry to meet city-wide management objectives. Stronger coercive and punishing elements might likely be required the more their objectives diverge from or interfere with non-state actors' views, especially those of individuals and households. These complexities surrounding land/tree ownership, actor types, and modes of involvement require being explicit about what trees, actors, and actions are under investigation.

### **2.3.2 Acting within Context**

Urban forestry is practised within a specific environmental, legal, technological and socio-political context. These factors are both internal to the actors, e.g. the number of employees or available technology, and external, such as soil or climatic conditions. Additionally, decisions made and actions taken by seemingly uninvolved groups can have unintended or undesirable effects on planning and management or the trees directly. As urban forestry is embedded within the broader context of urban development, it also competes with city planning's other objectives. Common aims include efficient cities that can ensure economic growth, feature inclusive communities and conserve natural, built and historic resources (Campbell, 1996; Couch, 2016). These complementary goals are often contradictory in terms of their implementation, thus requiring trade-offs (Campbell, 1996). Road constructions that compact soils and trenching for underground utility

pipes can impede tree root health (Jim, 2003; Day *et al.*, 2010). Furthermore, urban growth requires an adequate housing supply that can reduce space for other land cover types (Pauleit *et al.*, 2005). The effects of events and processes at the regional, national or global scale, such as new laws or technological innovations, may also trickle down and, directly or indirectly, alter a city's urban forest (Fig. 11).

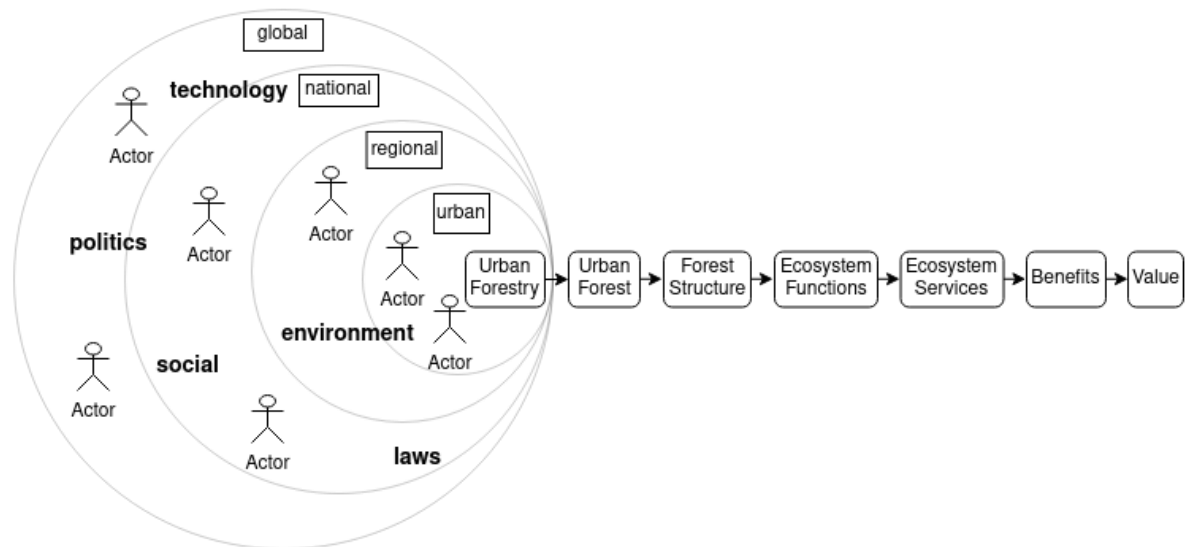


Figure 11 Framework – Part VIII

### 2.3.3 Inheriting (from) the Past

Urban forest structure is not just affected by processes at different scales but also by historical human–nature interactions. Any investigation aiming to understand current configurations should evaluate these feedback mechanisms. The study of such interplays started in the 18<sup>th</sup> century, formalised as the discipline of historical ecology in the 1960s (Szabó, 2015). Lunt and Spooner (2005, p. 1860) describe it as “a new paradigm in which ecologists view ecosystems as *historically* and spatially influenced non-equilibrium systems that are complex and open to human inputs”. Balée (2006), in turn, considers these past interactions not just crucial for our understanding of contemporary landscapes but also for their effects on the formation of culture. Historical ecology, however, not only facilitates an understanding of the present, as contemporary

landscapes are not endpoints but rather intermediate points in a continuing development. Evaluating how the past has influenced the present facilitates anticipating the future. This ‘predictive endeavor’, as Christensen (1989) calls it, often includes developing models that provide scenarios for ecosystem changes or future land-use patterns based on historical information. These predictions also “explain or [to] forecast spatial differences in system structure or function” (Pickett *et al.*, 1994, p. 139), merging space and time and illustrating their interdependencies.

Early interest in human–environment interactions was especially strong in forestry as “foresters deal with living organisms that have life cycles much longer than humans” (Agnoletti, 2000, p. 2), and past conditions play “a significant and continuing role in the structure of most forest ecosystems” (Christensen, 1989, p. 116). Though rural trees tend to outlive their urban counterparts that grow in more challenging conditions, city trees nonetheless grow for extended amounts of time. While their life spans vary based on planting site (Roman and Scatena, 2011), past events and processes affect current configurations. The legacy effects of human and biophysical factors have recently been reviewed (Roman *et al.*, 2018, p. 160), corroborating that “historical processes must be considered in any investigation that seeks to explain how urban forest structure and spatial patterns emerged”. My framework, therefore, needs to reflect the importance of understanding past developments and path dependencies (Fig. 12).

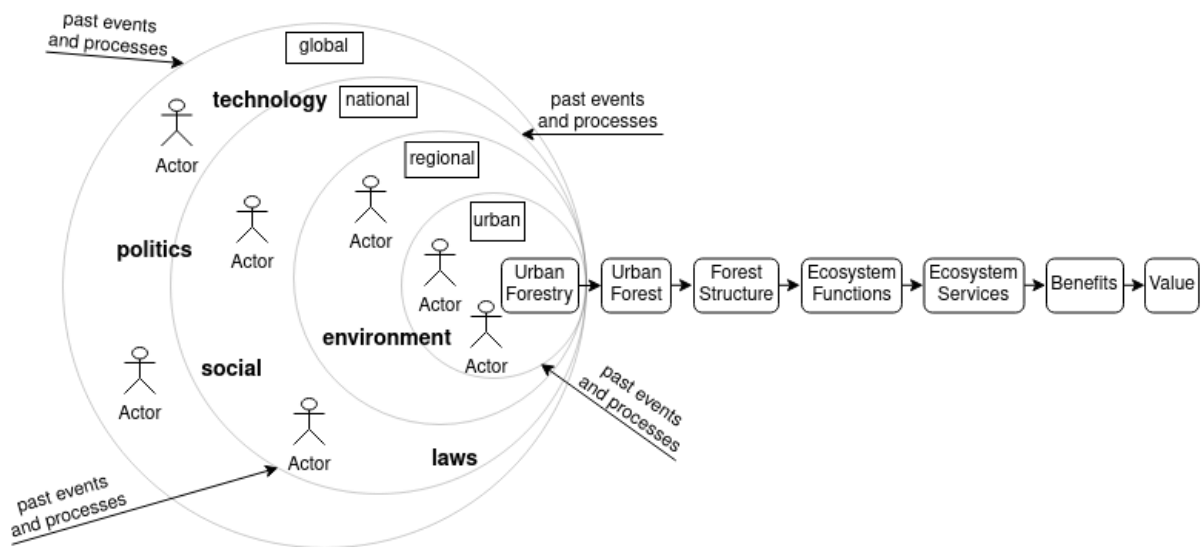


Figure 12 Framework – Part IX

## 2.4 The Larger Picture – Political Ecology

My framework illustrates how two seemingly distinct parts are connected. The framework’s right side focuses on trees and their characteristics, natural elements in a biological and ecological sense. On the left side, however, socio-political and historical themes dominate, constituting the context within which the former is planned and managed. The far-right side, where ecosystem functions turn into human benefits, further emphasises how urban trees are both natural and social elements. To examine Accra’s trees in context, I adopt the lens of political ecology, “a trans-disciplinary research field addressing nature-society interrelations” with an explicit focus on social inequality and asymmetries of power (Karlsson, 2015, p. 350). Political ecologists challenge common narratives, focus on the social production of the environment and “identify broader systems rather than blaming proximate and local forces” (Robbins, 2012, p. 13). In apolitical explanations, these local forces are often marginalised groups whose behaviour is regarded as irrational or ignorant. Environmental degradation or specific spatial structures of animal biodiversity, forest cover or land use are then blamed on their activities, disregarding alternative interpretations. While political ecology has been accused of “lacking a coherent theory” (Karlsson, 2015, p. 350), eclectically borrowing from e.g. (Neo-)Marxism, feminist studies, post-structuralism, or post-

colonial studies, it offers an alternative reading of environmental management and transformations.

Political ecology initially focused on rural areas due to its intellectual origins in human and cultural ecology, their proponents “[t]ypically working in rural and agrarian Third World societies” (Peet and Watts, 1993, p. 239). However, an urban version has since emerged, considering cities to be “dense networks of interwoven socio-spatial processes that are simultaneously local and global, human and physical, cultural and organic” (Heynen *et al.*, 2006, p. 1). Inequalities in cities, therefore, arise from unjust processes caused by unequal distributions of power and reveal themselves both in the presence and location of ‘the bad’ and ‘the good’. Thus, in Accra, poorer people inhabit the area of Agbogbloshie, which contains a toxic e-waste dump for equipment originating from all over the world (Akese and Little, 2018). Meanwhile, a functioning sewage system predominantly serves households in affluent neighbourhoods (Boadi and Kuitunen, 2005).

Urban political ecologists have researched city trees and their management, acknowledging “that the urban forest is a political and social construct, a creation of people’s preferences and choices” (Sandberg *et al.*, 2015, p. 6). McLain *et al.* (2012) expressed similar views, arguing that urban forest configurations are never neutral but exhibit how dominant voices and interests prevail over others. Urban forest structure, because of human decision-making, is inherently political. If the structure is political, so are the resulting functions, services, and benefits. Within cities, structural elements, like canopy cover or species diversity, often correlate with socio-economic variables, like household income (Pedlowski *et al.*, 2002; Kuruneri-Chitepo and Shackleton 2011; Schwarz *et al.*, 2015). While residents of affluent neighbourhoods benefit from the surrounding trees’ services, inhabitants of less wealthy areas are disadvantaged twice. Besides fewer available ecosystem services, they also suffer from the harmful effects of poorer urban living conditions, residing in hotter (Mehrotra *et al.*, 2018) and more polluted areas (Dionisio *et al.*, 2010) or neighbourhoods

prone to flooding (Amoako and Inkoom, 2018). Urban political ecologists, especially (Neo-) Marxist ones, consider such manifestations to embody neoliberal socio-structural realities like income inequality and resource ownership. In doing so, they insert ‘neoliberalism’ into the equation.

Neoliberalism, a political and economic theory and associated practices, entails “an institutional framework characterised by strong private property rights, free markets and free trade” (Harvey, 2005, p. 2). Beyond maintaining or creating the necessary political-economic and other structures to facilitate its operation in the way described, direct state intervention or participation in the economy is kept to a minimum. Neoliberalism has “become hegemonic as a mode of discourse” (Harvey, 2005, p. 3), having shaped global developments. Advocates of neoliberalism work in many institutions, including the World Bank and International Monetary Fund (IMF), and have disseminated their views widely, often at considerable expense (Cline-Cole and Harrison, 2010). In 1983, Ghana launched the Structural Adjustment Program (SAP), introducing neoliberal reforms linked to loans from these lenders of last resort. While inflation rates reduced and the gross domestic product grew, within-country inequalities increased and further marginalised already disadvantaged groups, including the urban poor, notably women (Brydon, 1999; Konadu-Agyemang, 2000; Obeng-Odoom, 2012).

My framework demonstrates how neoliberalism and urban forestry connect as tree benefits turn into (financial) value on the far-right side. Dollar prices are assigned to tonnes of stored carbon dioxide (Nowak and Crane, 2002; Liu and Li, 2012) and garden or neighbourhood trees increase property values (Anderson and Cordell, 1988; Sander *et al.*, 2010; Escobedo *et al.*, 2015). Additionally, “economic valuation provides monetary values for non-priced urban-forest amenities” (Tyrväinen, 2001, p. 76) such as its recreational use (Dwyer *et al.*, 1989; Tyrväinen and Väänänen,

1998). This process inserts nature into a neoliberal market structure where a tree benefit's financial value is often a key consideration when actors prioritise management objectives.

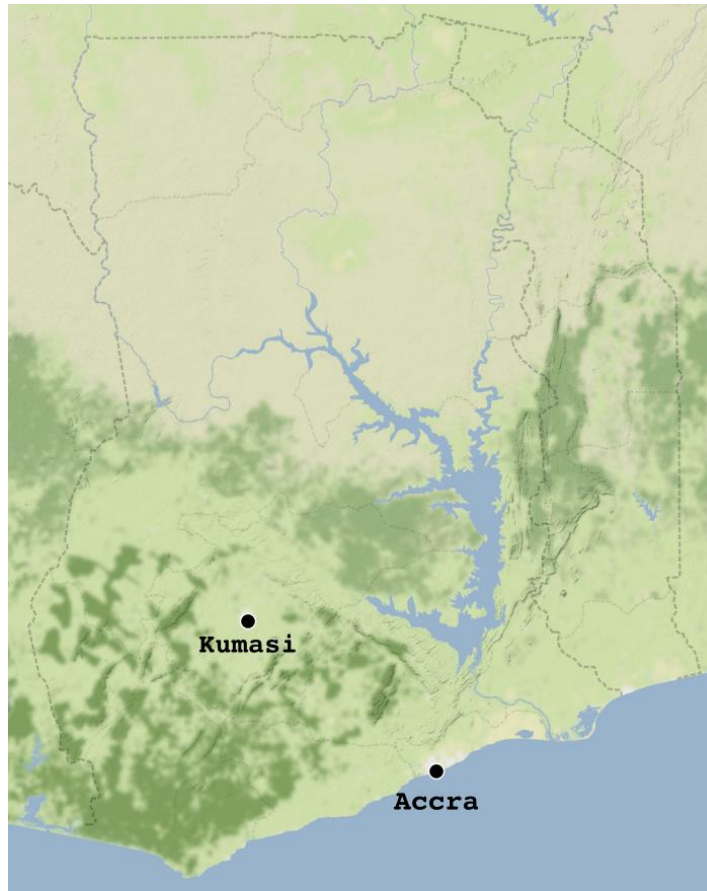
## **2.5 Focus on the Framework's Components**

I now focus on the framework's components to review the pertinent literature, thereby identifying knowledge gaps while rooting the research questions within an appropriate theoretical and conceptual structure. Though I favour comprehensibility and discuss individual elements separately, the framework itself substantiates how such divisions are artificial.

### **2.5.1 Context SpecificITY**

State and non-state actors plan and manage the urban forest within specific environmental, social, legal, political and technological settings. Urban forestry is, therefore, highly context-specific and practical experiences or study outcomes not necessarily transferable (Shackleton, 2012). Urban forestry research in Ghana is limited, despite slight increases in the past five years. A non-systematic literature search indicates a low double-digit number of publications, recording more than five journal papers for 2017 and 2018 only. A sub-set of this research focuses on the promotion and destruction of urban vegetation (Mensah, 2014a; Mensah, 2014b; Oduro-Ofori *et al.*, 2014; Arku *et al.*, 2016; Nero, 2017; Owusu, 2018), some of which connected to intra-city variance and the population's socio-economic characteristics (Stow *et al.*, 2013; Yeboah, 2016). Others collected species-level and individual tree information in Kumasi, about 250 km northwest of Accra (Uka and Belford, 2016)(Fig. 13), calculated carbon stocks (Nero *et al.*, 2017; Nero *et al.*, 2018a) or estimated the nutrients provided by food trees (Nero *et al.*, 2018b). Researchers also collected information on animals inhabiting the urban forest (Deikumah and Kudom, 2010). De-

spite the breadth of the covered topics and employed methods, the overall low publication number limits the depth of our understanding.



**Figure 13 Location of Kumasi**

Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL

Urban forestry research in Ghana focuses on Kumasi, probably due to its historical ‘Garden City’ designation and as home to the country’s Forestry Research Institute (FORIG). However, some publications devoted to Accra cover unique subjects, investigating food and nutrients sourced from the city’s trees (Nero *et al.*, 2018b) or the Achimota urban forest as a religious space (Okyerefo, 2014; Okyerefo and Fiaveh, 2017). Other topics mirror the Kumasi-based research and include changing land use, varying intra-city forest cover or neglected public parks (Stow *et al.*, 2013; Arku *et al.*, 2016, Yeboah, 2016; Owusu, 2018). While population size and climate in Kumasi and Accra resemble each other, the Köppen-Geiger classification assigning a tropical sa-



vannah/dry-winter climate to both, the cities are located in different agro-ecological zones (Abbam *et al.*, 2018) with different histories and cultures (Owusu and Agyei-Mensah, 2011). Setting my research in Accra, I not only redress the current imbalance in Kumasi's favour but also add to a field where outputs on North American and European countries dominate (Roy *et al.*, 2012; Shackleton, 2012).

### **2.5.2 Urban Forest Structure**

Urban foresters require basic information about the resource they manage, including the total number of trees, their locations, species, size, and health. They collect this data during complete or sample inventories, their scope defined by the requirements and available resources. Tree stock is assessed through field-based bottom-up approaches, 'remote' top-down ones that use aerial or satellite images, or a combination of both types. Forest structure has been studied all over the world, from Nordic countries (Gundersen *et al.*, 2005) to South Africa (De Lacy and Shackleton, 2017) and from Chile (Escobedo *et al.*, 2006) to Australia (Dobbs *et al.*, 2013). Besides their geographic range, these studies also utilised various methods, including aerial photographs (Melbourne), postal questionnaires (Northern Europe) and field-based sampling (Grahamstown and Santiago). Additionally, research may encompass all public and private trees, like in Australia, or focus on public trees (Chile), sacred sites (South Africa) or woodlands (Nordic countries). Furthermore, these four examples investigated diverse structural variables like canopy cover, species composition and richness, tree density, stem diameter, or leaf area index. Indeed, these few selected studies display the range of approaches available to investigate urban forest structure.

Most studies, however, not only assess forest structure but also investigate its correlation at sub-city level with socio-economic variables like race/ethnicity, income, or educational level (Heynen and Lindsey, 2003; Hope *et al.*, 2003; Martin *et al.*, 2004; Landry and Chakraborty, 2009; Lubbe *et*

*al.*, 2010; Kuruneri-Chitepo and Shackleton, 2011; Schwarz *et al.*, 2015). Generally, these structural and socio-economic variables correlate, thereby producing an uneven urban forest. Though effects were weak in Kumasi (Nero, 2016), areas of higher socio-economic status in Accra feature denser vegetation cover (Stow *et al.*, 2013; Yeboah, 2016). Whereas structural causes may systematically (dis)advantage certain neighbourhoods, private land-use decisions, e.g. based on cultural preferences or available resources (Lubbe *et al.*, 2010), also affect a city's urban forest.

In this project, I produce baseline information on Accra's current urban forest structure. Previous research utilised satellite images to measure vegetation cover but also included bushes, hedges, or grass areas (Stow *et al.*, 2013; Owusu, 2018). These top-down approaches study the city's green space though not individual trees. Yeboah (2016), who researched how urban forest and residential class interrelate, conducted a field-based assessment but only counted trees within random plots. This approach fails to include essential components of a tree inventory like diameter at breast height (DBH) or tree size (Leff, 2016). For a holistic picture, I combine desk- and field-based data collection methods to analyse Accra's urban forest structure. My neighbourhood boundaries match those of an earlier 'poverty mapping exercise' (CHF International and AMA, 2010) which rated areas based on population and housing density or access to toilets and fresh water (see Section 3.2). Combining these ratings with my urban forest structure data then allows investigation of how urban forest structure and socio-economic variables correlate in Accra.

### **2.5.3 Path Dependencies and Legacy Effects**

Contemporary urban forest structure reflects past events and processes. As trees are "long-lived organisms that require decades to achieve mature size" (Roman *et al.*, 2018, p. 158), their socio-spatial distribution is clearly linked to the past (Boone *et al.*, 2010; Grove *et al.*, 2014). These legacy effects "have too often been overlooked in analyses of urban forest spatial patterns" (Roman

*et al.*, 2018, p. 166). When researchers offer historically contextualised explanations, their detail and depth vary. cursory statements observe how Accra lost much of its vegetation “when Ghana embarked on [the] Economic Recovery Program (ERP) and its associated trade liberalization” (Owusu, 2018, p. 43). A more nuanced analysis relates contemporary plant diversity to a steep socio-economic gradient caused by the apartheid regime in South Africa (Lubbe *et al.*, 2010, p. 2908). The third type, though, consists of comprehensive narratives, often covering US cities (Nowak, 1993; McPherson and Luttinger, 1998; Merse *et al.*, 2009). I now discuss examples from Nairobi and Kumasi in detail to illustrate the complexities of path dependency.

Njeru (2010; 2013) examines how donor-driven neoliberal processes affected the Karura urban forest in Nairobi. I selected this example because Njeru uses an approach they label ‘political ecology’ in investigating the effects of SAP on urban forestry. Njeru argues that powerful international donors forced both democratisation processes and the SAP on the country, thereby influencing political and economic developments. Kenya depended on IMF loans, while the Moi regime “creatively used the discourse of privatization (and its associated free market ideology) to mask patronage connections underpinning the selling of the public forest reserve to private interests” (Njeru, 2010, p. 339). The funds raised were spent on a re-election campaign as donors had forced Moi to adopt a multiparty system. A report by the succeeding government suggested reclaiming the sold parts and protecting the forest, prohibiting human activity within its boundaries. However, this disadvantaged the surrounding inhabitants of low-income housing areas whose livelihoods depended on the forest, where they collected firewood, medicinal plants and fodder. Despite their active protests against privatisation in the first place, they were later excluded in the name of environmental protection.

The second example is a recent investigation of Kumasi’s development ‘From the seat of a traditional Kingdom to a Garden city’ (Amoako and Adom-Asamoah, 2019). The authors investigate

how the city's socio-political developments interact with green space management and attribute changing landscapes to a conflict between what they call 'traditional set-up' and 'state officialdom'. The traditional set-up refers to the "well-developed socio-political structure with the office of the Asantehene commanding absolute power and loyalty" (Amoako and Adom-Asamoah, 2019, p. 312). State officialdom, on the other hand, was introduced when the British defeated the Asantes in the late 19<sup>th</sup> century and changed the city according to their needs. However, chiefs returned most land to its original form and function when land ownership was restored to the Asante Kingdom in the 1920s. British ad hoc city planning in the 1940s then created an 'unplanned hybridity' where "[a] haphazard colonial urbanism overlay an older order, masking but not erasing it" (McCaskie, 2000, p. 205). Furthermore, the planners took the Asantes' support for granted, overlooking that people would try to assert ownership over plots that could potentially become valuable building land.

After independence, Kumasi City Council encountered similar problems as "chiefship and its many allies worked to retain historic rights of disposition over land" (McCaskie, 2000, p. 230). The dual management system, composed of customary and state institutions, remained in place, the latter group trying to manage green spaces "which are usually lands created by the state but owned by the powerful customary leadership." (Amoako and Adom-Asamoah, 2019, p. 314). State departments then cannot address encroachment and might be pressured into re-zoning open areas into commercial or residential use when traditional authorities ally themselves with prospective developers. Similar to Njeru, the authors comment on how ideas of preserving public open spaces lacked the city residents' inputs and "has been an imposition by state institutions with little or no consultations" (Amoako and Adom-Asamoah, 2019, p. 323). Since 1980, Kumasi has lost over half its open and green spaces, caused by conflicting needs and lack of cooperation between the 'traditional set-up' and 'state officialdom'. Despite the differences between Kumasi

and Accra, similar legacies might also affect the capital's urban forest and its historical development.

I now combine context specificity, urban forest structure and its path dependencies to form the first research question. Urban forestry research has grown over the past 20 years but remains dominated by European and North American study locations (Shackleton, 2012) and researchers (Bentsen *et al.*, 2010). As my framework illustrates, it is situated within a wider context, defined by place-specific environmental, legal, political, economic, or social variables with feedback loops across multiple scales. Despite “common threads in legacy effects across many cities for similar historical time periods, neighborhood forms, and bioregional contexts, there can be idiosyncrasies in urban forest patterns and trajectories” (Roman *et al.*, 2018, p. 165). These context-specific characteristics require us to “recognize *the crucial role of local sociopolitical history*” (Roman *et al.*, 2018, p. 165). We, therefore, need to obtain baseline information on Accra's urban forest structure and examine how biophysical and human legacies have shaped it over time. Accordingly, the first research question I address is:

1. How have contextual factors affected the structure of Accra's urban forest over time and across space?

#### **2.5.4 Urban Forestry – Planning and Managing the Urban Forest**

Urban trees naturally produce ecosystem services, but planning and management processes affect their location, quality and quantity. Urban forestry links management and maintenance to desired benefits and the required urban forest structure. ‘Sustainable management’, i.e. “maintaining healthy and functional vegetation and associated systems that provide long-term benefits desired by the community” (Dwyer *et al.*, 2003, p. 49), is a core component of this process. Dwyer *et al.* propose a sustainable management model with five relevant factors. These include the social context, management goals and objectives, management outcomes, inventory and survey data, as well

as the “vegetation structure and/or management programs that have been identified as necessary to sustain desired urban forest benefits” (p. 52). They recognise the central role of people in this process, such as stakeholders’ participation and partnerships among decision-makers. However, they conceptually disconnect urban forest managers from ‘the community’ for whose benefit the managers develop strategies that are then being ‘administered’.

The model proposed by Dwyer *et al.* (2003) resembles ‘governance by government’ approaches (Lawrence *et al.*, 2013), where official bodies seek limited inputs from the community, thus overlooking its central role. Urban forestry, though, is moving towards ‘governance with government’ (Lawrence *et al.*, 2013; Ugolini *et al.*, 2015). Environmental governance research, however, has received limited attention despite investigating these “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” (Tacconi, 2011, p. 240). Reflecting this approach, Lawrence *et al.* (2013) developed a framework where detailed narrative information complements summary outlines of any urban forest project. Combined with the ‘sustainable management’ model, this framework can guide the analysis of urban forest management processes. Besides identifying stakeholders and their relationships, it draws attention to the institutional and discursive circumstances in which they define management priorities or monitor and evaluate outcomes.

#### *2.5.4.1 Who?*

The diverse nature of actors and stakeholders complicates identifying all involved groups and individuals, but always includes the general public, some individuals only as stakeholders, others as both actors and stakeholders when they own land with trees. Depending on place and project, further stakeholders may include governmental departments, environmental groups, researchers,

and arboriculturists, “all of whom tend to have different points of view, goals, perspectives, skills, and means, which in many cases inhibit productive collaboration among them” (Ugolini *et al.*, 2015, p. 366). Besides generic stakeholder classifications (Miles, 2017) or simply distinguishing between state and non-state actors, researchers have also developed context-specific ones. These can be broad – Ugolini *et al.* (2015) identified three actor types (academics, public administrators, and practitioners) – or detailed, a Swiss study identifying 13 stakeholder groups (Wilkes-Allemann *et al.*, 2015). Typical research topics include how specific actor/stakeholder types plan and manage the urban forest, interact with each other, or a combination of both.

Focussing on municipal urban foresters, Ordóñez *et al.* (2019) reviewed the literature to identify their concerns and priorities. Out of 60 publications, however, only two were from an African country (South Africa). Research has also investigated how private individuals view and maintain their household trees (Summit and McPherson, 1998; Kirkpatrick *et al.*, 2012; Kirkpatrick *et al.*, 2013a; Shakeel and Conway, 2014; Hungerford and Moussa, 2017). Private individuals also participate in non-state and state actors’ urban forestry activities (Austin, 2002; Greene *et al.*, 2011; Gulrud *et al.*, 2018). Using Melbourne as a case study, Gulrud *et al.* (2018) present an example of successful and reflexive urban forest co-governance. Interested residents can become volunteer ‘citizen foresters’, participate in workshops or access tree data. When Melbourne faced water shortages, residents dissuaded the city from removing trees to reduce irrigation needs, instead prioritising their long-term benefits. Key to such co-governance is “coordination by local authorities that recognizes the autonomy of the individual and their situated expertise in social-ecological resilience” (Gulrud *et al.*, 2018, p. 165). While government departments are central to urban forestry (van der Jagt and Lawrence, 2019), they ultimately operate in a multi-stakeholder environment.

#### 2.5.4.2 What for?

Urban tree benefits have received considerable attention, but a growing body of research also points out potential disservices. How trees affect property values has been investigated widely (Anderson and Cordell, 1988; Dombrow *et al.*, 2000; Conway *et al.*, 2010; Sander *et al.*, 2010; Dimke *et al.*, 2013; Pandit *et al.*, 2013), most studies concluding that house prices/rents positively correlate with green cover. However, (densely) vegetated areas can increase fear of crime (Talbot and Kaplan, 1984), but findings are mixed and actual crime rates often rather decreased (Kuo *et al.*, 1998; Troy *et al.*, 2012; Gilstad-Hayden *et al.*, 2015; Locke *et al.*, 2017). Empirical evidence for energy savings from trees' cooling effects is less ambiguous but requires "planting the right trees in optimal locations" to maximise this benefit (Ko, 2018, p. 324). This study, however, focused on single-family, air-conditioned homes in North America, again underscoring how context matters in urban forestry.

The list of tree services further includes reduced groundwater run-off (Coder, 1996) and noise (Dwyer *et al.*, 1992), the provision of recreational space (Tyrväinen, 2001), air pollution interception (Yang *et al.*, 2005), or carbon sequestration (Nowak and Crane, 2002). They reduce temperatures and heat stress (Akbari *et al.*, 2001; Yu and Hien, 2006) but may also cause allergic reactions (Cariñanos and Casares-Porcel, 2011) or attract dangerous and disease-bearing wildlife (Lyytimäki, 2014). Trees damaging infrastructure, fertilisers and pesticides harming the environment and resources spent on maintenance operations are further disservices (Lohr *et al.*, 2004; Escobedo *et al.*, 2011; Gómez-Baggethun and Barton, 2013; Lyytimäki, 2014). While cost-benefit analyses could support decision-making, comprehensiveness is not easily achieved (Song *et al.*, 2018). Such calculations demand location-specific inputs (Williams, 2002; Avolio *et al.*, 2015) and multiple temporal and scalar trade-offs when selecting valuation methods and examined services and disservices.



Urban tree benefits have been researched globally (Lohr *et al.*, 2004; Schroeder *et al.*, 2006; Peckham *et al.*, 2013; Camacho-Cervantes *et al.*, 2014; Ordóñez and Duinker, 2014), but I now focus on African countries to counter the existing geographical bias. Researchers inventoried urban forests in Nigeria (Kayode, 2010; Borokini, 2012), Togo (Raoufou *et al.*, 2011), and Ghana (Uka and Belford, 2016). Uka and Belford (2016) identified 70 street tree species in Kumasi, fewer than reported for Lomé (Raoufou *et al.*, 2011). In Ekiti state (Kayode, 2010) and Ibadan (Borokini, 2012), species numbers ‘in and around households’ resembled those from Kumasi and respondents in both Nigeria and Ghana listed fruits, medicine, fuel, shade, wind control, and cash income as important tree benefits. Kayode (2010, p. 483), therefore, concluded that “the products derivable from the trees influenced the choice of species planted by the respondents”. While Uka and Belford (2016) recommend planting large trees in Kumasi to remove pollutants and sequester carbon, Kayode (2010) emphasises how better meeting people’s needs could avoid repeating previous failures of urban tree planting exercises.

A South African photorealistic visualisation study (Donaldson-Selby *et al.*, 2007) concurs with Kayode’s (2010) conclusion, albeit based on opposite results. Residents in a low-cost, high-density neighbourhood assigned lower ratings to landscapes with tangible benefits, like vegetable gardens or fruit trees. Instead, they favoured flower gardens, shade trees and sports fields, which surprised the researchers “given the socio-economic nature of the housing settlement” (Donaldson-Selby *et al.*, 2007, p. 11). However, the participant number was low ( $n = 20$ ) and the study’s aim imprecise, not specifying if people were asked to rate the landscapes’ aesthetic appeal or the benefits they would provide. Another South African study also illustrates how research design affects results. Socio-economically diverse respondents valued their towns’ green spaces for recreation, job opportunities and human well-being, these intangible benefits probably dominating as green spaces include “golf courses, sport fields and other open nature areas” (Shackleton and Blair, 2013, p. 106). Furthermore, responses to open-ended questions were classified post-

hoc and ‘job opportunities’ or ‘human well-being’ could include tangible products as research has documented their importance for South Africans (Kaoma and Shackleton, 2014; Kaoma and Shackleton, 2015; Shackleton *et al.*, 2015; Gwedla and Shackleton, 2019).

Research on urban tree benefits is ubiquitous but geographically and topically incomplete. With some exceptions (e.g. McLain *et al.*, 2012; Clark and Nicholas, 2013; Poe *et al.*, 2013; McLain *et al.*, 2014; Tiwary *et al.*, 2020), research in Europe and North America has focused largely on intangible tree benefits. When tangible products are studied, it usually is in the context of public rather than private trees. Almost a decade ago, Shackleton (2012) suggested investigating tree products for their potential role in alleviating urban poverty, which requires a place-specific understanding of the trees’ individual and household level functions. While Shackleton and colleagues have started to investigate this aspect, their studies often focus on quantitative research approaches (Kaoma and Shackleton, 2014; Kaoma and Shackleton, 2015; Shackleton *et al.*, 2015; Ward and Shackleton, 2016). This preference for the quantitative pervades research on urban tree benefits and costs more generally as a review of 115 papers demonstrated that no study “used observations, content/text analysis or focus groups” (Roy *et al.*, 2012, p. 356).

#### ***2.5.4.3 Under What Circumstances?***

City residents’ views on tree values often differ from those of municipal and state actors (Hunter, 2001; Hofmann *et al.*, 2012). While some cities have developed urban forest management plans, they can fail to identify planning objectives (Ordóñez and Duinker, 2013; Gibbons and Ryan, 2015). Where these documents are unavailable, like in 93 % of surveyed South African municipalities (Chishaleshale *et al.*, 2015), urban forestry lacks transparency. Few studies (e.g. Kirkpatrick *et al.*, 2013b; Gwedla and Shackleton, 2015) have investigated tree professionals’ and government departments’ management priorities, despite their views eventually being reflected in policies.

More commonly, researchers investigate the challenges these actors encounter. While Swedish green space managers feel sufficiently funded (Randrup *et al.*, 2017), they are an exception (Stobbart and Johnston, 2012; Driscoll *et al.*, 2015; Kronenberg, 2015). Facing resource constraints, managers forego regular tree monitoring (Ordóñez *et al.*, 2019) and focus on reactive arboricultural activities rather than pro-active schemes (Groniger *et al.*, 2002) thus impeding long-term sustainable urban forestry.

Besides limited budgets, stakeholder interactions, or the lack thereof, also complicate urban forestry (Ordóñez *et al.*, 2019). As Dwyer *et al.* (2003, p. 51) argue, “[i]f management activities are administered independently of community goals, they are not likely to represent the convergence of what is socially desirable and ecologically possible”. Official bodies and the public are but two groups whose relationships have been studied (Janse and Konijnendijk, 2007; Ugolini *et al.*, 2015; Kozová, 2018), researchers investigating differing priorities and the cost-benefit analyses they are based upon. In Accra, heat, pollution, and flooding have caused health problems and deaths (Dionisio *et al.*, 2010; Rain *et al.*, 2011). I, therefore, expect government departments to focus on utilising trees to reduce indoor and outdoor temperatures, stormwater run-off, and traffic-derived pollutants and particulate matter. I further assume that official actors regard the benefits as exceeding the costs, though species-site matching and maintenance affect both. I propose the following research questions to investigate how stakeholders value, manage, and use the city’s greenery:

2. How do individual actors and different stakeholder groups use and manage Accra’s trees, with a view to identifying strengths, weaknesses, opportunities, and threats?
3. To what end do residents in unplanned high-density, low-income neighbourhoods manage and use public and private trees?

### **2.5.5 Repeating the Process, Looking to the Future**

Path dependencies have shaped contemporary urban forests, and current events and processes will shape the forests of tomorrow. The global discourse on Millennium and Sustainable Development Goals centres cities and their nature, the trees' ecosystem services expected to mitigate problems associated with population growth, urbanisation, and climate change (Endreny, 2018). However, these same processes also threaten the urban forest, creating harsher growing conditions while land-use conflicts can cause tree damage or removal. Additionally, underfunded urban forestry programmes may “lack an overall vision about the values to be achieved by the tree planting, and the urban forest design best fit to achieve these values” (Barron *et al.*, 2016). Barron *et al.*'s decision support framework breaks this vision down into specific strategies with aligned indicators and targets but reflects how quantitative and positivist approaches dominate urban forestry research (Ostoić and Konijnendijk, 2015), limiting individual or household level interpretation and input.

When we predict future developments, proposed scenarios will tend towards the generic due to urban forestry's complexity; but to increase social equality, we need to be specific about who is involved and how they are affected. Hale *et al.* (2015) propose a structured process that begins with the desired tree benefits and then identifies under which conditions they are produced (e.g. water supply or canopy cover level). After that, researchers or practitioners can assess how future scenarios might affect these conditions and, thereby, the available benefits. While developed in a United Kingdom (UK) context, the approach can be adapted to other places. I suggest, though, that it currently fails to address how changes affect people differently, related, for example, to their socio-economic status. Urban trees' proposed role in sustaining human well-being and alleviating poverty is based at the individual and household scale. However, analysis of the effects of current and planned urban forestry interventions often ignores this scale. I, therefore, pose the following research question:

4. How will current and proposed interventions and developments affect people's ability to use urban trees within a livelihood context?

## **2.6 Chapter Conclusion**

In this chapter, I have developed a time-, scale-, and place-explicit framework that illustrates how different urban forestry-related concepts connect. I defined these components and introduced further relating classifications, typologies, and models. Through a stepwise process, urban forestry activities determine structure, functions, services, benefits, and values of city trees. Urban forestry itself occurs in a complex, multi-stakeholder setting that can be analysed in terms of its political, environmental, social, technological, and legal structure. Furthermore, events and processes at various scales and historical human–environment linkages also affect contemporary urban forest structure. Urban trees are both natural and social elements as discourses and power distribution shape urban forest planning and management of both public bodies and private individuals. These processes can be analysed through the lens of (urban) political ecology, which is crucial as they create, legitimise and thereby reproduce unequal availability and access opportunities. Focusing on specific framework parts, I reviewed the pertinent literature, thereby identifying knowledge gaps and the respective research questions that I am addressing in this project.

## 3 METHODOLOGY

“Aside that, it’s only individuals like your type who come here looking for information, they come for interview, after that, when they finish their dissertation, they put it on their libraries or whatever it is, and that ends it.”

**Mr Awidi, Department of Parks and Gardens (DPG)**

In this chapter, I present the methodological approach taken to answering the research questions identified in the previous chapter. To investigate these diverse, multi-dimensional issues in Accra, I adopted a mixed methods research (MMR) approach, collecting both quantitative and qualitative data. For this project’s purpose – an in-depth understanding of stakeholder interactions and the trees’ livelihood functions – I prioritised the qualitative component. To reflect political ecology’s focus on power relationships, I chose to work with Mertens’ (2007; 2008; 2010) transformative-emancipatory paradigm. Mixed methods research that includes marginalised groups often uses this paradigm due to its core concern for social justice. Furthermore, it requires examining the researcher’s positionality and the project’s ethical considerations in detail. After introducing my study site, I then focus on the data collection and analysis process of the tree inventory, the household survey and case study, the documentary research, and the stakeholder interviews.

### 3.1 Research Design

#### 3.1.1 Mixed Methods Research

Mixed methods research has become popular in a variety of disciplines since its introduction during the 1960s. Such a study design is defined as research “in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry” (Tashakkori and Creswell,

2007, p. 4). Its advantages and disadvantages have been discussed within different contexts (Ivankova and Stick, 2007; Guerra *et al.*, 2011), including natural resource management in Ghana (Teye, 2012). These studies require being familiar with several data collection and analysis methods and often need more time and financial resources. However, their main advantage is often described as providing a more comprehensive understanding with qualitative and quantitative information complementing each other (Johnson and Onwuegbuzie, 2004), offering the ‘best of both worlds’.

These two worlds refer to positivism and interpretivism, common paradigms in social science research. Until the early 20<sup>th</sup> century, positivists dominated and conducted ‘value-free’ research to discover the objectively existing truth (Onwuegbuzie and Leech, 2005). Proponents of interpretivism, however, argued for a constructed and subjective reality. While positivism developed into post-positivism in the 1950s, rejecting the former’s rigid claims about value-neutrality, the two worlds’ ontological, epistemological, and methodological views were considered irreconcilable. In the 1990s, MMR became increasingly popular and challenged these claims (Howe, 1988). Researchers interpret ‘paradigm’ in four nested ways, from an all-encompassing worldview to a narrow description of how research is done in a given field (Masterman, 1970; Morgan, 2007), the chosen definition determining if and how data can be mixed. However, the methods themselves are essentially a-theoretical and a-methodological though often associated with specific paradigms and their methodologies that include certain preferred forms of data analysis (Giddings and Grant, 2007).

Mixed methods researchers developed several approaches to accommodate collecting and analysing various data types. An a-paradigmatic stance ignores potential incompatibility and assumes that methodology is independent of epistemology (Patton, 1990), an approach often rejected as “no research is paradigm free” (Hall, 2013, p. 5). Multi-paradigmatic approaches keep methods

separate, mix assumptions, or use the project's specific design to determine the most appropriate paradigm (Tashakkori and Teddlie, 2003; Cameron, 2011; Hall, 2013). Additionally, there are single-paradigmatic approaches for mixed methods research, such as the pragmatic, (critical) realist, or transformative ones. However, paradigms themselves are constructed by humans (Guba and Lincoln, 1994) and "what counts as a paradigm and how the core content of a paradigm is portrayed involves a series of ongoing struggles between competing interest groups" (Morgan, 2007, p. 61). I do not suggest that any classification is meaningless but instead agree with Onwuegbuzie and Leech (2005, p. 275), who argue in favour of re-conceptualising dichotomies as lying on a continuum instead.

### **3.1.2 The Transformative Paradigm**

Mertens' transformative paradigm centres social justice and power issues, and while constructivist or pragmatic research can also accommodate these, I chose Mertens' more radical approach for this project. Its axiological objectives of "enhancement of social justice, furtherance of human rights, and respect for cultural norms" (Mertens, 2010, p. 470) directly affect ontological, epistemological and methodological views. Though I did not fully adhere to its methodological approach, as I did not interact with the participants in defining the problem (Table 3), I take this explicitly non-neutral stance for three reasons. First, solely on principle; second, as appropriate due to the environmental equity issues identified in the literature review; and third, as a relevant overarching structure for a political ecology lens. Another paradigm often used in MMR is the outcome-oriented pragmatism (Johnson and Onwuegbuzie, 2004) that selects the most suitable methods for particular research questions (Feilzer, 2010). Mertens (2003), however, challenges the approach's prioritisation of practicality, questioning who it is practical for and for what purpose. Additionally, pragmatism has been described as a 'trojan horse', often inserting (post-)



positivist views into the research (Giddings and Grant, 2007) and the mixed methods discourse (Denzin, 2010).

**Table 3 The Transformative Paradigm: Ontology, Epistemology, Methodology, and Axiology**

Belief System	Transformative Paradigm
Ontology	<p>“There are multiple realities that are socially constructed, but it is necessary to be explicit about the social, political, cultural, economic, ethnic, racial, gender, age, and disability values that define realities. Different realities can emerge because different levels of unearned privilege are associated with characteristics of participants and researchers. Transformative researchers need to be aware of societal values and privileges in determining the reality that holds potential for social transformation and increased social justice.” (Mertens, 2007, p. 216)</p>
Epistemology	<p>“To know realities, it is necessary to have an interactive link between the researcher and the participants in a study. Knowledge is socially and historically located within a complex cultural context. Respect for culture and awareness of power relations is critical.” (Mertens, 2007, p. 216)</p>
Methodology	<p>“A researcher can choose quantitative or qualitative or mixed methods, but there should be an interactive link between the researcher and the participants in the definition of the problem, methods should be adjusted to accommodate cultural complexity, power issues should be explicitly addressed, and issues of discrimination and oppression should be recognized.” (Mertens, 2007, p. 216)</p>
Axiology	<p>“Three basic principles underlie regulatory ethics in research: respect, beneficence, and justice. The transformative axiological assumption pushes these principles on several fronts. Respect is critically examined in terms of the cultural norms of interaction within a community and across communities. Beneficence is defined in terms of the promotion of human rights and an increase in social justice. An explicit connection is made between the process and outcomes of research and furtherance of a social justice agenda.” (Mertens, 2007, p. 216)</p>

### 3.1.3 A Design for Mixed Methods Research

With rising popularity, the number of mixed methods research projects increased, and so did the desire to classify them. MMR studies vary regarding the prioritised data type (qualitative or quantitative), the timing of data collection (e.g. concurrent or sequential), and how and when researchers combine data. Classification schemes have been developed to group designs (Morse, 1991; Greene and Caracelli, 1997; Tashakkori and Teddlie, 1998), some, however, criticised as too complicated, too simplistic, or inconsistent (Leech and Onwuegbuzie, 2009). Creswell *et al.* (2003) identified six major but flexible designs, adaptable to specific projects. In their typology, my design corresponds to a ‘sequential transformative’ one, where either qualitative, quantitative, or both data types can be prioritised, either one collected first while data is integrated at the interpretation phase. This type’s more distinctive feature is the researcher’s explicit advocacy or empowerment perspective. While I first collected quantitative data, I prioritised qualitative information which corresponds to a ‘partially mixed, sequential, dominant status’ design in Leech and Onwuegbuzie’s (2009) scheme. To illustrate my project’s design, I provide a procedural diagram drawn according to Ivankova and Stick’s (2007) guidelines (Fig. 14).

Stage	Procedure	Product
Quantitative Data Collection 1	<ul style="list-style-type: none"> <li>Desk-based land use classification of random points (500 per neighbourhood)</li> </ul>	<ul style="list-style-type: none"> <li>Numeric data</li> </ul>
Quantitative Data Analysis 1	<ul style="list-style-type: none"> <li>Canopy cover analysis</li> <li>Correlation with socio-economic variables</li> </ul>	<ul style="list-style-type: none"> <li>Descriptive statistics</li> </ul>
Neighbourhood selection	<ul style="list-style-type: none"> <li>Purposeful selection based on poverty rating and location</li> </ul>	<ul style="list-style-type: none"> <li>Neighbourhoods (N = 5)</li> </ul>
Quantitative Data Collection 2	<ul style="list-style-type: none"> <li>Ground-based sample tree inventory in 5 neighbourhoods</li> <li>Plots N = 200</li> </ul>	<ul style="list-style-type: none"> <li>Numeric data</li> </ul>
Quantitative/qualitative Data Collection 1	<ul style="list-style-type: none"> <li>Household survey in selected neighbourhoods</li> <li>Households N = 100</li> </ul>	<ul style="list-style-type: none"> <li>Numeric data</li> <li>Text data</li> </ul>
Selection of case study households	<ul style="list-style-type: none"> <li>Purposeful selection of case study participants from household survey</li> </ul>	<ul style="list-style-type: none"> <li>Cases (N = 4)</li> </ul>
Qualitative Data Collection 1	<ul style="list-style-type: none"> <li>Archival research</li> </ul>	<ul style="list-style-type: none"> <li>Text data</li> </ul>
Qualitative Data Collection 2	<ul style="list-style-type: none"> <li>Interviews with key actors, stakeholders, and informants</li> </ul>	<ul style="list-style-type: none"> <li>Text data</li> </ul>
Qualitative Data Collection 3	<ul style="list-style-type: none"> <li>Case study with households (N = 4)</li> </ul>	<ul style="list-style-type: none"> <li>Text data</li> </ul>
Quantitative Data Analysis 2	<ul style="list-style-type: none"> <li>Analysis of iTree Eco (automatic analysis, model run by iTree)</li> </ul>	<ul style="list-style-type: none"> <li>Numeric data</li> </ul>
Qualitative Data Analysis 1	<ul style="list-style-type: none"> <li>Text analysis</li> </ul>	<ul style="list-style-type: none"> <li>Topics</li> <li>Timeline</li> </ul>
Qualitative Data Analysis 2	<ul style="list-style-type: none"> <li>Reflexive thematic analysis</li> </ul>	<ul style="list-style-type: none"> <li>Codes and themes</li> </ul>
Qualitative Data Analysis 3	<ul style="list-style-type: none"> <li>Framework analysis</li> </ul>	<ul style="list-style-type: none"> <li>Cross-thematic matrix</li> </ul>
Quantitative/Qualitative Data Analysis 1	<ul style="list-style-type: none"> <li>Frequency distribution</li> <li>Text analysis</li> </ul>	<ul style="list-style-type: none"> <li>Descriptive statistics</li> <li>Topics</li> </ul>
Integration of qualitative & quantitative results	<ul style="list-style-type: none"> <li>Interpretation of qualitative and quantitative results</li> </ul>	<ul style="list-style-type: none"> <li>Discussion of implications and directions for future research</li> </ul>

Figure 14 Procedural diagram

### **3.1.4 Positionality**

The multiple contexts in which I found myself allow no simple answer as to how my age, race, class, or gender attributes affected this research. All interviewees from governmental organisations and sub-metropolitan assemblies were male. Men also founded and led the two NGOs, though one woman participated in one of these interviews. I also never encountered a female herbalist or a woman selling fresh coconuts or tree seedlings and saplings by the roadside. Apart from the Achimota visitor whom I recruited during my visit to the forest, no woman could have replaced any of the male interviewees. In several instances, I felt I was not being taken seriously as a woman talking about (urban) forestry, particularly being significantly younger than some of the interviewed senior government officials. However, this might have worked in my favour as respondents possibly shared information more freely with me, being perceived as neither threatening nor overtly critical in conversation (Gurney, 1985; McDowell, 1988; England, 1994).

Being a white female undoubtedly facilitated access in neighbourhoods of higher socio-economic status, where walls and security guards protected the houses. I believe that my race and gender attributes made me appear non-intimidating and guards more likely to forward my request for participation to homeowners. Additionally, the notion of a shared class or socio-economic background might well have acted in my favour in securing interview permission with governmental actors. A static insider/outsider dichotomy, therefore, “ignores the dynamism of positionalities in time and through space” (Mullings, 1999, p. 340). Throughout data collection, I shifted between positions located more towards either side of an insider-outsider continuum. However, positionality might be better conceptualised through multiple, simultaneously interacting attributes (e.g. age or gender) for which location on the insider-outsider continuum can vary in any given situation.

My personal views, values and experiences also affected the study’s design and data analysis. The transformative paradigm and the political ecology lens reflect my aim to uncover alternative reali-

ties and knowledges that dominant groups or influential individuals tend to mute. However, I have never experienced either absolute or relative poverty in the study context and, therefore, might not be the most suitable person to examine urban tree livelihood functions and roles in promoting human well-being. As a European, Ghana's culture, history, and climate were unfamiliar to me; and while this might enhance the inclination to question the unknown, it also brings with it the risk of naivety. In hindsight, I remember several PhD supervisions where my supervisor asked about tree benefits other than the tangible ones I so insisted on focusing on. It required first-hand experience of Accra's climate to understand how tree shade can indeed top the list of desirable services. Both my personal experiences and the Euro- and Americentric nature of urban forestry research (Bentsen *et al.*, 2010; Roy *et al.*, 2012), therefore, influence my assumptions and approaches.

Besides positionality, the researcher's personality also affects a study's design and data analysis process (Moser, 2008). Moser argues that positionality attributes, like gender, race, or class, are superficial and a person's character more closely related to what kind of data collection approaches might be favoured. I relate to this view, preferring the position of the (quiet) observer, taking notes, eventually inquiring about what I see, or working in an archive. While observation and listening skills are also core abilities in interviews, these additionally require 'thinking on the spot' and more direct inter-personal social skills. At the beginning of the project and long before data collection, I wrote a reflexivity memo, questioning my ability to conduct interviews effectively (Fig. 15). While increasing experience reduced my pre-interview anxiousness, which varied depending on interviewee and setting, these personality traits are less affected by practice. As "we bring different internal qualities and various emotional abilities to our fieldwork that have an impact on the knowledges we create" (Moser, 2008, p. 390), research is never 'un-personal' and the researcher's traits are integral elements in each step of the process.

25. February 2016: What worries me more is, however, my personality, which I consider to be 'wrong' for doing interviews well. These kinds of things do not come naturally to me.

Figure 15 Extract from my research journal

### 3.1.5 Ethical Considerations

The University of Birmingham's Humanities and Social Sciences Ethics Committee approved this research. All potential participants were introduced to the study's objectives, the specific data collection tool, and their expected role using the respective participant information sheet or oral explanations in English or Twi (Appendix 1). Informed consent was obtained if the individual had no further questions and agreed to participate (Appendix 2). Besides these standard procedures, I now discuss three other ethical considerations. The first two concern participants' contributions and include the topics of confidentiality and power relationships, while the third one considers the environmental impacts of 'fieldwork abroad'.

'Good practice' in the social sciences often involves guaranteeing participants confidentiality. However, some types of research may contain visual data like photographs (Miller, 2015) or require describing the researched, their lives or inter-personal relationships in detail (Surmiak, 2018). This in-depth information can cause deductive disclosure, where the combination of personal attributes can identify a participant. De-identifying data (e.g. reporting age ranges instead of a specific number) mitigates this problem but "can alter or destroy the original meaning" (Kaiser, 2009, p. 1635). I informed interview and case study participants of this risk and selectively de-identified some data in my discussion chapters. While confidentiality may be the gold standard, some participants want to be identified and thereby recognised for their contributions (Miller, 2015). Especially in emancipatory and participatory approaches, the notion of partnership between researcher and researched implies "that confidentiality should not be imposed but negotiated with participants" (Surmiak, 2018, no page number). Accordingly, I offered my participants

the opportunity to link their names to their contributions, and one household and several interviewees opted to do so (see Sections 3.3.4, 3.3.5, and 3.6.2).

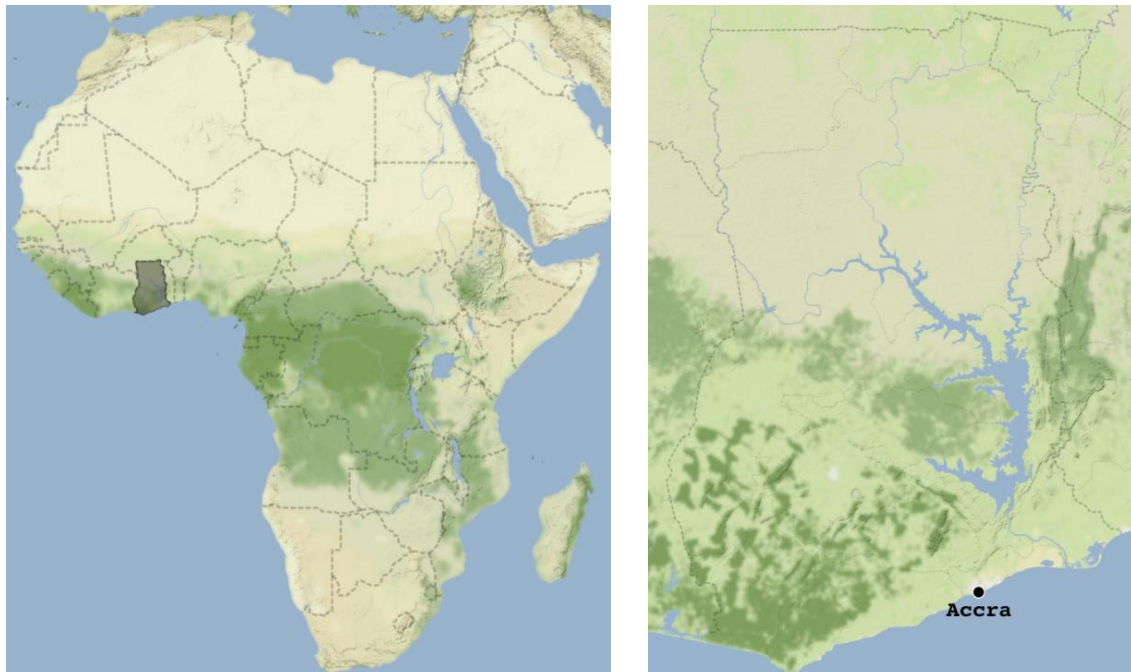
The transformative paradigm and political ecology are explicit about power relationships. However, participants volunteer their time and knowledge with potentially no or limited benefit for themselves, as the chapter's introductory quote illustrates. If the interviewee's statement creates an uncomfortable feeling, it does so because it demonstrates that "recognizing or even being sensitive to these power relations does not remove them" (England, 1994, p. 85). Even in an emancipatory-transformative approach, which conceptualises research as a partnership, some people are more equal than others. Interviewing, observing, or otherwise engaging individuals constitutes a "purposeful disruption of other people's lives" (England, 1994, p. 85), and consent does not eliminate these unequal power relationships. Though a research focus might be determined in collaboration with the to-be-researched, the investigator ultimately creates these spaces and invites others into them.

The environmental impacts of frequent research-related (air) travels and their ethical implications have received limited attention so far. Few universities or other research institutions have calculated the environmental footprint caused by the mobility of both staff and students (Stohl, 2008; Arsenault *et al.*, 2019). While all researchers should consider the adverse effects of (air) travel, it is essential for climate researchers whose credibility declined with increased flying (Attari *et al.*, 2016). The ethical approval process of any research should include reflecting on travel behaviour and reducing trips (Stohl, 2008; Le Quéré *et al.*, 2015). Throughout this project, I took multiple intercontinental flights from Germany to Ghana. Starting the PhD, I lacked concern for the environmental impacts of flying, which only developed more recently. In hindsight, my behaviour is ethically questionable, especially since social justice is central to my research and climate change, to which air travel contributes, disproportionately affects lower-income countries and their most

marginalised populations (Hallegatte *et al.*, 2016; Islam and Winkel, 2017; Diffenbaugh and Burke, 2019).

### 3.2 Study Site

Accra is Ghana's capital city and located at about 5°33' N 0°11' E, directly on the Atlantic Ocean (Fig. 16). It is the country's largest city, both in terms of population and area, with approximately 2 million inhabitants as of 2019.<sup>2</sup> While reported land area varies, often excluding information on the boundaries used or the year of reference, my study site covered 156 km<sup>2</sup>. The city experiences two rainy seasons (March to June and September to November) and has a tropical savannah climate, an Aw type according to the Köppen-Geiger climate classification scheme. This climate is characterised by the driest month having both less than 60 mm precipitation and less than  $100 - \frac{\text{Mean annual precipitation (mm per year)}}{25}$  (Peel *et al.*, 2007).



**Figure 16 Location of Ghana (grey) and Accra**  
Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL

<sup>2</sup> <https://www.statsghana.gov.gh/regionalpopulation.php?population=MTM0NTk2MjQzOS4yMDE1&&Greater%20Accra&regid=3> (Accessed: 27.01.2020)



My city and neighbourhood boundaries coincide with those of the Accra Poverty Map (CHF International and AMA, 2010), which, for lack of access, excluded the Airport area, Burma Camp (military zone), and Korle lagoon (Fig. 17). Using these boundaries, I can correlate my canopy cover assessment and the map's poverty ratings.



**Figure 17 Neighbourhood boundaries**

Shapefiles from EPA, map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL

1 – Kisseman	2 – Legon	3 – East Legon Ext.	4 – Akweteyman	5 – Alogboshie
6 – Abofu	7 – Achimota College	8 – North Dzorwulu	9 – South Legon	10 – East Legon
11 – Kwashiman	12 – Lapaz	13 – Abeka	14 – Old Tesano	15 – Abelenkpe
16 – Dzorwulu	17 – Airport West Res.	18 – North Odorkor	19 – Darkuman	20 – New Fadama
21 – Tesano	22 – North Alajo	23 – Roman Ridge	24 – Airport Residential	25 – South Odorkor
26 – Bubuashie	27 – North Kaneshie	28 – North Industrial	29 – Avenor	30 – Alajo
31 – Kpehe	32 – Kokomlemlé	33 – Kotobabi	34 – New Town	35 – Mamobi
36 – Nima	37 – Kanda	38 – Dansoman	39 – West Abossey-Okai	40 – Mateheko
41 – Abossey-Okai	42 – Kaneshie	43 – Awudome	44 – South Industrial	45 – Adabraka
46 – Asylum Down	47 – North Ridge	48 – Cantonments	49 – La Dadekotopon	50 – Russia
51 – Sukura	52 – Lartebiokorshie	53 – Sabon Zongo	54 – Zoti	55 – Tudu
56 – West Ridge	57 – Ringway Estate	58 – Labone	59 – Sempe	60 – Old Mamprobi
61 – Korle Bu	62 – Korle Dudor	63 – Accra Central	64 – Ministerial Area	65 – Osu
66 – Nyaniba Estate	67 – South Labadi	68 – La	69 – Mpoase	70 – Gbgebungbese
71 – Mamponse	72 – Mamprobi	73 – Chorkor	74 – Korle Gonno	75 – Jamestown
76 – Ussher Town				

In 2010, Accra Metropolitan Assembly (AMA), together with an NGO, conducted the poverty mapping exercise and rated the city’s neighbourhoods on eight variables (population density, income level, housing density, room occupancy, nature of access to water, domestic wastewater, mode of solid waste disposal, and nature of access to toilet facilities). Each variable was scored on a five-point scale (non-poverty, low poverty, moderate poverty, high poverty, very high poverty) and combined to an ‘overall poverty rating’ for each neighbourhood (Table 4; see Appendix 3 for individual neighbourhood ratings).

**Table 4 Number of neighbourhoods in each poverty class**

<b>Poverty Class</b>	<b>Number of Neighbourhoods</b>
1 – Non-poverty	7
2 – Low poverty	14
3 – Moderate poverty	25
4 – High poverty	28
5 – Very high poverty	2

### **3.3 Data Collection**

#### **3.3.1 Tree Inventory**

##### *3.3.1.1 iTree Canopy*

Between February and April 2016, I used the iTree Canopy programme<sup>3</sup>, an online tool provided by the United States Department of Agriculture’s (USDA) Forest Service, to determine tree cover of Accra and its neighbourhoods. I selected this tool because it requires neither technical knowledge nor extensive training and is freely available. On the website, the user uploads shapefiles of their study area, which are overlaid on Google Maps aerial photographs. The programme then displays random points that the user classifies according to previously defined land cover

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<sup>3</sup> <https://canopy.itreetools.org/> (Accessed: 16.03.2021)

categories. As the standard error decreases with an increasing number of points, between 500 and 1,000 should be categorised. For this study, I classified 500 points for Accra as a whole and for each of its neighbourhoods separately, using the categories ‘tree’, ‘non-tree plantable’, and ‘non-tree non-plantable’ (Table 5). The aerial photographs’ low quality impeded a more detailed division as even distinguishing between ‘tree’ and ‘non-tree’ proved difficult in some areas. After the user has classified the desired amount of points, the tool generates a report, summarising the categories’ per cent values, the corresponding land area, and the respective standard error (reported in brackets in the discussion section).

**Table 5 Examples of different land cover categories**

<b>Land Cover Category</b>	<b>Examples</b>
Tree	Tree
Non-tree plantable	Backyards Roadsides Open spaces
Non-tree non-plantable	Buildings Water bodies Roads

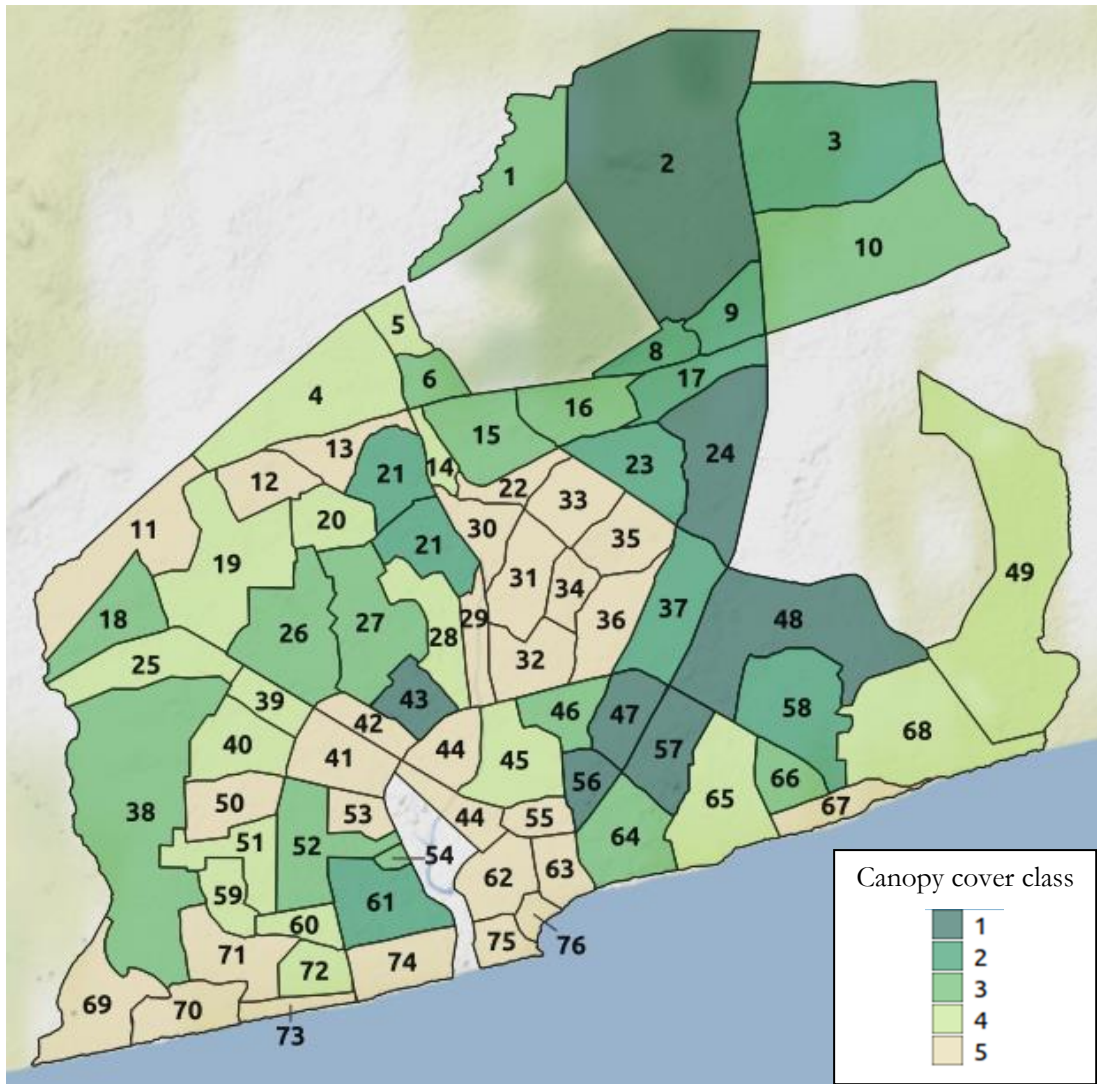
To facilitate data visualisation, I transformed the continuous ‘Tree Canopy values into categorical data, which further ensures comparability with the poverty map that also utilised (five) ordinal classes. As the place-specific nature of urban tree cover precludes applying values from other cities to Accra, I used Jenks’ natural breaks classification method to obtain five canopy classes. This method, also known as Jenks optimisation or Jenks-Caspall algorithm, clusters data in a way that minimises the average deviation of the class mean while maximising each class’s deviation from the other means (Jenks and Caspall, 1970). The Achimota College neighbourhood, because of the

3.6 km<sup>2</sup> Achimota Forest, has a canopy cover of 53.6 %, significantly higher than the second-highest value of 33.6 % in Legon. Accra's average of 14 % thus ended up in the second-lowest canopy class, which ranged from 8.4 to 15.2 % canopy cover. As the city average should be a reference point when creating classes that are to show intra-city variation, I excluded Achimota College neighbourhood as an outlier, resulting in the city average being located in class 3, now ranging from 12.4 to 17.4 % (Table 6).

**Table 6 Number of neighbourhoods in each canopy cover class**

<b>Class</b>	<b>Canopy Cover Range %</b>	<b>No. of Neighbourhoods</b>
1	26.2 to 33.6	7
2	19.4 to 24.8	9
3	12.4 to 17.4	14
4	7.4 to 11.8	17
5	0.2 to 6.6	28

Using these canopy cover classes, I coloured the neighbourhood map accordingly, with lighter green for lower and darker green for higher canopy cover (Fig. 18). I used the software 'R' (R Core Team, 2015) for statistical analyses, employing the Fisher-Freeman Halton test to investigate correlations between poverty and canopy classes. This test is suitable for  $5 \times 5$  contingency tables where observed numbers include zeros or expected numbers are smaller than five in more than 20 % of the cells. For computational reasons, I used the test with the Monte Carlo method (1,000,000 replicates).



**Figure 18 Neighbourhood canopy cover classes**  
 Shapefile from EPA, map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.  
 See Fig. 16 for neighbourhood numbering

### 3.3.1.2 *iTree Eco*

Besides the desk-based *iTree* Canopy cover analysis, I also conducted a plot-based sample inventory stratified by neighbourhood poverty class. For this, I used the *iTree Eco* tool<sup>4</sup>, another free software application from the USDA Forest Service. Users can either conduct a complete inventory of all trees within their study site or collect data in randomly located plots. The programme then runs a model that quantifies the forest’s structure – species condition, distribution, biomass,

<sup>4</sup> <https://www.itreetools.org/tools/i-tree-eco> (Accessed: 16.03.2021)

leaf area – and its functions, including pollution removal, carbon sequestration or avoided runoff. The exact output, however, depends on the information collected and further inputs such as air pollution and meteorological data. In designing the project, I followed the user manual’s guidelines and recommendations (USDA Forest Service, 2016), which suggest a total of 200 circular plots with at least 20 per stratum. Based on the combined land area of the neighbourhoods in each poverty class, I calculated the number of plots per stratum using a log formula (Table 7).

**Table 7 Number of plots per stratum**

<b>Stratum</b>	<b>Combined Land Area (ha)</b>	<b>No. of Plots</b>
1 (No poverty)	1,138.05	41
2	4,236.05	46
3	6,270.56	47
4	3,811.61	46
5 (Very high poverty)	188.89	20

Data collection was based on the field manual but excluded some of the non-required variables that lacked relevance in relation to my research questions (see Appendix 4 for data collection form). As the iTree Eco approach requires considerable resources, I sought to maximise efficiency by trading off costs and the potential added value of further data inputs (Table 8). Additionally, some of the application’s outputs necessitate information, such as annual hourly amounts of certain pollutants, that was unavailable for Accra and collecting the related ground-based data would have been redundant. The data collected included:

**Table 8 Collected plot and individual tree data**

<b>Plot</b>	<b>Individual Tree</b>
ID	ID
Stratum	Species
Global Positioning System (GPS) coordinates of centre	Land use
% of plot measured	DBH
% of plot tree cover	Crown condition
Trees present y/n	Total tree height
Land use	Live crown height
% Land use of plot	Crown base height
Ground cover	Crown width
	% Crown missing
	Crown light exposure
	Street tree y/n
	Public tree y/n
	Tree GPS coordinates
	Maintenance recommended y/n
	Sidewalk conflict y/n
	Utility conflict y/n

Two two-member teams visited the 200 plots between August and November 2016. I had to replace 22 plots that were located on school grounds or private property to which owners did not grant access (Table 9).

**Table 9 Replaced plots per stratum**

<b>Stratum (Poverty Rating)</b>	<b>No. of Plots Replaced</b>
1	6
2	8
3	5
4	2
5	1

Before starting data collection, I trained the research assistants in a theoretical class, after which we visited three plots to gain practical experience. For fieldwork, each team was equipped with the required forms and tools, including a GPS device, measuring tape, and clinometer (Table 10). Additionally, they took a tree identification guide and an information sheet that introduced the project to homeowners when a plot was located on their private property. If the trees could not be identified *in situ*, sample leaves were collected in plastic bags and given to the Department of Botany at the University of Ghana for identification. While most trees could be identified to species level, some could be identified to genus level only or not at all. The iTree Eco application then allows for entering a tree simply as hardwood or softwood. After I entered all paper-based data into the computer programme, a model was run and a comprehensive report provided.

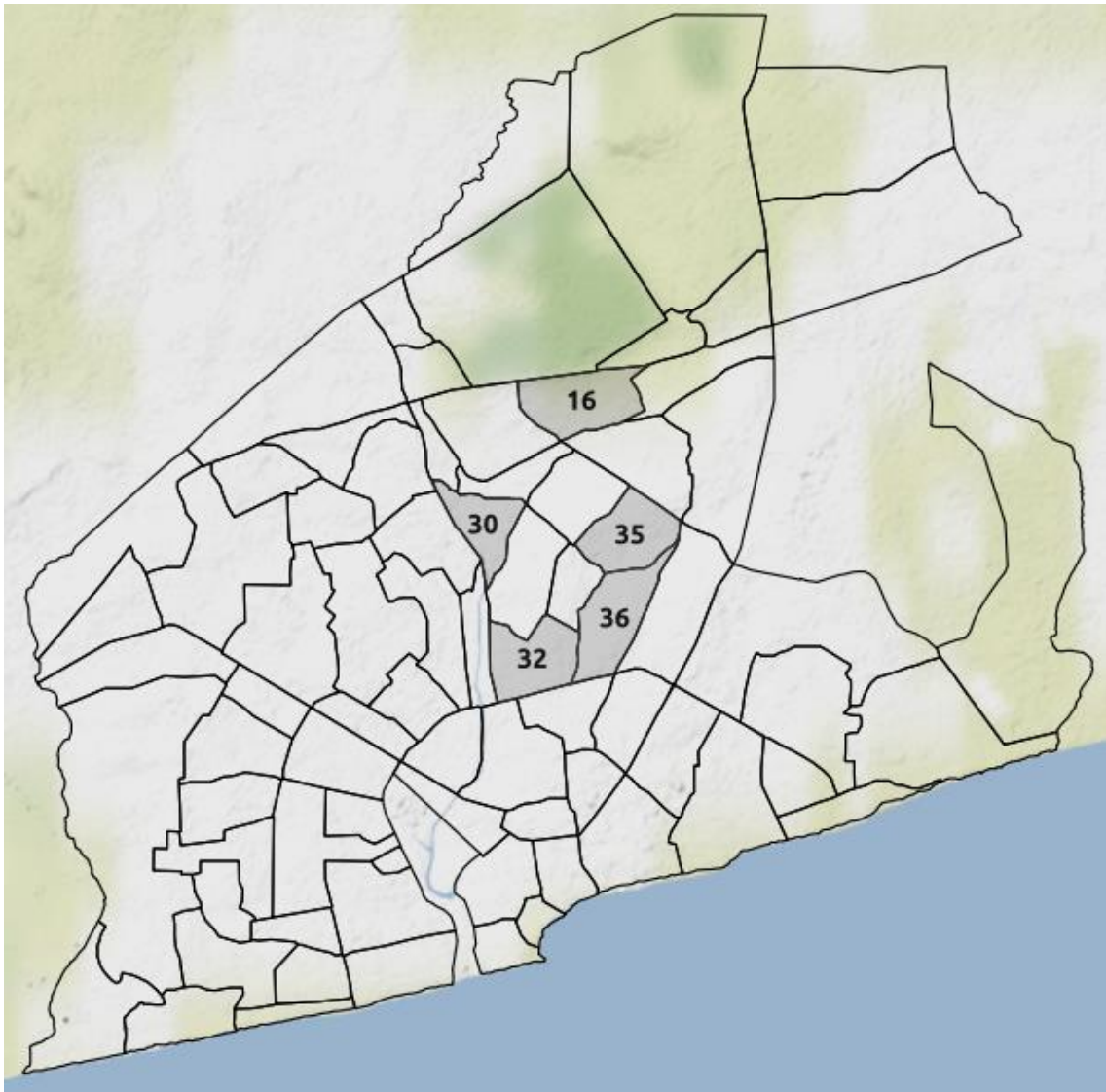
**Table 10 Equipment and producer information**

<b>Equipment</b>	<b>Type</b>	<b>Producer</b>
Measuring tape	20 m, Glasfaser-Bandmaß	Brüder Mannesmann Werkzeuge, Remscheid, Germany
Clinometer	PM-5/360 PC	Suunto, Vantaa, Finland
GPS device	GP-102 G-Porter	Canmore, Zhubai, Taiwan



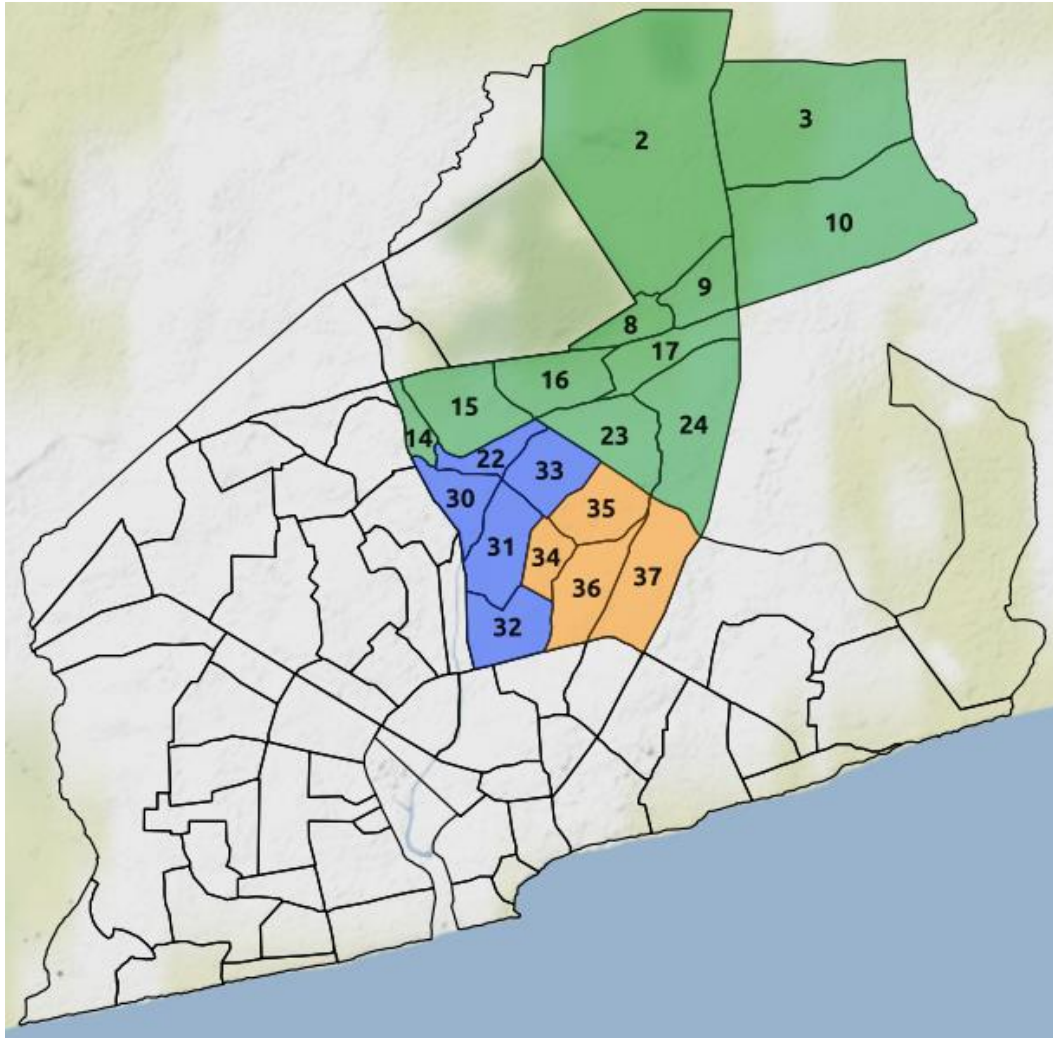
### 3.3.2 Household Survey

Between October and December 2016, I conducted a cross-sectional household survey with 100 participants in five of Accra's neighbourhoods that I chose based on three criteria. First, poverty map rating (Dzorwulu – 1; Kokomlemle - 2; Alajo – 3; Mamobi – 4; Nima – 5); second, their inner-city location; and third, proximity to each other (Fig. 19), all located in the Ayawaso sub-metropolitan areas (Fig. 20).



**Figure 19 Household survey neighbourhoods**

Shapefile from EPA, map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.  
16 – Dzorwulu      30 – Alajo      32 – Kokomlemle      35 – Mamobi      36 – Nima



**Figure 20 Ayawaso sub-metropolitan areas**

Shapefile from EPA, map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL  
 Green – Ayawaso West                      Blue – Ayawaso Central                      Orange – Ayawaso East

To account for potentially different opinions in relation to canopy cover, I used a stratified sampling approach. Stratification, however, was not proportionate as I lacked access to census data listing every household in the study sites. Instead, I adopted a disproportionate approach, with 20 respondents per neighbourhood. Initially, I intended to utilise a three-step process to identify respondents, starting with a random point (provided by iTree Canopy), then enumerating all households within a plot surrounding the point, and finally randomly selecting one from the list. However, I had misjudged the situation, and this approach would have been overly resource-consuming and was complicated by inadequate road naming and house numbering. As the dis-

proportionate sampling approach already limited external validity, I resorted to a two-step process where a random point served as the starting location for a convenience sample approach, contacting the closest available household. This offered a feasible approach considering the given circumstances.

Designing the questionnaire, I used various guidelines covering theoretical and practical aspects involved in developing a household survey (Grosh and Glewwe, 2000; Statistics Canada, 2003; United Nations, 2005a; United Nations 2005b). My finished questionnaire contained six sections with mostly close-ended questions followed by open-ended ones so respondents could explain their views (Appendix 5). Section A, the household roster, followed the Ghana Living Standard Surveys in terms of identifying household members and options for pre-coded answers. Section B consisted of multiple-choice questions to determine the household's Progress out of Poverty Index (PPI®)<sup>5</sup>. It calculates the household's likelihood of falling below a certain poverty line based on ten country-specific questions.<sup>6</sup> I added this section to account for potential intra-neighbourhood variation of socio-economic status. However, within-household differences of income or views on trees were covered in the household case study (see Section 3.3.5). Sections C and D contained general questions about the benefits and maintenance of public and private trees, while the remaining sections investigated tree product use (E) and sale (F) in the previous year. Pre-administration, I discussed the questionnaire with the research assistants and tested timing and clarity on three randomly selected households. Minor adjustments were made to improve the wording of some questions, after which a research assistant translated them into Twi.

Household questionnaires were administered and resembled structured interviews as self-administration could have lowered response rates due to the population's characteristics (e.g. high illiteracy rate). Depending on the given answers and the related skip patterns of irrelevant follow-

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<sup>5</sup> since rebranded as the Poverty Probability Index

<sup>6</sup> The higher the PPI score, the lower the household's likelihood to fall below the poverty line

up questions, administering each questionnaire required between 30 and 60 minutes. Administering questions to a multi-person household in a group setting may provide differing opinions and potentially more holistic results. However, some individual members' views may dominate and arranging appointments and repeated visits is time and cost-intensive. The questionnaire was, therefore, conducted with any available adult household member, this convenience sample approach including instances of adult children representing their households and 52 female respondents. As 68.2 % of households in the Greater Accra Metropolitan Area are headed by men (Ghana Statistical Survey, 2014a), a group setting would potentially have made women's responses less visible. After data collection, I entered the paper-based information into a spreadsheet and used basic descriptive statistics for analysis.

Non-sampling errors are common in surveys and include respondents providing false information, intentionally or unintentionally, and issues related to administering the questionnaire. There is evidence that at least one respondent provided wrong information on their household composition, directly affecting PPI scores. This index also included potentially sensitive questions as people could avoid reporting not owning certain assets, like mobile phones, or be unaware of another household member owning them. Asking respondents to report information from a particular previous period can introduce recall bias as "there is an inverse relationship between the length of time over which subjects are asked to recall prior use and the accuracy of the reported estimates" (Clarke *et al.*, 2008, p. 1275). Researchers, therefore, face a trade-off between the information to be obtained and potential errors caused by inadequate recall periods. In my survey, I asked respondents about tree parts and their use(s) in the previous twelve months, a relatively long timeframe. This recall period, however, covered trees' seasonality in flowering/fruitletting and uncommon events like decorating with palm leaves on Palm Sunday. While I used a matrix to facilitate remembering less common occasions, participants may have unintentionally misreported on these interactions, many of them ordinary and lacking any memorable characteristics.

Certain problems can arise when individuals are tasked with administering a questionnaire they did not design. While I was familiar with how different questions or skip patterns related due to constructing the survey myself, the research assistants had to accustom themselves to the questionnaire and process of administration. Before starting data collection, I introduced the assistants to my project in general and the survey's purpose more specifically. After that, we discussed any existing questions and the technical aspects of administering the questionnaire. I then accompanied them into the field, and they interviewed two to four participants in my presence. Though there were no further concerns when these training sessions ended, a lack of attention seems to have caused some problems when research assistants went out alone in the following days. In several cases, relevant boxes were left unmarked, and while responses could be deduced from those given to the connected open-ended follow-up questions, these occurrences potentially reduced the survey's quality.

### **3.3.3 Documentary Research**

#### ***3.3.3.1 Online Newspaper Article Research***

Despite a recent increase, published information about urban forestry in Ghana is still limited, and I only identified a few relevant articles during my initial literature search. In April and May 2017, I searched the online presences of the country's four highest circulated daily newspapers for further information on forest planning and management, especially in Accra. The newspapers included the Daily Graphic, the Daily Guide, the Ghanaian Times, and The Chronicle, all super-regional but differing in ownership, political preferences and number of copies (Kuehnhenrich, 2012)(Table 11). I searched each newspaper's website for four terms: 'Parks and Gardens', 'Tree AND Accra', 'Forest AND Accra', and 'Environmental Protection Agency'. Rather than producing a systematic review on urban forestry, I employed this scoping review to identify possible stakeholders and current issues before commencing interviews and the case study. The search

yielded 114 articles (Appendix 6) which I categorised according to the topic(s) discussed. As I encountered issues with the searchability of the websites, including unprocessed requests due to timeouts and what appeared to be a limited time scope, I likely did not find all relevant articles.

**Table 11 Searched newspapers and their characteristics**

<b>Newspaper</b>	<b>Ownership</b>	<b>Political Position</b>	<b>Copies</b>
Daily Graphic	Public	above party lines, slightly towards the National Democratic Congress	100,000
Daily Guide	Private	New Patriotic Party close	22,000
Ghanaian Times	Public	National Democratic Congress close	80,000
The Chronicle	Private	above party lines, slightly towards New Patriotic Party	45,000

According to Kuehnhenrich, 2012

### *3.3.3.2 Archival Work*

In April 2017, I conducted research in the archive of the Public Records and Archives Administration Department (PRAAD) in Accra. As documents had not been classified according to the topic of urban trees and forestry, my approach was exploratory and focused on obtaining descriptions of tree-related activities in Accra's past. After summarising my project, an employee suggested potentially relevant group codes, including departmental reports, minutes of Town Council meetings, and documents related to city planning and development. I entered each file that contained pertinent information into a spreadsheet, including its classmark, the record's title and date of reference, a summary of its content, access date, direct quotes as well as further comments and observations. I also searched for historic photographs and other depictions which I planned to describe and analyse. However, photographs mostly lacked any reference to location or used colonial road and place names, which I could not match to their respective present loca-

tions. While an option for future research, it requires cooperating with someone knowledgeable about Accra's past. As many of the retrieved documents were in a poor state, I refrained from studying some of them to avoid further damage, limiting the work's scope.

### **3.3.4 Stakeholder Interviews**

Between April and August 2017, I interviewed 13 individuals from governmental agencies and departments, sub-metropolitan officers, NGO leaders, and people otherwise participating in urban forestry-related activities in Accra (Table 12). My first list of potential interviewees included those stakeholders whose names appeared during the literature review and online newspaper search. This list mostly covered governmental organisations like the Department of Parks and Gardens (DPG), the Town and Country Planning Department (TCPD), the Environmental Protection Agency (EPA), or the Forestry Commission (FC). To obtain multiple perspectives, I also wanted to include non-state actors, but the internet search suggested only two relevant NGOs, and neither interviewee suggested other relevant organisations that could have offered further insights. While inventorying trees, I noticed individuals such as herbalists, and roadside tree or coconut sellers whom I added to the list of potential participants. During each interview, I also questioned the respondents about other relevant groups or individuals, thereby introducing the element of chain referral. This resulted in a long list including, e.g. the Department of Urban Roads, the National Disaster Management Organisation, or the Ghana Garden and Flower Show. Due to limited resources, I could not interview every possible respondent and prioritised according to their involvement's intensity, the centrality of urban trees in their work, and new angles they might offer.

Table 12 Interviewees and dates of interviews

Interviewee	Name(s)	Position/Role	Date
Youth4GreenGhana (Y4GG)	Reginald Quaye, Amakoue Ayih, Solomon Affah, Afua Owusu-Ansah	Four members of the NGO	09.04.17
Herbalist	/	Self-employed herbalist with roadside shop	07.06.17
Achimota Forest User/Pastor	/	Pastor who regularly visits Achimota Forest	08.06.17
Roadside coconut seller	Samuel Kwakye	Self-employed roadside coconut seller	21.07.17
Department of Parks and Gardens	Ebenezer Awidi	Assistant Horticultural Officer	31.07.17
Town and Country Planning Department	Kwadwo Yeboah	Metropolitan Director of Town Planning	02.08.17
Environmental Protection Agency	Carl Fiati	Head of EPA's Natural Resource Department in Accra	04.08.17
Ghana Youth Environmental Movement (GYEM)	Gideon Commey	Founder	04.08.17
Ayawaso West (Sub-metro)	/	Environmental health officer	07.08.17
Ayawaso Central (Sub-metro)	L. Sampson	Environmental health officer	09.08.17
Ayawaso East (Sub-metro)	/	Environmental health officer	09.08.17
Roadside tree seller	Anasawudu	Self-employed roadside tree seller	10.08.17
Forestry Research Institute of Ghana (FORIG)	/	Researcher at FORIG	11.08.17



Interviews were semi-structured and consisted of three components, however, the respondents' backgrounds varied considerably, and I adjusted questions accordingly (see Appendix 7 for an interview guide example). I first asked respondents to introduce their organisation/job and describe their activities, responsibilities and professional background. I then inquired about planning and management objectives and tree maintenance where relevant. In this second part, I also focused on the strengths and weaknesses of their work and that of their organisation, as well as on opportunities and threats they identified in relation to urban forestry, both in the country and in Accra specifically. Interviews lasted between 30 and 70 minutes and were audio-recorded when conducted in English. In the case of Twi speaking respondents, a research assistant was present for the interview and translated my questions and the interviewee's responses, which I then wrote down in English.

Before analysing interviews, I first transcribed the audio recordings for which various approaches exist, each with its advantages and disadvantages. I selected an approach that focused on content and transcribed interviews verbatim using Braun and Clarke's orthographic approach (2013, p. 165-166), a simplified version of Jefferson's system (1984) widely used in conversation analysis. While I added overlaps, pauses, laughter, and uncertain hearings, my interviews were focused on obtaining topical information about different stakeholders and their views rather than on linguistic subtleties. My transcriptions meet the minimum requirements that Braun and Clarke (2006, p. 88) specify for their version of thematic analysis (TA), including "a rigorous and thorough 'orthographic' transcript – a 'verbatim' account of all verbal (and sometimes nonverbal – eg, coughs) utterances". However, transcribing is an interpretive act itself (Bird, 2005) as even deciding on punctuation affects perceived meaning (Braun and Clarke, 2006). Additionally, the researcher chooses what is represented how or what is excluded and why (ten Have, 1990). Where I include direct interview quotes, I have lightly edited them for speech repetitions and fill words to facilitate easy understanding of the content.

Using NVivo for data management, I analysed the interview transcripts using Braun and Clarke's (2006) reflexive thematic analysis, which differs from commonly used coding reliability and codebook approaches. In their opinion, positivist assumptions underpin coding reliability approaches, such as by Boyatzis (1998), which claim to find 'reality' in the data, a view they oppose. They consider codebook approaches, such as framework or template analysis (Ritchie and Spencer, 2002; King and Brooks, 2017), to be paradigmatically closer to their approach. However, these structured codebooks organise data in a way that themes are (also) analytical inputs rather than just outputs. I chose Braun and Clarke's approach as they emphasise how the researcher's positionality, the respondents and their data, and the research context co-produce themes, which do not simply 'emerge' from the data. In reflexive thematic analysis, there is, therefore, no 'accurate' way of coding and analysing data, an approach in accordance with the general assumptions underlying this research project.

Braun and Clarke's TA involves a six-step process from data familiarisation to coding, generating initial themes, reviewing these themes, defining and naming them, and writing up the findings. Data familiarisation is essential and includes reading through the transcripts several times. In the second step, the researcher codes selected data segments, organising them into meaningful groups. I combined 'descriptive' and 'versus' coding, the former summarising "in a word or short phrase – most often as a noun – the basic topic of a passage" (Saldaña, 2009, p. 71) while the latter looks for binary divisions "that suggest strong conflicts within, among, and between participants" (Saldaña, 2009, p. 94). Versus coding constitutes a more interpretive and latent approach suited to my aim of identifying strengths, weaknesses, opportunities, and threats. Combining two approaches can cause simultaneous coding, which is "the application of two or more different codes to a single qualitative datum" (Saldaña, 2009, p. 62), warranted if coding both at the descriptive and inferential level (Miles *et al.*, 2014). The researcher then develops the codes into themes that capture "something important about the data in relation to the research question,

and represents some level of *patterned* response or meaning within the data set” (Braun and Clarke, 2006, p. 82). These themes should not be confused with ‘domain summaries’ (DeSantis and Ugarriza, 2000; Sandelowski and Leeman, 2012; Connelly and Peltzer, 2016) that simply summarise the content of a group of codes.

Various problems can arise when planning, conducting and analysing interviews. Rather than focusing on the general limitations associated with interviews as a research method, I want to focus on an aspect specific to this project, which is that of language. My initial list of potential stakeholders mainly included government employees whom I planned to interview in English. During the data collection process, however, I came across individuals, such as the coconut seller or the herbalist, with whom I did not share a common language to the degree that we could easily converse. While I could have audio-taped these interviews, with a research assistant translating answers and questions back and forth, I instead decided on note-taking only. Thus, the research assistant translated my questions into Twi, and I handwrote the back-translated responses down with the translator interpreting both the interviewees’ and my words. These transcripts, therefore, differ from those I conducted in English.

When researcher and participants do not share a common first language, and sometimes none at all, translation becomes a core component of the work. Just like transcription, it contains multiple interpretive acts as “communication across languages involves more than just a literal transfer of information” (Temple and Edwards, 2002, p. 2). Some researchers refrain from using translators (Filep, 2009) to avoid ‘triple subjectivity’, referring to the interactions between participants, interpreter, and researcher (Temple and Edwards, 2002, p. 6). However, as I am a native German speaker conducting research in English, avoiding any form of translation, even if only internal, was impossible. Rather than employing a professional interpreter, I had a research assistant translate who also participated in the tree inventory and survey, being familiar with the work and its

objectives. As a geography graduate, they had extensive fieldwork experience and served as a type of ethnographic informant explaining and clarifying cultural-specific aspects. I consider it worthwhile for future research to ‘formalise’ this additional role of a translator and interview them, as suggested by Temple and Edwards (2002), about their views and backgrounds in relation to the research topic.

### **3.3.5 Household Case Study**

In June and July 2017, four surveyed households also participated in my case study to investigate human–tree interactions in Accra and the trees’ livelihood functions. For this purpose, a case study approach is particularly suitable as it answers ‘why’ and ‘how’ questions when the researcher investigates a “contemporary phenomenon within a real-life context” over which they exercise limited or no control (Yin, 2009, p. 2). A case study is not a data collection tool as such, but rather a research strategy that utilises contemporary documents and archival material, interviews, physical artefacts, or direct and participant observation. While I focused on interviews and observations, documents and physical artefacts were also included in this study. Three writers, whose approaches differ notably, have influenced case study research. For Yin’s post-positive position, case studies are designed to falsify hypotheses and use qualitative and quantitative data collection and analysis methods to triangulate information and minimise levels of subjectivity (Harrison *et al.*, 2017). Stake and Merriam, however, take a constructivist/interpretivist approach and emphasise the researcher’s role in interpreting subjective realities (Yazan, 2015; Harrison *et al.*, 2017). I partly followed Yin’s more structured approach for design choices and terminology, though I take an explicitly constructivist stance.

In case study research, individuals, organisations, or specific events or programmes can constitute the case(s) under investigation. In my project, I define the four households as cases and their in-

dividual members as embedded subcases. Including household members as subcases allows investigating intra-household dynamics and differences, as they are heterogeneous units of analysis. My descriptive-explanatory case study (Lijphart, 1971; Stake, 1995; Yin, 2003) uses multiple cases “because it is believed that understanding them will lead to better understanding, and perhaps better theorizing, about a still larger collection of cases” (Stake, 2005, p. 446). The descriptive component provides an in-depth understanding of how and why households and individuals interact with city trees and fills an existing knowledge gap. My case study’s findings offer a foundation on which to start building theories around urban human–tree interactions and their broader context and relevance.

I purposefully selected the four cases to represent a diverse range in terms of tree interactions and their household composition. I first eliminated those survey respondents who did not own a tree on their private property. Though valuable information, investigating how city residents interact with public trees in a case study approach could produce limited insights, especially on tree care and management. I then grouped the remaining tree-owning households according to location, type and amount of used tree benefits, reported maintenance, and whether or not they had sold tree products in the previous twelve months. I further considered household size, age structure and gender composition, and while I also intended to select households based on PPI scores, none had a high likelihood of falling under the income poverty line. Though dividing PPI scorecards by urban and rural sites did not improve accuracy in other countries (Schreiner, 2015), Accra’s characteristics as a primate city could potentially affect households’ scores. The final deciding factor remained the household members’ willingness to participate in time-consuming and intrusive research. While the participating households might not cover an ‘ideal’ range (see Section 6.3), case study research does not aim for statistical generalisation as cases are not used to “extrapolate probabilities” (Yin, 2014, p. 21).

I spent about two weeks with each household, staying in rented accommodation and visiting participants during the day. I interviewed household members and related individuals, such as other compound residents or a neighbour that had planted trees in the participant’s yard (Table 13). Interviews were semi-structured and included questions about the respondent’s life, their views on tree benefits and disservices, and tree maintenance. In most cases, the research assistant who had previously participated in data collection translated these interviews. Additionally, I observed how people interacted with trees and recorded these fieldnotes in a notebook, typing them up in more detail afterwards. While writing notes might seem intuitive, Spradley (2016, p. 82-83) developed a descriptive question matrix that suggests collecting data on spaces, objects, acts, activities, events, times, actors, goals, and feelings, thereby helping to structure observations. For data analysis, I used framework analysis, a structured version of thematic analysis developed by Ritchie and Spencer (2002) for applied policy research but since used in various other contexts as well (Gale *et al.*, 2013).

**Table 13 Interviewees associated with the case study households**

<b>Interviewee</b>	<b>Name</b>	<b>Associated Case (see Section 6.3)</b>
Tenant	/	1 – Nima
Four men regularly sitting underneath a household owned tree	/	1 – Nima
Tenant and friend of the participant	Fred Agbobli	1 – Nima
Tenant	/	2 – Mamobi
Neighbour/friend who planted moringa trees in the household’s compound	David Mamattah	4 – Kokomlemlé

In framework analysis, the researcher produces a matrix with cases and topics/codes, entering the relevant summarised data into the cells. Data can then be compared and contrasted across cases and, in this project, also within cases, i.e. between individual household members. I combined deductive and inductive coding and theme-generating approaches, drawing on both the literature review and my research questions. Additionally, I aimed “to leave space to discover other unexpected aspects of the participants’ experience or the way they assign meaning to phenomena” (Gale *et al.*, 2013, no page number). Data analysis is similar to Braun and Clarke’s thematic analysis and includes transcription, data familiarisation and coding based on which the researcher develops an analytical framework. Relevant information is then entered into a spreadsheet, where summarising and thereby reducing the data is an integral part of the process. The obtained matrix is “visually straightforward and can facilitate recognition of patterns in the data [...], including through drawing attention to contradictory data, deviant cases or empty cells” (Gale *et al.*, 2013, no page number).

To move towards theory building, I would have liked to increase case number, including households that only reported using public trees’ benefits or recalled few interactions. I obtained a considerable amount of data during the two weeks, but spending more time with each household and using a more participatory form of observation, could yield further insights. Additionally, certain tree products are only seasonally available and care activities, such as pruning or planting, conducted at specific times of the year and on few occasions. A longitudinal design might therefore be more appropriate to investigate certain human–tree interactions. The above-described limitations of working with a translator are equally relevant in this case study, potentially even more so due to the intimate everyday settings. While stakeholder interviews tended to be topically focused, the case study aimed to obtain an in-depth understanding of people’s views and choices, making a shared language both parties feel comfortable conversing in even more preferential.

### **3.4 Chapter Conclusion**

This chapter outlined my research design choices and how they relate to the identified research questions. To investigate the complexities of urban forest planning and management in Accra, I opted for a mixed methods approach. While collecting and analysing both qualitative and quantitative data, I focused on the former. A visual diagram of the study's design summarises the more detailed descriptions of the data collection and analysis process. The literature review demonstrated how the distribution of power affects urban forest structure, the trees being both natural and social elements. I, therefore, chose to work within Mertens' transformative paradigm that includes social justice issues as a core component. I summarised the paradigm's ontological, epistemological, methodological, and axiological views and discussed my positionality and my project's ethical implications in detail. I further introduced the study site and described each of my data collection methods – tree inventories, documentary research, stakeholder interviews, and a household survey and case study – in detail. This also included outlining my data analysis approaches and the methods' disadvantages and problems.



## **4 ACCRA'S URBAN FOREST – STRUCTURE OVER TIME AND ACROSS SPACE**

“[T]here may be more trees but now, as development is going on, that is where my fear is because the majority [of] trees are now being replaced with buildings as development is going on.”

**Environmental Health Officer, Ayawaso East**

~~~~~

“Many ornamental and shade trees in towns and residential areas are being destroyed or mutilated by bad cutting. Much of this damage is being done in connection with development works, improvement to roads, new buildings etc. and can be avoided.”

**PRAAD, RG 3/5/349 – 1950, p. 12**

In this chapter, I outline how human–environment interactions have shaped Accra’s urban forest from pre-colonial to present times. I first detail how pre-colonial, colonial, and post-independence events and processes affected the city’s tree cover. Here, I consider both biophysical legacies, such as earthquakes or tree pests and diseases, as well as human legacies, such as state and non-state interventions. Following, I present the findings of my desk-based and field-based tree inventories to describe Accra’s current urban forest structure both at city and sub-city level. Over the centuries, numerous legacies have interacted with each other in complex ways, creating a city that, today, is characterised by sparsely populated, greener and ‘richer’ neighbourhoods on one end of the continuum and densely populated, less green and ‘poorer’ neighbourhoods on the other end. Throughout this chapter, I intersperse descriptive summaries of historic developments pertaining to issues of land ownership and use, central to city planning and, by extension, to urban forestry. The following parts should be read as an example of how some selected factors

have shaped Accra's urban forest rather than as an all-encompassing explanation. While archival records provide information on past events and activities, this will be incomplete due to the multifaceted 'silence of the archive'. The archive as an institution, and the records within archives, hold considerable 'power over memory' (Schwartz and Cook, 2002). Despite best efforts to include alternative knowledges and non-events, i.e. those that do not appear in archival documents, this information was difficult to access, posing limitations to and creating biases in this chapter.

#### **4.1 Human–Nature Interactions and Their Legacy Effects**

In this section, I examine the historical spatio-temporal dynamics and their legacy effects on Accra's forest. These legacies are "impacts that previous events, processes, and phenomena have on current properties or processes" (Roman *et al.*, 2018, p. 159) and facilitate an understanding of contemporary patterns (Szabó, 2010). Several authors have recognised the importance of history in ecology (Cook *et al.*, 2012; Bürgi *et al.*, 2017; Roman *et al.*, 2018) and created different frameworks that demonstrate how society and environment interconnect in and over time. I define history to include both past human and natural activities, which Roman *et al.* (2018) term 'human' and 'biophysical' legacies. The former includes civic beautification movements, socio-economic changes or national and regional identity as "species composition of many urban forests is strongly influenced by the selection of species that held strong cultural or political meaning in the past" (Roman *et al.*, 2018, p. 161). The latter, among others, subsumes ecological disturbances like extreme weather events and disease outbreaks. These legacies act within the bioregional context, i.e. climate, native biome, or regional species pool and "co-produce spatio-temporal dynamics of urban tree canopy cover, species composition, and diversity" (Roman *et al.*, 2018, p. 158).

#### 4.1.1 Accra and Trees – The Pre-Colonial Past

The origin of the Gas, the founders of Accra, is a matter of diverging opinions (Reindorf, 1895; Bruce-Myers, 1927; Boahen, 1966; Odotei, 1991) but of secondary importance as, in this case, the relevant time begins with their establishment along the shore in the 15<sup>th</sup> century. Due to “[t]he growing importance of European trade along the coast, the gradual degradation of the soil, and some rivalry between the Gas and their neighbours” (Alhassan, 2006, p. 22), they left their inland location some kilometres away and founded numerous coastal towns. While Gas and Europeans had traded since the second half of the 16<sup>th</sup> century, the English, Portuguese, Dutch and Danish only started building (trading) forts in the 17<sup>th</sup> century. Despite the then permanent European presence and the forts’ association with the Ga towns, “the Gã king and people were clearly the sovereign power. They chose which Europeans to trade with, and they decided, by treaty, which nations could establish forts and settlements in their territory” (Osei-Tutu and von Hesse, 2018, p. 211). Additionally, Europeans had to pay lump sums and rent to the king, who also taxed the goods arriving in Accra (Odotei, 1991).

Barbot, a French man who travelled to Guinea twice (1678/1679 and 1681/1682), describes the ‘kingdom of Acra [sic]’ as being composed of the towns of Soko (also known as Ngleshi/Ŋlěshi, Jamestown), Little Acra/Accra (Kinka, Usshertown) and Orsaky (Osu). The first associated with the English Fort James, the second with the Dutch Fort Crèveœur (later Ussher Fort) and the last with Fort St. Francis Xavier (Fig. 21). When he visited, the latter belonged to the Portuguese but was shortly after (1683) returned to the Danish and henceforth known as Fort Christiansborg (Hair *et al.*, 1992). Ngleshi and Kinka, two towns in the Europeans’ eyes, were, however, “seven geographically and politically defined divisions (*akutsei*, sing. *akutso*)” in the Ga’s eyes (Kropp Dakubu, 1997, p. 43). Within these quarters, extended families/lineages (*wei*, sing. *we*) lived in gated, rectangular homesteads, “at the centre of which is a shade giving tree, under which all family gatherings [...] take place” (Quarcoopome, 1998, p. 136). Barbot estimated that Soko (Ngleshi)

and Little Accra (Kinka) consisted of less than 100 and about 60 houses, respectively (Hair *et al.*, 1992, p. 430). However, the population was likely low as the Akwamu defeated the Gas in a war in 1678, driving them away to surrounding areas, depopulating their coastal towns (Anquandah, 2006).



**Figure 21 Location of Fort James, Ussher Fort, and Fort Christiansborg (left to right)**  
Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL  
Forts marked in red, current-day Accra highlighted in grey for reference

Customary and social norms embedded in religious beliefs guided Ga pre-colonial notions of land ownership (Quarcoopome, 1992). The Ga Mashie, Accra's indigenous inhabitants, believed that "the ultimate owners of their lands are the gods" who inhabited the lagoons (Quarcoopome, 1992, p. 41). The towns' inhabitants managed the lands they occupied and could farm unoccupied land that belonged to their quarter. Allodial rights were vested in clans, families and individuals acting as corporate groups and could be obtained through conquest, sale, ritual transfer and

the occupation of unused land (Sackeyfio, 2012). To build and settle on a plot required a ritual to be performed and a small fee to be paid, after which the land was allocated by corporate groups like clans or families. However, these were usufructuary rights as the land could not be alienated (Quarcoopome, 1992).

With time, population growth reduced available land and while this transformed ideas of ownership, “[s]uch rights were regulated by codes of conduct rather than proprietary laws that connoted notions of individual ownership” (Sackeyfio, 2012, p. 297). Indeed, a family or clan head could not sell/alienate land without his group’s approval which, however, occurred as early as the 1830s in the Ga towns (Sackeyfio, 2012). In the 1870s, unoccupied land between Kinka and Osu (‘New Site’), an area located within current-day Accra, “was selected as a convenient location for the offices of the growing colonial bureaucracy” (Sackeyfio, 2012, p. 298). The chief of Accra and other similar authorities transferred this land to the British, further increasing the number of groups and individuals who could lay some form of claim to usage rights in certain parts of the growing city.

Over the years, as trade intensified with Europeans, the coastal towns grew with people immigrating in search of income opportunities. Historical records show “that the Ga, Akwamu, Akyem, Asante and Fante as entrepreneurs in collaboration, or competition, with Europeans, played no small role in the rise of Accra to the pinnacle of international commerce in the 17th and 18th centuries” (Anquandah, 2006, p. 4). In Accra, European, African (Ga) and also increasingly Euro-African merchants amassed great riches, serving as middlemen in trade between the Europeans and groups from further inland (Winsnes, 2013; Paller, 2019). They did so in both the slave trade and after its abolition in the early 19<sup>th</sup> century when the export of other goods, especially agricultural produce, replaced the slave trade. However, some of these products, like oil from the African Oil Palm (*Elaeis guineensis*), had already been traded before (Lynn, 1997).

Many of the Africans and Euro-Africans were educated in fort and missionary schools, while some were also sent to Europe for educational purposes (Quarcoopome, 1998; Winsnes, 2013). The relevancy of these developments resides in their associated changes to the growing town. These “prominent citizens and wealthy trading merchants all constructed houses heavily influenced by European architectural style” (Labi, 2006, p. 132) quite distinct to and separated from the more densely populated and unplanned areas of Accra. Those who could afford it left Central Accra and settled in the new suburbs, forming part of the city’s urban elite (Quarcoopome, 1998). The distinction between often unplanned and over-populated areas inhabited by the African population and the less densely populated areas inhabited by a predominantly European population is, therefore, a simplified one as the richer African and Euro-Africans also resided in the latter type.

Current-day Accra’s original vegetation cover is thought to have been a dry semi-deciduous forest that human impact turned into a savannah grassland type (Simmering *et al.*, 2013; Stow *et al.*, 2013; Owusu, 2018). Though some early European visitors described the area’s floristic composition and the Natives’ tree uses, these accounts often discussed the Gold Coast in general or places other than Accra (Cruickshank, 1853; Bosman, 2011; Burton and Cameron, 2011). While Burton and Cameron collected plants in Axim in 1881, Burton had also travelled further east two decades prior (1863). Travelling from Cape Coast to Accra by ship, he could “easily distinguish from the quarter-deck acacias and mimosas, wild dates, adansonias, and guinea palms” (Burton, 2011, p. 132)(Fig. 22). He then described Accra as “dotted with green” (p. 133), “wind-wrung cocoa [coconut], forming a natural vane” (p. 134) around James Fort while “a stratum of equally bright green verdure” (p. 134) surrounded Christiansborg Castle. These accounts help picture early Accra and its surroundings. However, botanists, those with an explicit interest in the discipline, and individuals who lived in Accra for an extended time provide more detailed information.

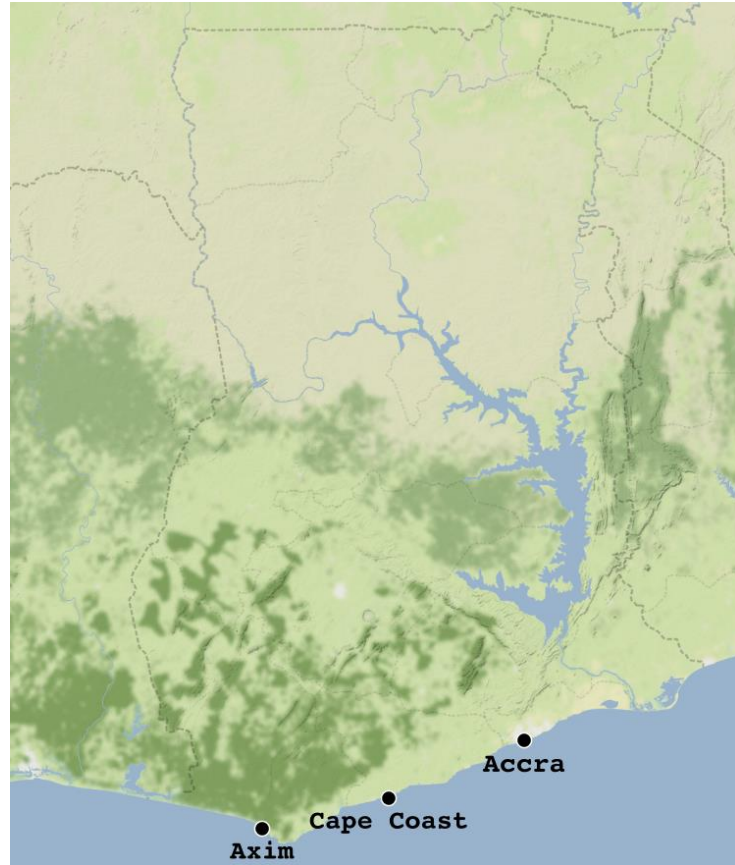


Figure 22 Location of Axim and Cape Coast

Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

Two Danish chaplains who resided at Christiansborg Castle one hundred years apart documented their stays and commented on trees in Accra and its immediate surroundings. Johannes Rask left for the Gold Coast in 1708 and described the plants growing in the Christiansborg Castle garden, which included pawpaws and palm trees (Winsnes, 2009a, p. 85-86). More importantly, however, among the examined accounts, his is among the few providing information on the trees in the areas surrounding Christiansborg that were inhabited by the African population. Rask narrates that “[a]long all the streets green trees have been planted, [...] which provide a comfortable shade and a lovely appearance, so that every [settlement<sup>7</sup>] looks like a small green grove” (Winsnes, 2009a, pp. 156-157). His comment indicating that Gas actively greened their environs in the early 18<sup>th</sup> century. H.C. Monrad, stationed in the fort from 1805 to 1809, dedicated a chapter’s section to

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<sup>7</sup> I replaced the original (Danish) term used at that time due to its resemblance with current racist terms

the area's flora but only listed and described tree species and their uses (Winsnes, 2009b, pp. 154-159). Although neither Rask nor Monrad were explicitly interested in botany, their accounts remain valuable as early first-hand descriptions of trees in and around Accra/Osu.

In the nearly one hundred years separating the stays of the two chaplains, two botanists, P. E. Isert (1783-1786) and P. Thonning (1799-1802), travelled to the Gold Coast. Both sent their collected specimens to Copenhagen, where Prof. Schumacher published a book in 1827 describing almost 500 plant species of the Gold Coast area (Schumacher, 1827). Schumacher “also acquired Thonning’s notebooks including the detailed and accurate field descriptions of the living plants” (Adams, 1957, p. 31), and incorporated some of his comments in the 1827 book. While only a minority of the plants identified are trees, the book provides the most detailed information on the Gold Coast flora, including several plants described for the first time. In addition to Latin plant descriptions, Schumacher’s book contains comments in Danish on the trees’ uses and growth sites.<sup>8</sup> Though most trees were observed outside the towns proper, Schumacher mentions that *Dialium guineense* Willd. grows in Accra (Schumacher, 1827, p. 18). This species was also present in my tree inventory (see section 4.3.1) and remains common in the city’s peri-urban locations (Simmering *et al.*, 2013). The book is another of the few sources providing information on the trees in the African towns, mentioning that the natives commonly plant *Ficus umbellata* Vahl for its fast growth and shade (see Appendix 8 for a list of all trees in Schumacher’s book).

#### **4.1.2 Accra and Trees – The Colonial Past**

In this section, I discuss tree planting as well as town planning and development in colonial Accra. These two are implicated in co-producing the spatio-temporal dynamics of the city’s urban forest and continue to affect its structure until today. Official annual government reports permit

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<sup>8</sup> Part of the almost 500 species descriptions were also translated into German, particularly those that included either the local name and/or comments on its use in the original version (Ascherson, 1879).



tracing town development and the long history of tree-related activities in Accra. The city's Town Council was another interest group involved in these activities. Established in 1898 with the "purpose of training the inhabitants of this country in local self-government" (PRAAD, CSO 20/1/3a, p. 3), it consisted of African and European councillors and derived its income from licences, land rates, and a government grant (PRAAD, ADM 5/1/27). In addition to general monthly meetings, the council also discussed specific issues such as the destruction of seedlings planted along roads (PRAAD, CSO 20/1/3b). The multiple urban forestry actors were not just financially connected – the Town Council providing a yearly budget to the Department of Agriculture for tree planting and maintenance of ornamental gardens (PRAAD, CSO 20/1/7a) – but also debated responsibilities and questions of ownership (PRAAD, CSO 20/1/7b).

In 1862, an earthquake destroyed large parts of Accra, which allowed the colonial power to rebuild the space according to their wishes (Grant and Yankson, 2003). When the British moved headquarters from Cape Coast to Accra in 1877, the town started growing due to increased commerce. As Accra grew, so did the demand for land by the government, firms, and individuals to construct buildings and associated infrastructure. In 1876, the Public Lands Ordinance was enacted, regulating "the acquisition of land required for public service of the colony and protected territories as well as the manner in which such lands would be held" (Sackeyfio, 2012, p. 299). It allowed property to be valued as a commercial asset, and while Africans could assert their ownership rights, the British written documentation process often superseded oral evidence (Sackeyfio, 2012). In 1894, the British attempted to introduce the Crown Lands Bill, which would have vested all unoccupied 'waste lands' in the Crown (Omosini, 1972). Chiefs and the educated African elite, however, protested this bill, arguing that "there was not an inch of land without an owner under customary law" (Omosini, 1972, p. 458). In their opinion, the Public Lands Ordinance already "gave the colonial government adequate allowance to acquire land for legitimate public uses" (Nti, 2012, p. 7).

Three years later, in 1897, the British attempted to introduce a bill that sought to provide the Crown with administrative rights rather than actual ownership. What appeared like a scaled-down version was, however, more elaborate and expansive, including not just ‘waste lands’ but all land in the country. Opposing the bill, chiefs, elites, and British commercial interest groups formed the Gold Coast Aborigines’ Rights Protection Society (Gocking, 2005). It argued that “the conversion of customary title into English certificates of individual ownership would destroy the chiefs’ and community rights in land” (Omosini, 1972, p. 463). In 1898, a deputation of the society met Colonial Secretary Chamberlain to voice their objections and to propose amendments to the bill. Surprisingly, he conceded all points, and in 1900 the Concessions Ordinance formalised the principle “that all lands were vested in African communities and chiefs and not in the crown or governor” (Omosini, 1972, p. 467).

Based on the evidence of early colonial interest in city trees, I now discuss two interrelated core aspects of urban forestry: the rationale behind what trees (species selection) are planted where (site selection). Species selection determines what types of benefits are produced, archival records suggesting that the colonial government focused on three services: trees for shade, beautification, and economic development. While some tree benefits are not location-specific, many of them are. A tree offers shade, where it is located, beautifies its immediate surroundings, and reduces wind and noise in its vicinity. Therefore, a tree’s location, and often by extension ownership status, affects who can benefit from its services. In colonial Accra, site-selection heavily favoured the city’s European areas constituting, along with town planning characteristics, one of the most fundamental legacies to impact contemporary urban forest structure. I now discuss the elements of species and site selection in more detail.

#### *4.1.2.1 Shading Accra*

Prioritising shade trees is a logical response to Accra's bioregional context, which the British hoped to ameliorate through tree planting. In 1895, the Botanical Garden Department cleared some land at the Governor's Lodge to establish a tree nursery "to raise different kinds of shade and other trees for planting in and around Accra" (PRAAD, ADM 5/1/51, p. 57). Two years later, 800 shade trees had been raised, now large enough to be transplanted during the next rainy season (PRAAD, ADM 5/1/53). Additionally, 400 seedlings were brought to the city from Aburi station, located 40 km north of Accra and the Botanical Garden Department's head station. However, many of these did not successfully establish in Accra's arid climate and died during the dry season. The British planted these seedlings in the Club House, the Colonial Secretary's bungalow, and the Inspector General's quarters (PRAAD, ADM 5/1/53). Throughout the years, shade trees were commonly planted in Accra, the records mentioning 3,000 in 1912 (PRAAD, ADM 5/1/68) and 4,500 in 1922 (PRAAD, ADM 5/1/79), for example.

The preference for shade trees has survived into the present, prioritised by DPG and EPA (Mr Awidi, DPG; Mr Fiati, EPA) and the most frequently named benefit in my household survey. While planting shade trees is a reaction to the area's bioregional context, the climatic conditions themselves constitute a biophysical legacy. Though the British recognised that "young plants will require a lot of water, especially in the dry season" (PRAAD, ADM 5/1/51, p. 57), they more than once lost trees to drought (PRAAD, ADM 5/1/58; PRAAD, ADM 5/1/59; PRAAD, ADM 5/1/60) and mentioned the positive impact of unusually heavy rains (PRAAD, ADM 5/1/74). Scarce rainfall tends to influence urban forest spatio-temporal dynamics on a shorter-term basis only, as smaller seedlings are especially susceptible to drought but can, theoretically, be easily replaced. However, urban forest planners and managers should not underestimate how insufficient and infrequent precipitation impedes tree establishment. One interviewed stakeholder,

an NGO representative, reported losing all their planted trees, partly because they lacked the resources to water them regularly (Interview Y4GG).

#### *4.1.2.2 Beautifying Accra*

Colonial greening efforts also focused on growing decorative plants. In the 1920s, the British planted them in significant numbers, mostly along avenues in their neighbourhoods and on government compounds (PRAAD, ADM 5/1/78; PRAAD, ADM 5/1/79; PRAAD, ADM 5/1/88; PRAAD, ADM 5/1/89). The Agricultural Department provided the seedlings and assisted the European population in designing their bungalow grounds (PRAAD, ADM 5/1/73, PRAAD, ADM 5/1/75). These efforts indicate the value the British attached to living in vegetated and green surroundings, a human legacy factor (Roman *et al.*, 2018). The British also supplied trees to the African population (PRAAD, ADM 5/1/77; PRAAD, ADM 5/1/79), encouraging “the growing of flowering and decorative plants by natives in the vicinity of their homesteads” (PRAAD, ADM 5/1/73, p. 16). Additionally, chiefs were urged to promote tree planting, the British offering free seeds, trees, and advice (PRAAD, ADM 5/1/79). However, provided seedlings were few and limited planning interventions caused crowded and increasingly overcrowded African neighbourhoods (Larbi, 1996). As shelter is not only a basic need but also a critical income-generating asset in the urban context (Moser, 1998), people likely prioritised housing over tree planting.

The Town Council meetings’ minutes reveal that tree planting in the 1930s focused on High Street and other European dominated areas like Post Office Square or Christiansborg Cross Roads, where trees were planted to beautify Accra (PRAAD, CSO 20/1/7a). In 1936, the Town Council appointed a special committee tasked to control and coordinate arboricultural and horticultural works on Crown land in Accra. The group was responsible for hiring staff and super-

vised tree planting and cutting on municipal areas and government residential land (PRAAD, RG 3/5/349). The committee considered hiring a full-time officer from Kew Botanic Gardens as “the work to be carried out was of a difficult nature, and could not be satisfactorily executed without a large measure of European supervision” (PRAAD, CSO 20/1/66, p. 1). However, they apparently abandoned the plan due to the involved costs. Departmental reports and meetings’ minutes suggest that the European neighbourhoods tended to be fairly green during colonial times. Most African neighbourhoods, though, were more densely populated, with 16 to 24 inhabitants per hectare compared to two per hectare in the European areas in the 1940s (PRAAD, CSO 20/12/20). Restricted planting space combined with the British government’s limited planting efforts in these areas likely caused African neighbourhoods to be less green.

These planning and planting patterns are frequently visible in cities with a colonial history, where segregation created distinct European and native areas. Pryor (2015, p. 36), who investigated colonial Hong Kong’s tree planting history, reported that in the early period, “[n]o trees appear to have been planted [...] within the Chinese Quarters”, despite widespread planting elsewhere in the town. Likewise, greening in Delhi benefitted “specifically that part of the city which was inhabited by the white colonizers” (Mann and Sehrawat, 2009, p. 553). In previously French towns, such as Dakar, similar developments played a “crucial role in the creation of racially polarized colonial urban environments” (Bigon, 2013, p. 477). In many of these places, “street trees came to emphasise the informal racial segregation of the city” (Pryor, 2015, p. 40). Acknowledging urban forestry’s political nature avoids creating and reproducing oversimplified explanations. While racist reasoning is no longer employed to explain Accra’s tree cover variation, narratives that suggest a causal relationship with socio-economic status have often replaced them, a narrative for which I did not find any support (see Chapters 5 and 6).

#### *4.1.2.3 Monetising Urban Land*

In the early 20<sup>th</sup> century, the British attempted to commercialise Accra's land and planted economically valuable trees. These activities constitute a geographical extension of previous colonial plantation agriculture, which, as 'legitimate commerce', was supposed to replace the slave trade (Austin, 2013). In 1901, they sowed 13,000 coconuts at Christiansborg Castle Garden, later transferring these to a 90 ha plantation site located between the castle and Labadi, located just 4 km to the east, as part of efforts to develop the country's copra industry. While 9,000 coconuts germinated, many others were stolen (PRAAD, ADM 5/1/56) or killed by droughts and insect attacks (PRAAD, ADM 5/1/58; PRAAD, ADM 5/1/59). In 1905 alone, beetles destroyed more than 4,000 coconut seedlings (PRAAD, ADM 5/1/60) and, as later reports contain no further references to the plantation, the British would appear to have given up on this endeavour. Still, the intervention is a reminder that a key aim behind the establishment of Aburi station was to "teach the natives to cultivate economic plants in a systematic manner for purposes of export" (PRAAD, ADM 5/1/76, p. 5). However, beetle pest infestation and challenging climatic conditions, both biophysical (legacy) factors, limited the achievement of this goal, while still affecting tree distribution at the time.

By 1908, the Botanical Garden Department had become part of the Agricultural Department, and the reports' style shifted to a more scientific and technical tone. Their content now focused on exportable cash crops like cotton, oil palm, kola nuts, and rubber (PRAAD, ADM 5/1/63), and it took several years before a Division of Horticulture was created. The division became responsible for "the upkeep of public gardens and the provision of assistance in avenue planting in towns" (PRAAD, ADM 5/1/88, p. 12), but archival records provide limited information on its work. In the following years, the Agricultural Department expanded its research on economically attractive plants and stated in 1915 that, due to the "necessity for experimental work on agricultural crops, little opportunity occurs at any of the departmental Stations for horticultural effort"

(PRAAD, ADM 5/1/72, p. 17). From the 1930s on, urban trees disappear from the reports and cocoa production and plant pathology dominate (PRAAD, ADM 5/1/94; PRAAD, ADM 5/1/101), reflecting this cash crop's economic importance.

#### *4.1.2.4 Colonial Town Planning*

The city's designation and subsequent growth as colonial headquarters reflected its newfound importance and associated cumulative advantages. For the British who now lived and worked there, its development became a central interest. Some general principles, including physically separating European and African areas, guided early colonial town development (Grant and Yankson, 2003). However, despite the city's expansion in the late 19<sup>th</sup> and early 20<sup>th</sup> century, town, regional, and country planning formally became an issue only in the 1930s. At this time, Lord Passfield, the Secretary of State for the Colonies, was a pioneer in recognising the need for effective town and country planning overseas. Arguing that “[n]othing is more expensive than haphazard or narrowly conceived development which will later involve the costly undoing of earlier mistakes” (PRAAD, CSO 20/12/3, p. 1), he suggested appointing a Regional and Town Planning Officer. The Director of Public Works and the Governor, however, offered resistance, delaying implementation for over a decade. The British only took further steps in 1944, when they officially listed Accra, Sekondi-Takoradi, Kumasi, Cape Coast, and Tarkwa as places that needed a Town Planning advisor's services (Fig. 23).



**Figure 23 Places listed as needing a town planning advisor**  
 Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL

In 1945, the British enacted the Gold Coast Town and Country Planning Ordinance (CAP 84), which granted a Town and Country Planning Board the power to establish ‘planning areas’. In these sites, the Board controlled development, granting building permits and preventing unauthorised construction. Effectively, the British had gradually undermined pre-colonial norms of land ownership and use, which had “shifted from Ga traditional authorities to the central government” (Quarcoopome, 1992, p. 42) (see Sections 4.1.1 and 4.1.2). In Accra, an increasing demand for land, and rising prices paid for it, facilitated alienation. Furthermore, natural resources offered no alternative path to wealth, and the population was obliged to allow the government to



develop stool and private land for public use (Quarcoopome, 1992). By the 1950s, large parts of Accra were no longer under Ga ownership, hindering the younger generation to “benefit from their family land holdings as a matter of birthright” (Quarcoopome, 1992, p. 46). The Ga youth, living in now densely populated Ussherstown or Jamestown, could no longer move as the peri-urban land had been alienated. The resulting mosaic of tenure affected and continues to affect Accra’s development, including urban forestry, where the government lacks ownership and land disputes obstruct holistic planning.

### **4.1.3 Accra and Trees – The Post-Independence Past**

With independence in 1957, the colonial government reports ceased, but urban forestry in Accra experienced further profound changes in the following decades. I discuss three aspects in more detail, including continued town planning activities and the role of trees within this, the Department of Parks and Gardens and its work, as well as socio-economic developments in the country. Their separate examination does not imply independence of each other as the previously developed framework demonstrates how actors, such as the Department of Parks and Gardens, operate within a wider context, like the economic situation of a region or nation or more local processes, e.g. in the form of town planning schemes.

#### ***4.1.3.1 Tree Planting and Town Planning Post-Independence***

In 1958, the Government prepared a ‘Plan for the Town’, revising a first plan from 1944. Clerk and Fry, the latter Town Planning Advisor to West Africa, had developed the earlier plan, which promoted a ‘garden city’ approach. These towns feature “neighbourhoods connected by an outer ringroad with each area served by its own shops, community centres, schools and parks” (Jackson, 2019, p. 103) and gardens separating the settlements (Jackson and Holland, 2014). The pair

also developed Kumasi's planning schemes, which were "rhapsodic over future possibilities [...] but sober in its detailing of basic enablements" (McCaskie, 2000, p. 205), potentially also the case in Accra's plan. The earlier plan never became a statutory one, but the continuous planning efforts supposedly created favourable preconditions for its successor (PRAAD, RG 8/2/779). The 1958 plan describes the city as "fortunate in so far as existing and potential open spaces are concerned" as the Government "has had the foresight to retain extensive building free zones" (PRAAD, RG 8/2/779, p. 23). These open spaces receive praise for "providing both amenity and opportunities for relaxation and recreation", recognising, however, that the "distribution of the open space throughout the town is important" to maximise benefits for the residential areas (PRAAD, RG 8/2/779, p. 23). These excerpts demonstrate, once more, how location and species choice (i.e. the desired benefits) are two central aspects of urban forestry.

Town planning in Accra, loosely following 'garden city' principles, reinforced the city's spatial differences. The 'green wedges' radiating through the town would separate "the residential areas from each other and thus providing them with a physical boundary which helps to give a special character to each area" (PRAAD, RG 8/2/779, p. 24). Supplying each neighbourhood with its own facilities reduces travel time and increases access to schools or shops but also preserves colonial green space inequalities. With independence, political power had shifted to an indigenous elite, yet poorer people and new immigrants still settled in the cheaper, high-density areas. Though parts of the Ghanaian middle and upper class already lived in less populated places (see Section 4.1.1), they now also moved into the spacious and green areas that used to be European (Grant and Yankson, 2003). Early Ghanaian town planning, therefore, retained and reinforced intra-city variations of population density or green cover that originated in colonial times.

The British focus on tree planting for shade and beautification also survived the transition to independence. Town gardens, street trees and parks featured prominently in the 1958 planning

documents, the former envisaged as recreational sites for workers, shoppers, and visitors or framing notable buildings (PRAAD, RG 8/2/779). Street trees, in turn, were valued for their beauty and “the vitally important question of shade which makes all the difference between pleasant conditions and acute discomfort” (PRAAD, RG 8/2/779, p. 30). The four areas that were designated to become parks were located in central Accra and totalled 60 ha of land. They were considered vital “as a place where one may walk in quiet and pleasant surroundings and where children may play” (PRAAD, RG 8/2/779, p. 24). The 1958 plan, however, was not adhered to (Arku *et al.*, 2016), as undeveloped open spaces are often considered free to draw upon for construction projects (PRAAD, RG 8/2/779). Today, these sites feature buildings, albeit with a fair amount of trees, being located in the greener neighbourhoods of Asylum Down and North Ridge. Until today, parks in Accra are few, and the existing ones often difficult to access or poorly maintained (Arku *et al.*, 2016).

Like its predecessor, the post-independence government prioritised selected public tree benefits, disregarding their provisioning services despite the city’s expansion into previously rural locations where trees fulfil this role (Gakou *et al.*, 1994; Kaimowitz, 2003; Kalaba *et al.*, 2009). Though the government recognised the need for food production in urban areas, it delegated this responsibility to privately owned food growing gardens (PRAAD, RG 8/2/779, p. 5). Until today, these benefits, which primarily accrue on the individual to household scale, occupy little space on official agendas (e.g. interviews with DPG and EPA). Instead, government departments often prioritise services that are important on a national scale, e.g. avoided spending on road maintenance through tree shade, while mitigating climate change’s adverse effects even matters at a global scale.

Town planning in Accra not only guided development within existing neighbourhoods but also attempted to regulate the city’s outward growth. Accra’s continuous expansion incorporated land

into the city, which was previously located outside its boundaries. In the early 1920s, the British established Achimota Forest as a firewood plantation north of the city (PRAAD, ADM 5/1/80), the forest now part of Accra metropolis. Described in 1958 as “not only a useful source of firewood but also an important landscape feature” (PRAAD, RG 8/2/779), it is no longer used for the former, but its importance concerning the latter has grown. Today, the Achimota Forest is a vital greenbelt and recreation area (Interview TCPD, Interview GYEM), but its history continues to affect current-day management. Though DPG is responsible for maintaining Accra’s trees, the Forestry Commission is accountable for Achimota Forest, creating dual responsibility for the city’s tree cover. Additionally, FC disagrees with the Town and Country Planning Department about the forest’s purpose and its management. While the former argues that it should be transferred to more profitable land use, which supposedly would also protect it against encroachment, the latter favours retaining Achimota as part of Accra’s greenbelt (Mr Yeboah, TCPD).

Disagreement over Achimota includes other groups, which contest the forest’s current ownership as the various co-existing land tenure types in Accra raise questions about the limits of, and overlaps between, usufructuary and ownership rights. In the 2010s, the Osu division’s chief filed to reclaim about 70 hectares of the Achimota forest as it was not utilised for the purpose for which the colonial government compulsorily acquired it. The Chief also backed a private developer who claimed part of the land, and both the police and FC officials became involved when the latter erected a fence to protect the land against the developer (The Chronicle, 2014a; The Chronicle, 2014b; The Chronicle, 2014c; The Chronicle, 2014d; Daily Graphic, 2014a; Daily Graphic, 2014b). Furthermore, the La Stool argued that the disputed land was theirs and did not belong to the Osu Stool (The Chronicle, 2014e). Disagreements caused by multiple land tenure systems and competing interest groups can have direct and lasting effects on land use. In the case of Achimota, these conflicts, among other reasons, reduced its size from 494.95 hectares in 1930 to 341.28 hectares in 2015 (Tuffour-Mills *et al.*, 2020).

#### *4.1.3.2 The Department of Parks and Gardens*

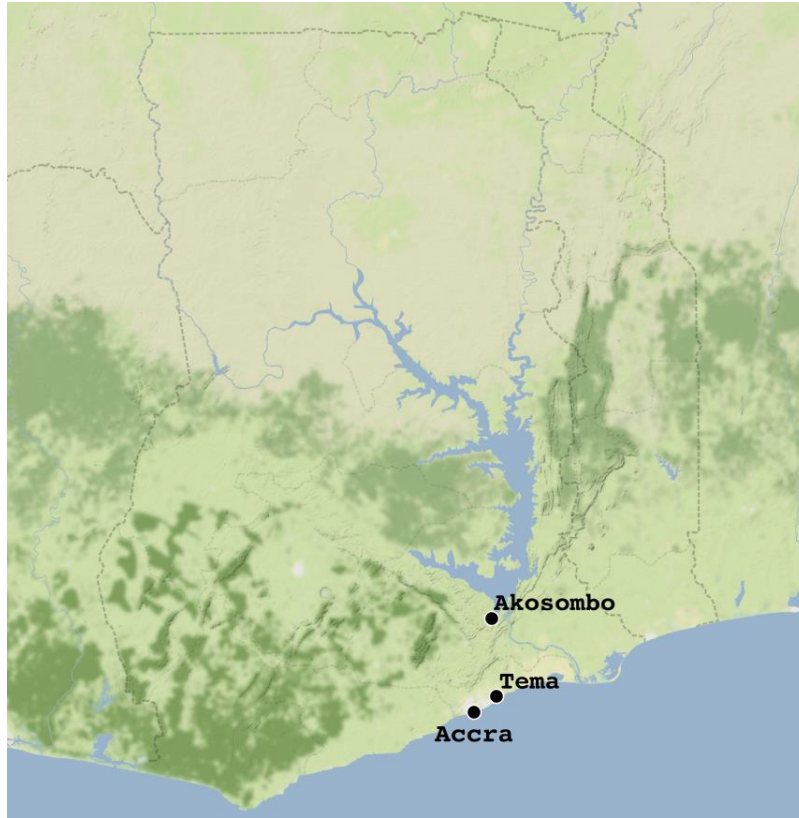
Post-independence, the Department of Agriculture, the Planning Department, and the Arboricultural and Horticultural Committee carried out “[m]uch valuable tree planting work along main roads and on open spaces” (PRAAD, RG 8/2/779, p. 30). In 1961, the Department of Parks and Gardens was established, and four years later, Nkrumah supported a proposal to upgrade it to the Ministry of Parks and Gardens and Tourism. After the First Republic’s fall in the following year, the Ministry was demoted to a department under the Forestry Department. It was then transferred to the Ministry of Works and Housing, the Ministry of Local Government and Rural Development (MLGRD), the Ministry of Environment and Science and back to the MLGRD, where it is still located today. When government priorities change, urban forestry can become overlooked or (un)intentionally sidelined, either when personnel is substituted or in the process of bureaucratic and administrative restructuring. Therefore, some state and non-state actors wish to stay ‘politically neutral’ (Interview Y4GG, Interview FORIG), avoiding too close an association with politics to minimise the risk of losing funding or support when urban forestry is reorganised.

Despite Nkrumah’s early interest in urban greenery, the Department of Parks and Gardens today suffers from a lack of (financial) support and prioritisation of its work. At the district level, the DPG is merged with TCPD to form the Physical Planning Department. However, interviewees suggested a merger in name only and limited practical operational details in place. Recently, a study that aimed to identify factors that differentiate ‘good’ and ‘poor’ performing public organisations in Ghana classified DPG as a ‘poor performer’ (Owusu, 2006). The author started by compiling a list of 47 institutions and then tasked 23 ‘knowledgeables’ to rate them based on the ability to perform their respective functions. These ‘knowledgeables’ included individuals from a range of backgrounds, working in “government agencies, bilateral and multilateral agencies, non-governmental organizations, academic institutions, research organizations and the private sector”

(Owusu, 2006, p. 476). Creating mean scores for each organisation, the 13 highest and lowest ranking ones were then classified as ‘good’ or ‘poor’ performers. While the author acknowledges possible limitations due to the sample size, several interviewees (Interview Y4GG, Interview TCPD) and newspaper articles (Ghanaian Times 2015; Daily Graphic 2017a; Daily Guide 2017) also commented on DPG’s poor performance.

#### *4.1.3.3 The Socio-Economic Context*

Both town planning and DPG’s work take place in a specific socio-economic context. At independence, Accra’s economy was non-manufacturing and dominated mainly by foreign export trading firms (Grant and Yankson, 2003). To facilitate economic growth, Nkrumah intended to shift emphasis away from commerce, which had been the focus during colonial times, to import substitution industrialisation. He envisioned a new ‘Industrial Triangle’ formed by Accra, Tema and Akosombo (Ahlman, 2017). While Tema, located just east of Accra, was the proposed site for the new industrial harbour, Akosombo was strategically located at the Volta river to the North (Fig. 24). Nkrumah’s policies attracted a growing amount of industries to Accra, and people followed, searching for jobs and drawn by services that were unavailable elsewhere in the country (Adarkwa, 2012). Accra’s high population growth rate destroyed the government’s ambitious plans to provide adequate housing to all inhabitants. New immigrants, therefore, settled at the city’s outskirts where slums and unplanned satellite towns developed to the vegetation’s detriment (Government of Ghana, 1964).



**Figure 24 Location of Accra, Akosombo, and Tema**

Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL

By the early 1980s, “economic mismanagement, over-regulation, inability to control inflation, productivity disincentives, an over-bloated and mismanaged public sector, over-subsidized social services (education and health in particular), overvalued currency, political instability, corruption, inept leadership, acts of God, unfavorable terms of trade, and clientelism” (Konadu-Agyemang, 2000, p. 473) had brought Ghana close to bankruptcy. To save the economy, the country implemented the Structural Adjustment Program (SAP) and its neoliberal, ‘free-market’ policies in 1983. Between 1975 and 1997, Accra’s area increased by 318 %; however, most of this expansion occurred in the post-SAP years and took the form of “encroaching on rural settlements or into green spaces between rural settlements” (Yeboah, 2000, p. 70). Additionally, the post-SAP years also coincided with the period of greatest vegetation loss within Accra (Owusu, 2018). According

to Owusu (2018), increased urbanisation and green space conversion into residential and commercial land directly relate to the SAP and its predecessor, the Economic Recovery Program.

Structural adjustment indirectly affected urban and peri-urban tree cover through various mechanisms. SAP's changes to the finance and transportation system facilitated urban growth and urbanisation (Briggs and Yeboah, 2001). More liberal currency transaction laws caused increased remittances from expatriates while reduced import/export controls aided capital accumulation, often invested in real estate. Additionally, deregulated public transportation improved access to peri-urban zones, increasing development in these fringe areas (Briggs and Yeboah, 2001). As people anticipated "infrastructure and services like roads, drains, electricity, water, and telephone services" (Yeboah, 2000, p. 72), the capital's surroundings densified and houses replaced vegetation. Structural adjustment also cut state expenditures on social welfare and public services (Konadu-Agyemang, 2000), disproportionately affecting society's more vulnerable groups, including the urban poor, whose numbers rose from 9 to 23 % (Grant and Yankson, 2003). A sizeable proportion of Accra's population rents accommodation (UN-HABITAT, 2011), especially in the densely populated, lower-income neighbourhoods (Yankson, 2012). Interviewed tenants often expressed little interest in planting trees in their compounds, even if allowed by their landlords/landladies, as they expect to move before being able to reap the benefits. Thus, urban compounds often lack trees unless the landowners plant and maintain them (see Chapter 6).

## **4.2 Accra and Trees – The Present**

In the late 1950s, the colonial 'green wedges' gradually disappeared as the government allowed residents to encroach upon them, primarily in low-density areas with sufficient open spaces (PRAAD, RG 8/2/779). Until today, though, neighbourhoods continue to differ in terms of greenery. If legacy effects exist, formerly European areas should tend to be greener and less pop-



ulated, while higher population densities in previously ‘native’ areas would limit canopy cover. However, these two configurations constitute a continuum’s two ends (see Section 4.1.1), and neighbourhoods themselves can be heterogeneous like Nima, its southern parts greener and less built-up (Cobbinah *et al.*, 2021). Previously European areas include Cantonments, Ridge (presumably North and West Ridge) (Rain *et al.*, 2011), Kanda, Ringway Estate, and Airport Residential (Quayson, 2014), while Nima, Jamestown (Andersson, 2016), and Sabon Zongo (Pellow, 2001) were African areas (Fig. 25). As neighbourhood boundaries and names change, contemporary residential areas not necessarily conform to historical ones. Additionally, many current outskirt neighbourhoods used to be rural hinterlands in colonial times, located well outside the city’s boundaries. While colonialism is but one legacy factor, it can leave unmodifiable marks due to its strong relationship with city planning and development. In this section, I first describe Accra’s urban forest at city-level before discussing how it varies at sub-city level.



**Figure 25 Previously European and African neighbourhoods**

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|                          |                 |                     |                  |                  |
|--------------------------|-----------------|---------------------|------------------|------------------|
| 24 – Airport Residential | 36 – Nima       | 37 – Kanda          | 47 – North Ridge | 48 – Cantonments |
| 53 – Sabon Zongo         | 56 – West Ridge | 57 – Ringway Estate | 75 – Jamestown   |                  |

#### 4.2.1 City-Level

Estimates of Accra's green cover are limited and vary considerably. According to my desk-based iTree Canopy analysis, the city's tree cover totals 14.0 % ( $\pm 1.55$ ). However, the ground-based iTree Eco approach suggests a canopy cover of only 8.2 %, translating to 391,600 trees in the study site. As the aerial photographs' low quality impeded the iTree Canopy analysis, I might have misclassified bushes or other green areas as trees, potentially overestimating Accra's canopy cover. In comparison, Stow *et al.* (2013) reported a vegetation cover of 29.2 % in 2010, considerably higher than the 13.45 % estimated by Owusu (2018) for the end of 2013. Both of these stud-

ies used satellite images and determined not just the tree cover but the amount of all green, vegetated land, including grasslands or bushes. Additionally, the study site boundaries in these earlier studies do not coincide with the ones used for this study. Stow *et al.* included only about two-thirds of Accra Metropolitan Assembly (AMA), while Owusu measured vegetation cover in areas that I had excluded. As neither the Department of Parks and Gardens nor the Environmental Protection Agency could provide further information, I assume that Accra's canopy cover is somewhere between 8.2 % and 14 % (plantable space according to iTree Canopy equals  $40.4 \% \pm 2.19$ , non-plantable space  $45.6 \% \pm 2.23$ ).

Researchers and practitioners have estimated canopy cover values for cities all around the world, but these figures should not be directly compared. First, research methods and definitions of what constitutes a 'tree' may vary. More importantly, "there is no set canopy cover level that would be considered 'optimal' everywhere – or perhaps even in a single location" (Leff, 2016, p. 12), thus other cities' values cannot serve as reference points. Instead, place-specific inquiries must determine the amount of tree cover that is desirable, attainable and sustainable considering a location's area, climate, original vegetation, urban density, and financial resources. My research provides current baseline information on Accra's tree canopy, which can be used to analyse and monitor future changes.

Though tree cover should not be compared between cities, Accra has experienced land-use changes similar to many other urban agglomerations. Between 1986 and 2013, the city's vegetated area reduced from about 38 % to 13.6 %, with most green cover lost in the northern part where previously open land became built-up (Owusu, 2018). Similarly, Stow *et al.* (2013) report a decrease of almost 6 % between 2002 and 2010, caused by vegetation being converted into residential and commercial land use. Both in Kumasi (Mensah, 2014a; Nero, 2017) and Sekondi-Takoradi (Mensah *et al.*, 2018) developments were similar. Despite Tema's built-up area increas-

ing between 1990 and 2007, green space also increased temporarily due to rising rainfall and an afforestation programme (Mariwah *et al.*, 2017). While this tree planting exercise first increased vegetation cover, it decreased again when the trees were felled for sale, demonstrating urban forestry's impact on canopy levels.

Across the 200 iTree Eco plots, I recorded a total of 190 trees, considerably fewer than Morgenroth *et al.* (2020) inventoried in 38 US cities using the same approach. Sixteen trees remain unidentified, and 20 were only identified to genus level. Trees identified to species level belonged to 27 species, the most common ones neem (*Azadirachta indica* A. Juss) with 32 individuals, mango (*Mangifera indica* L.) with 16 trees and African oil palm (*Elaeis guineensis* Jacq.) with 14 plants. I recorded eleven individuals each of coconut palm (*Cocos nucifera* L.), Indian Cork tree (*Millingtonia hortensis* L.f.) and white lead tree (*Leucaena leucocephala* (Lam.) de Wit) while papaya (*Carica papaya* L.) and royal palm (*Roystonea regia* (Kunth) O.F.Cook) were present with eight plants each. Additionally, there were five avocado (*Persea Americana* Mill.), false ashoka (*Polyalthia longifolia* Sonn.), and moringa trees (*Moringa oleifera* Lam.). Species with less than five individuals include, among others, cacao (*Theobroma cacao* L.), soursop (*Annona muricata* L.), ackee (*Blighia sapida* K.D.Koenig), lime (*Citrus aurantiifolia* (Christm.) Swingle), and cashew (*Anacardium occidentale* L.)(Table 14). While another study in six of Accra's neighbourhoods recorded more species, neem, mango, oil palm and coconut were also the most common ones (Nero *et al.*, 2018b). Overall, my sampled trees were in good health and vigour, and only 25 individuals received a crown condition rating of less than 90 %, only six of which I rated as 'dead'.

**Table 14 Recorded species and number of trees per species**

| Species                                       | Number of Trees |
|-----------------------------------------------|-----------------|
| Neem Tree ( <i>Azadirachta indica</i> )       | 32              |
| Mango ( <i>Mangifera indica</i> )             | 16              |
| African oil palm ( <i>Elaeis guineensis</i> ) | 14              |

|                                                                                |    |
|--------------------------------------------------------------------------------|----|
| Coconut palm ( <i>Cocos nucifera</i> )                                         | 11 |
| White lead tree ( <i>Leucaena leucocephala</i> )                               | 11 |
| Indian cork tree ( <i>Millingtonia hortensis</i> )                             | 11 |
| Florida royal palm ( <i>Roystonea regia</i> )                                  | 8  |
| Papaya ( <i>Carica papaya</i> )                                                | 8  |
| Avocado ( <i>Persea americana</i> )                                            | 5  |
| False ashoka ( <i>Polyalthia longifolia</i> )                                  | 5  |
| Moringa ( <i>Moringa oleifera</i> )                                            | 5  |
| Cacao ( <i>Theobroma cacao</i> )                                               | 3  |
| Soursop ( <i>Annona muricata</i> )                                             | 3  |
| Ackee ( <i>Blighia sapida</i> )                                                | 2  |
| Key Lime ( <i>Citrus aurantiifolia</i> )                                       | 2  |
| Senegal mahogany ( <i>Khaya senegalensis</i> (Desr.) A. Juss.)                 | 2  |
| Yellow flametree ( <i>Peltophorum pterocarpum</i> (DC.) Backer ex K.Heyne)     | 2  |
| Velvet tamarind ( <i>Dialium guineense</i> Willd.)                             | 2  |
| Madagascar almond tree ( <i>Terminalia mantaly</i> H.Perrier)                  | 2  |
| <i>Millettia thonningii</i> (Schumach.) Baker                                  | 2  |
| Rain tree ( <i>Albizia saman</i> / <i>Samanea saman</i> (Jacq.) Merr.)         | 2  |
| <i>Albizia ferruginea</i> ( <i>Albizia ferruginea</i> (Guill. & Perr.) Benth.) | 1  |
| Cashew ( <i>Anacardium occidentale</i> )                                       | 1  |
| Roughbark lignum-vitae ( <i>Guaiacum officinale</i> L.)                        | 1  |
| Boundary tree ( <i>Newbouldia laevis</i> (P.Beauv.) Seem. ex Bureau)           | 1  |
| Indian almond tree ( <i>Terminalia catappa</i> L.)                             | 1  |
| Brimstone tree ( <i>Morinda lucida</i> Benth.)                                 | 1  |

Tree and palm species commonly planted by the Department of Parks and Gardens (Table 15) were underrepresented in the sample, potentially due to its limited planting activities, both in numbers and covered area.<sup>9</sup>

Table 15 List of species commonly planted by DPG

| Botanic Name                      | Common Name                  | Function                                |
|-----------------------------------|------------------------------|-----------------------------------------|
| <i>Blighia sapida</i>             | Ackee apple                  | Foliage with fruit                      |
| <i>Cananga odorata</i>            | Lavender tree                | Fragrance                               |
| <i>Caryota urens</i>              | Toddy palm                   | Foliage                                 |
| <i>Cassia fistula</i>             | Golden showers               | Yellow flowering (beautification)       |
| <i>Chrysalidocarpus lutescens</i> | Cane palm                    | Foliage                                 |
| <i>Cocos nucifera</i>             | Coconut palm                 | Fruiting                                |
| <i>Delonix regia</i>              | Flame of the forest          | Red flowering (beautification)          |
| <i>Eucalyptus multifida</i>       | Blue gum                     | Foliage for sound absorption            |
| <i>Jacaranda mimosaeifolia</i>    | Jacaranda                    | Blue flowering (beautification)         |
| <i>Lagerstroemia speciosa</i>     | Queen flower/ Pride of India | Flowering (beautification)              |
| <i>Lignum vitae</i>               | Tree of Life                 | Mauve flowering (beautification)        |
| <i>Michellea champaca</i>         | Champac tree                 | Fragrance                               |
| <i>Millettia thonningii</i>       | Millettia                    | Flowering                               |
| <i>Millingtonia hortensis</i>     | India cork tree              | White flowering                         |
| <i>Mimusops elengii</i>           | Mimosups                     | Foliage/Shade                           |
| <i>Phitecellobium saman</i>       | Rain tree                    | Foliage/Shade                           |
| <i>Plumeria alba/ rubra</i>       | Frangipani                   | White/yellow flowering (beautification) |

<sup>9</sup> Botanic/common names may differ from those in Table 14, as I used them as provided by DPG

|                              |                      |                                 |
|------------------------------|----------------------|---------------------------------|
| <i>Roystonea regia</i>       | Royal palm           | Palm for avenue                 |
| <i>Tabebuia rosea</i>        | Tabebuia             | Pink flowering (beautification) |
| <i>Terminalia ivoriensis</i> | Umbrella tree        | Foliage/Shade                   |
| <i>Thuja orientalis</i>      | Oriental arbor vitae | Foliage                         |

Source: Mr Awidi, DPG

Furthermore, most inventoried trees grew on residential land, 97 on single-family and 18 on multi-family property (Fig. 26), the 28 trees belonging to eleven different species. Nero *et al.* (2018b) described similar high levels of species richness and abundance in home gardens in Accra. Fourteen of the 15 individuals growing on vacant land were neem trees. Neem's potential uses and benefits have led to the tree being described variously as 'green treasure' (Girish and Shankara, 2008), 'nature's drugstore' (Hashmat *et al.*, 2012), and 'a tree for solving global problems' (National Research Council, 2002). However, the species has also been declared a pest/weed in some parts of the world, including in Australia, where it "has a reputation for surviving in harsh, dry, infertile soils" (State of Queensland, 2016, p. 8). Together with *Leucaena leucocephala* and *Millingtonia spp.*, also recorded in my tree inventory, neem has been listed among the top 20, respectively 30, invasive alien plants in Ghana (CAB International, 2004; Boy and Witt, 2013). Considering its dominance on vacant land, there is a risk of neem replacing native species, especially when management is lacking or absent. While city residents plant trees to claim land ownership, the neem trees' growing locations, such as in the middle of building ruins, suggest that some plants likely resulted from natural regeneration instead.

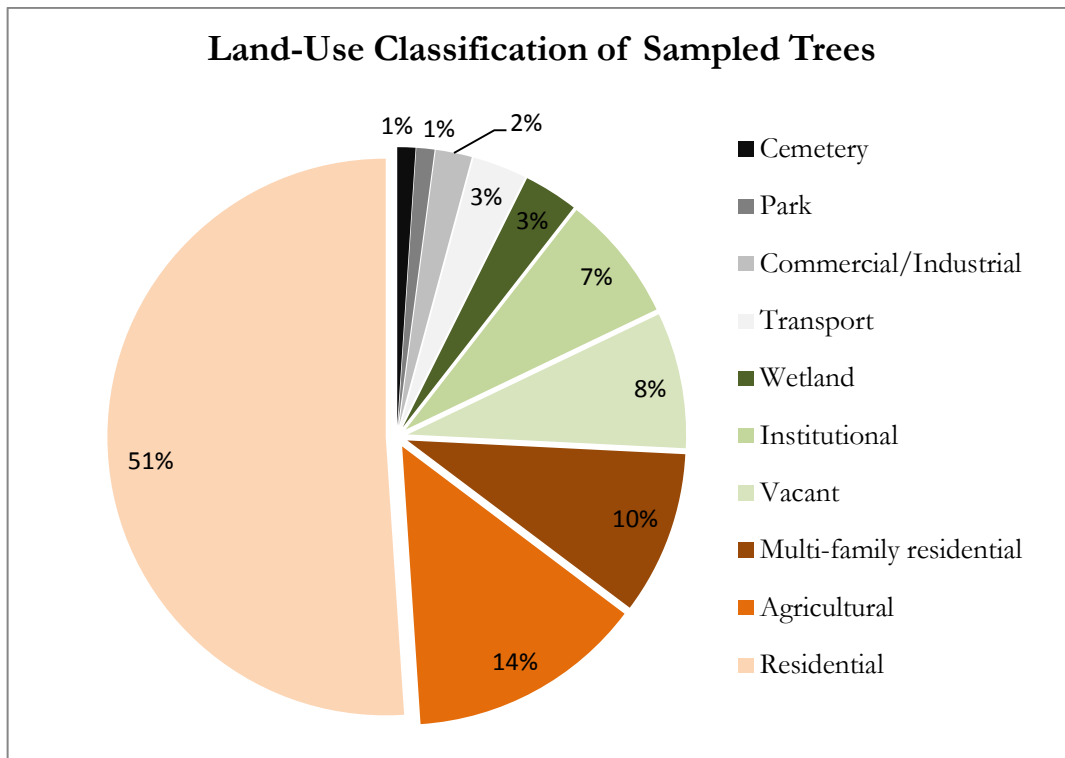


Figure 26 Land-use classification of sampled trees

A tree's ownership status is closely related to the land use on which it grows. As part of the inventory, I classified all trees within the 200 plots as either 'public' or 'private'. Similarly to classifying the land use, identifying tree ownership is prone to mistakes, and I might have misclassified some trees. However, species composition of Accra's private and public urban forest parts differs (Fig. 27), suggesting that private individuals' selection criteria and those adopted by government bodies for public lands also differ. Several species appeared only in public ownership, such as Indian cork or almond tree, while soursop, cacao and avocado were all encountered on private land. Even where a species grew on both land types, it often predominated in one as in the case of neem, mango or papaya. With the exception of ackee, all other food trees were either exclusively privately owned or more common in this land type than on public ones. I discuss species selection criteria and urban forest management objectives and priorities of both public and private actors in more detail in Chapters 5 and 6.



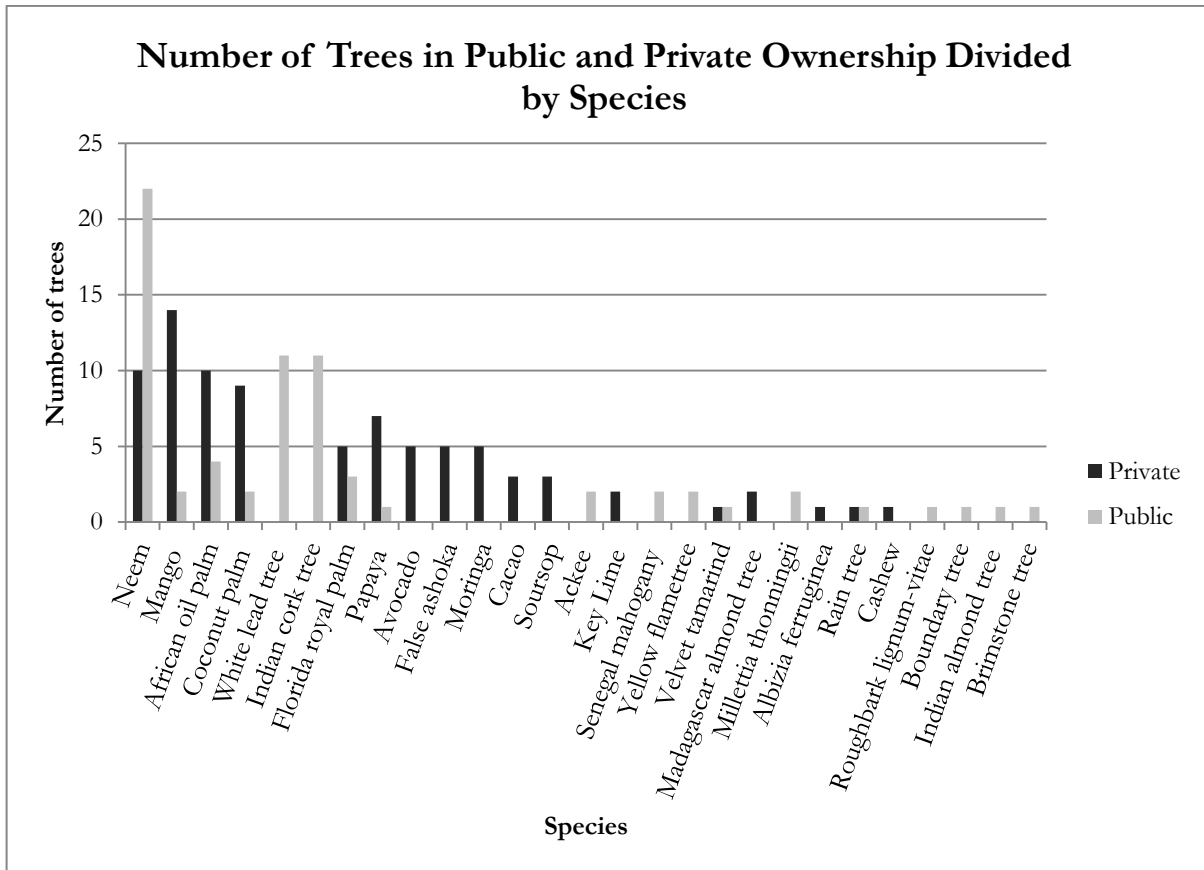


Figure 27 Number of trees in public and private ownership divided by species

Tree height and diameter at breast height (DBH) are two commonly recorded inventory variables, which describe both the current urban forest structure and serve to predict future developments. The inventoried trees' average height was 6.2 m, and more than half were up to 5 m high (Fig 28). Lower trees dominate in Accra's urban forest for two likely reasons. First, species selection often focuses on small to medium-sized trees, reflecting limited growing space in cities. Second, biotic and abiotic factors create harsh growing conditions, which can shorten the trees' life spans. As the iTree Eco definition of 'tree' requires a diameter at breast height of at least 2.54 cm, no tree up to 1 m was included in this inventory, although individuals in this size class grew in the sampled areas.

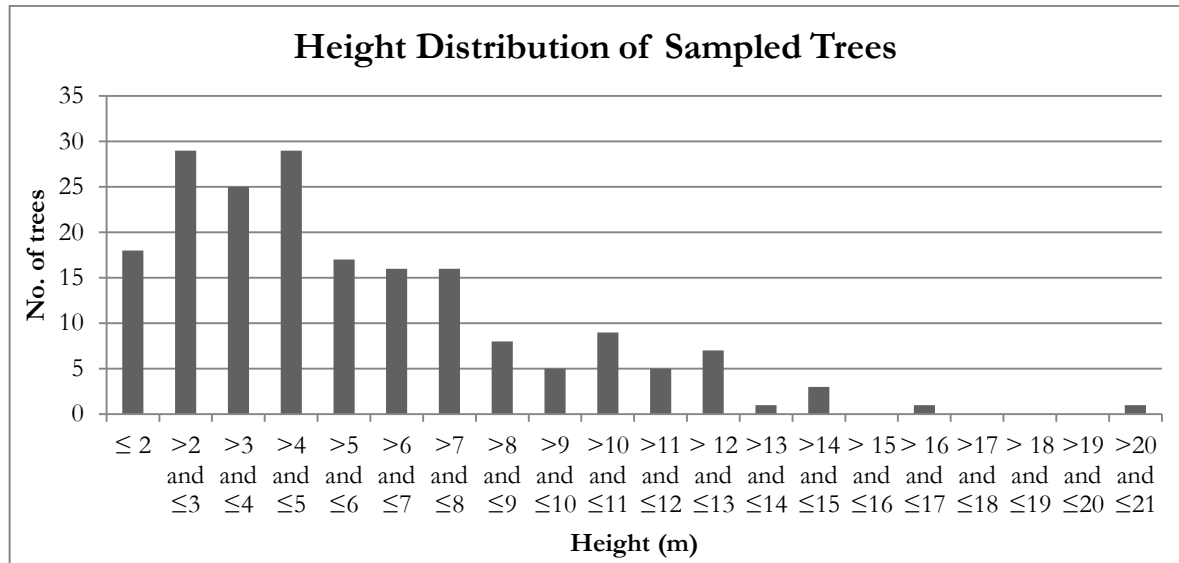


Figure 28 Tree height distribution of inventoried trees

The DBH distribution mirrors the height distribution, with almost half of the trees having a diameter<sup>10</sup> of up to 10 cm (the average equals 19 cm). To analyse diameter distribution, I excluded palms and other tree-like species such as papaya, which do not have woody stems, thus remaining with 147 trees. The observed curve (Fig. 29) is a ‘reverse J’ type, also called a ‘youthful’ population “characterised by a high proportion of young, small trees” (Morgenroth *et al.*, 2020, p. 2). Though researchers have suggested ideal distributions for specific places and/or sub-types of urban trees (Richards, 1983; Millward and Sabir, 2010), DBH/age correlation varies between species and preferred distribution would depend on the defined management objectives (Morgenroth *et al.*, 2020). A preference for planting smaller species, comparatively high natural regeneration of these trees and increased planting activities in recent times can result in a large proportion of trees in smaller diameter classes (Morgenroth *et al.*, 2020). Information to determine how these factors interplay in Accra is insufficient, but this distribution type requires a short-term focus on management and maintenance to ensure that small trees successfully establish and mature.

<sup>10</sup> In line with iTree Eco guidelines, I measured the largest stem of multi-stemmed individuals

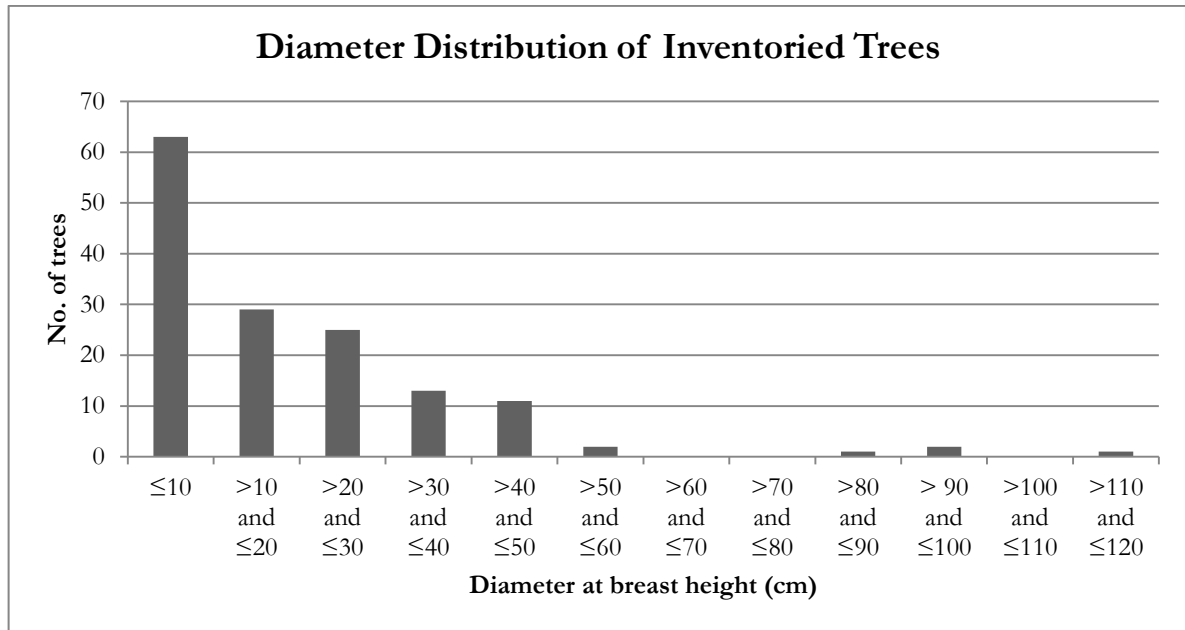
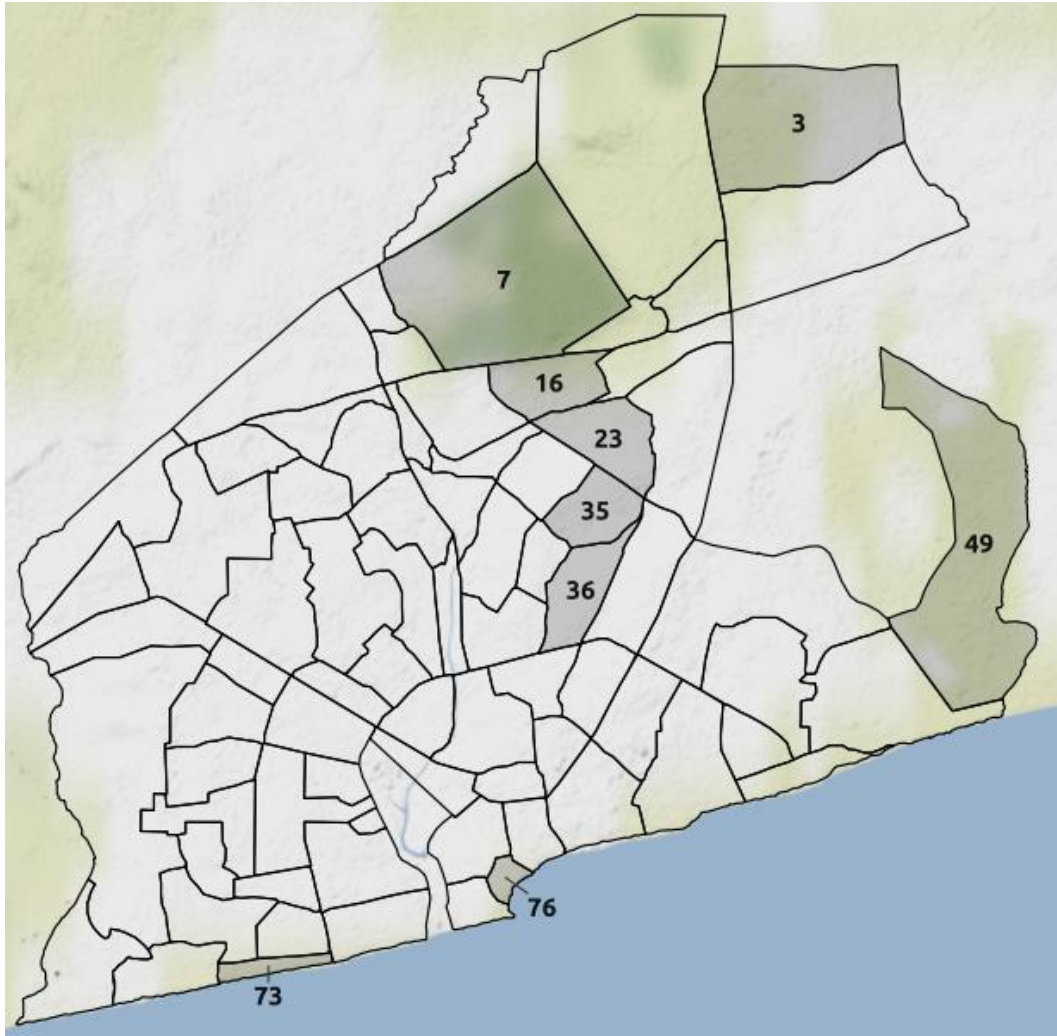


Figure 29 Diameter distribution of inventoried trees

#### 4.2.2 Intra-City Variation

In Accra, neighbourhoods' tree covers range from 0.2 % ( $\pm 0.2$ ) in Chorkor to 53.6 % ( $\pm 2.23$ ) in Achimota College, the latter including the previously-mentioned Achimota Forest, a roughly 3.6 km<sup>2</sup> urban forest. Plantable space is lowest in Ussher Town (10.4 %  $\pm 1.74$ ) and other densely populated inner-city neighbourhoods like Chorkor, Mamobi, and Nima, which, by the same token, have significant proportions of non-plantable land (e.g. Ussher Town with 87.0 %  $\pm 1.5$  or Nima with 78.0 %  $\pm 1.85$ ). Free space is higher in neighbourhoods on the peri-urban fringes of Accra like East Legon Extension (49.8 %  $\pm 2.24$ ) and La Dadekotopon (67.2 %  $\pm 2.1$ ), or in the less densely populated inner-city neighbourhoods like Dzorwulu (41.4 %  $\pm 2.2$ ) and Roman Ridge (46.4 %  $\pm 2.23$ ) (Fig. 30, see Appendix 9 for further values).



**Figure 30 Neighbourhood locations**

Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL

3 – East Legon Extension    7 – Achimota College    16 – Dzorwulu    23 – Roman Ridge    35 – Mamobi  
 36 – Nima    49 – La Dadekotopon    73 – Chorkor    76 – Ussher Town

Nero *et al.* (2018b), who also conducted an iTree Canopy analysis in their six study neighbourhoods (Jamestown, Nima, Asylum Down, Kanda, East Legon, and Roman Ridge), report significantly higher numbers (Table 16) than mine. Their high standard errors suggest that they classified fewer points per neighbourhood than I did, potentially even less than the recommended number. They likely over-estimate tree canopy cover, which exceeds the broader green cover values determined for Accra (Stow *et al.*, 2013; Owusu, 2018).

**Table 16 Comparison between iTree Canopy values for selected neighbourhoods**

| <b>Neighbourhood</b> | <b>Nero <i>et al.</i> 2018b</b> | <b>This Study</b> |
|----------------------|---------------------------------|-------------------|
| Jamestown            | 10.2 % ± 4.15                   | 1.2 % ± 0.49      |
| Nima                 | 14.0 % ± 5.29                   | 4.4 % ± 0.92      |
| Asylum Down          | 30.0 % ± 10.0                   | 12.6 % ± 1.48     |
| Kanda                | 37.5 % ± 7.65                   | 21.4 % ± 1.83     |
| East Legon           | 46.7 % ± 6.44                   | 14.4 % ± 1.57     |
| Roman Ridge          | 60.9 % ± 5.88                   | 24.8 % ± 1.93     |

Various elements of urban forest structure, like canopy cover, leaf area or species diversity, show pronounced intra-city spatial variation that correlates with socio-economic variables in locations around the world (Pedlowski *et al.*, 2002; Landry and Chakraborty, 2009; McConnachie and Shackleton, 2010; Kuruneri-Chitepo and Shackleton, 2011; Seburanga *et al.*, 2014; Schwarz *et al.*, 2015). In Accra, the average canopy cover declines with increasing poverty class (Table 17, Standard deviation (SD) in brackets). While non-poverty neighbourhoods have an average cover of 23.1 %, this declines to 3.5 % in the highest poverty class. Examining the relationship between poverty and canopy classes, lower-poverty neighbourhoods fall into higher canopy cover classes and those with higher poverty ratings into lower canopy classes significantly more often than expected by chance ( $N = 76, p < .01$ ). These results correspond to those by Stow *et al.* (2013), who reported higher vegetation cover for neighbourhoods of higher socio-economic status, even while using different neighbourhood boundaries and methods from those used in the present study.

**Table 17 Average canopy cover per poverty class**

| <b>Poverty Class</b> | <b>Non</b>   | <b>Low</b>   | <b>Moderate</b> | <b>High</b> | <b>Very High</b> |
|----------------------|--------------|--------------|-----------------|-------------|------------------|
| Average Canopy Cover | 23.1 % (6.3) | 13.8 % (7.0) | 12.4 % (8.8)    | 8.1 % (4.8) | 3.5 % (0.9)      |

With increasing canopy cover, plantable space also increases while non-plantable space decreases (Table 18). This illustrates how canopy cover tends to be higher in less densely populated and built-up neighbourhoods, structural factors that can often be traced back to early (colonial) town planning activities.

**Table 18 Average plantable and non-plantable space per canopy cover class**

| <b>Canopy Class</b>         | <b>5 (low)</b>      | <b>4</b>           | <b>3</b>           | <b>2</b>           | <b>1 (high)</b>    |
|-----------------------------|---------------------|--------------------|--------------------|--------------------|--------------------|
| Average plantable space     | 26.9 %<br>(SD 7.7)  | 34.6 %<br>(SD 6.1) | 36.8 %<br>(SD 9.3) | 37.8 %<br>(SD 6.4) | 42.6 %<br>(SD 7.2) |
| Average non-plantable space | 68.5 %<br>(SD 10.7) | 59 %<br>(SD 6.3)   | 53.2 %<br>(SD 9.6) | 46.4 %<br>(SD 8.1) | 31.3 %<br>(SD 6.9) |

Based on the inventoried trees in the 200 plots, iTree Eco estimates the total number of trees in each stratum (Table 19).

**Table 19 Trees per poverty class**

| <b>Poverty Class</b> | <b>Number of Trees</b> |
|----------------------|------------------------|
| 1 (non)              | 35,432                 |
| 2                    | 118,896                |
| 3                    | 182,293                |
| 4                    | 52,384                 |
| 5 (very high)        | 2,567                  |

However, these absolute numbers are misleading as trees/ha values in non- to medium-poverty neighbourhoods (classes one to three) exceed those in poverty classes four and five (Fig. 31), the first three above the city's average of 25 trees/ha, the other two below. This density pattern also

exists in Kigali (Rwanda), where richer, more ‘Western-style’ settlements feature more trees (Seburanga *et al.*, 2014).

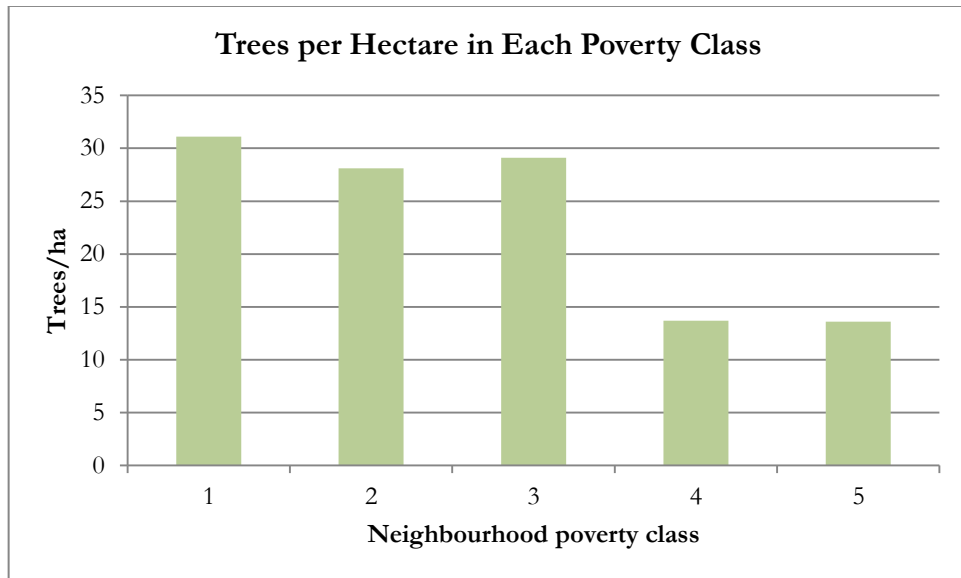


Figure 31 Trees per hectare in each poverty class

Similarly, species richness, i.e. the number of different species, also decreases with increasing poverty class (Fig. 32), as could also be observed in a Brazilian city (Pedlowski *et al.*, 2002).

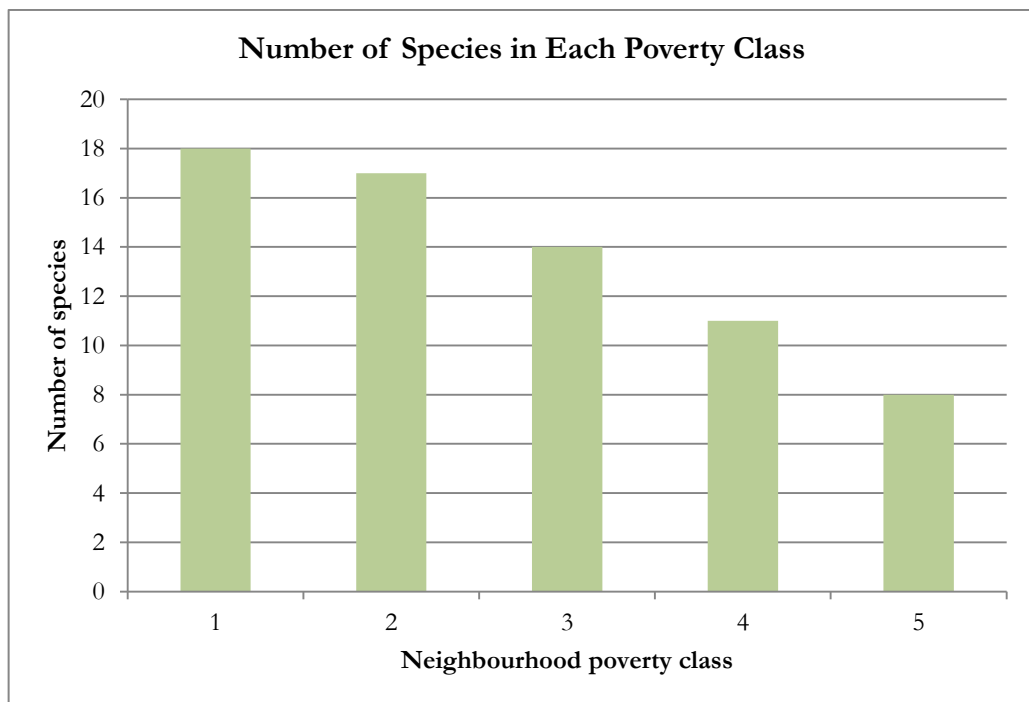


Figure 32 Number of species in each poverty class

Though determining a tree’s ownership status may include a certain level of misclassification, it provides information on who is planting and where. In Accra, I categorised 81.6 % of all trees in the non-poverty stratum as ‘public’, while this applied to roughly half of the trees in stratum 2 and 3. In the higher poverty strata, however, a majority of trees were classified as ‘private’ (Table 20). This pattern could indicate that ample growing space in sparsely populated neighbourhoods allows for higher levels of naturally regenerating trees in open spaces. However, it more likely points to government agencies focusing their planting and maintenance endeavours in these residential areas. In turn, inhabitants of the poorer neighbourhoods must rely on privately planted trees and, as discussed above (see Section 4.2.1), their landowners’ interest and/or permission when renting accommodation.

**Table 20 Trees in public and private ownership per poverty class**

| <b>Poverty Class</b> | <b>1 (non)</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5 (very high)</b> |
|----------------------|----------------|----------|----------|----------|----------------------|
| Public trees         | 81.6 %         | 45.1 %   | 42.6 %   | 8 %      | 27.3 %               |
| Private trees        | 18.4 %         | 54.9 %   | 57.4 %   | 92 %     | 72.7 %               |

Although urban vegetation and socio-economic characteristics do not always correlate (Talen, 1997; Nero, 2016), urban green divides exist in most places. As within-city variations are pervasive, they point to structural issues and underlying mechanisms and processes that create and maintain them. Current canopy cover varies significantly between richer and poorer neighbourhoods in Accra, resulting in uneven access to trees and their benefits. These ecosystem goods and services can help to compensate for problems associated with rapid urban population growth and climate change, thereby improving people’s well-being. While urban trees do have costs, outputs can be optimised by selecting appropriate trees for designated planting spaces and implementing adequate maintenance schemes to enhance their survival and growth. Some trade-offs – in terms of who can benefit, how and to what extent – are unavoidable due to the complex interplay of



services and disservices at various scales. The decision of what to plant where and for what purpose is, in fact, a fundamental conundrum of urban forest management as “planting a finite number of trees to create an equitable distribution for a city’s inhabitants might, in the end, reduce the overall efficiency (defined as the greatest benefit provided for the most people) of the urban forest” (Heynen, 2003, pp. 989-990).

### **4.3 Chapter Conclusion**

In this chapter, I discussed how some historical events and processes affected Accra’s development and, directly or indirectly, its urban tree cover. Exclusively European areas in colonial times were well planned, with tree planting an integral part of their design. Many African areas, however, suffered from unplanned growth and increasingly high population densities as people migrated to Accra in search of income opportunities. My desk-based iTree Canopy assessment and the ground-based iTree Eco inventory demonstrate how this structure has been preserved over time and continues to be visible in current day Accra. Here, factors related to historical land ownership, city planning and tree planting patterns have left lasting imprints, moulding the basis for contemporary urban forestry. History, however, does not just help explain the present but can and should be used to analyse how today’s urban forest might develop under current political, economic, and social events and processes. Assessing these potential effects requires not just a deep understanding of the past but a substantial amount of foresight. While not a precise prediction, the “effects of past management systems can provide an indication of how current ecosystems may react to management efforts” (Szabó, 2010, p. 383). As such, we can utilise an understanding of historical human–environment interactions to enhance future outcomes.

## **5 MANAGING AND USING THE URBAN FOREST – STAKEHOLDER OPINIONS AND INTERACTIONS**

“[F]or pruning we don’t restrict them too much because we even encourage them to do. Now felling, you need to take permit.”

**Mr Sampson, Environmental Health Officer, Ayawaso Central**

~~~~~

“Yes, you pay for pruning because we still lose value. You have taken off some of the branches, and the services that those branches are to provide for the general good of the public has been taken away by one person. So you must compensate.”

**Mr Fiati, Head of the Natural Resource Department, EPA**

In this chapter, I analyse how urban forestry stakeholders in Accra act and interact, demonstrating how inadequate resources, conflicting priorities and an ill-defined allocation of tasks and responsibilities impede efficient tree management. I thereby challenge the prevailing assumption that holds private individuals, especially in lower-income neighbourhoods, primarily responsible for declining tree cover. After reviewing stakeholder theory, I apply it to urban forestry in Accra and introduce the interviewed stakeholders – including government actors, NGOs and private individuals connected to the city’s trees – and their organisational structure. I then summarise what strengths, weaknesses, opportunities, and threats (SWOTs) the interviewed stakeholders identified regarding their urban forestry-related activities, experiences and views. These explicitly mentioned SWOTs form the basis of my thematic analysis, where I categorise and interpret these statements. I identified two themes, ‘The little that we have, the lot that we have to do’ and ‘The long road from awareness to action’, the first consisting of two further sub-themes. While the

first theme focuses on actors' activities and priorities within the context of resource availability and interactions among these stakeholders, the second one traces the steps involved in the process from 'becoming aware' of a topic to 'taking action'. Using a hierarchy of effect model, I suggest that (especially) government organisations need to re-evaluate their views on the general public's position.

## **5.1 Establishing Stakeholding in Accra's Urban Forest**

### **5.1.1 Stakeholders – The Theory**

In 1984 Freeman proposed that 'stakeholders' include "any group or individual who can affect or is affected by the achievements of the firm's objectives" (p. 46). Since then, researchers and practitioners have modified his definition or created new ones. As the chosen definition impacts study sample criteria and selection (Mitchell *et al.*, 1997), I opted for an inclusive and broader one to avoid overlooking stakeholders (Bryson, 2004; Lewis and Gillman, 2005), recognising how more stakeholders might increase (management) complexity. Additionally, I selected a definition less focused on researching a commercial company, defining stakeholders in this research as "individuals or groups who have an interest or some aspect of rights or ownership in the project, and can contribute to, or be impacted by, the outcomes of the project" (Bourne and Walker, 2006, p. 6). Two questions then arise: first, what constitutes 'the project', and second, how do we identify stakeholders and their interests to systematically characterise them and their (potential) roles in the project? In this section, I briefly discuss these two aspects in general and theoretical terms before applying them specifically to the case of urban forestry in Accra in the following one.

The Project Management Institute defines a project as "a temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2013, p. 3). Every project involves stakeholders whose influence, needs and expectations need to be understood as

“[f]ailure to do so can lead to delays, cost increases, unexpected issues, and other negative consequences including project cancellation” (Project Management Institute, 2013, p. 31). Stakeholder analysis utilises various tools to identify these individuals and groups, commencing either with a brainstorming approach (Smith, 2000) or a more structured one that examines the political, economic, social/cultural or legal contexts (Manchester Metropolitan University, no date). Additionally, one can consult theme-specific lists of potential stakeholders, existing for both forestry (Mayers, 2005) and urban forestry (Leff, 2016; see below for more detail). Furthermore, identified stakeholders may identify others while stakeholders can also self-identify in response to public announcements (Mayers, 2005). Identified stakeholders can then be listed, summarised or classified in tables, matrices and graphs to understand their interests, impact levels, relative priorities, types of participation in different project stages and/or their potential influence with regards to achieving project aims. Based on these factors, project managers can then determine the best management strategies for each involved stakeholder.

### **5.1.2 Stakeholders in Accra – The Practice**

Applying the above theory and blueprint matrices, graphs and tables to Accra first requires identifying the specific project under investigation. However, three major state actors, the Environmental Protection Agency, the Department of Parks and Gardens, and the Town and Country Planning Department, participate in Accra’s urban forest planning and management but seem to operate lacking a comprehensive plan. My suggestion of what the ‘project’ can be understood as, from their perspective, therefore, remains vague, focusing on the most basic common goal: plan and manage the urban forest sustainably to produce a range of benefits. To identify further stakeholders, I conducted a web and literature search before commencing data collection and also followed up on individuals and groups mentioned during stakeholder interviews and the household case study. Additionally, Leff’s (2016, p. 34) list of possible stakeholders and collaborators in

urban forest planning and management provided a starting point for further brainstorming and online search activities (Table 21). Though he developed the list within the context of US-American urban forestry, several of these stakeholder types both actively participate or are passively affected in Accra as well.

**Table 21 Stakeholder types and examples for each type**

<b>Type</b>	<b>Examples</b>
Municipal departments and agencies	Forestry, Natural resources, Housing, Transportation, Public utilities, Fire, Education
Regional and state agencies	Public health agencies, Regional planners, Park districts, Forest preserves
Landholders	Residential homeowners, Homeowner associations, Institutional/Commercial/Industrial
Academia	Colleges/Universities with tree or horticultural programmes, Colleges/Universities where students and faculty seek research
NGOs	Tree advocacy groups, Watershed partnerships, Environmental justice organisations
Public individuals/groups	General public, Faith groups, Community and neighbourhood groups, Tree-planting volunteers
Private individuals/groups	Developers, Landscape architects, Arborists and tree-care companies, Small business associations

According to Leff (2016)

As available resources determined how many stakeholders I could interview, I tried to identify their interests and assess their importance and influence before travelling to Accra. Influence “indicates a stakeholder’s relative power over and within a project”, and one with high influence “would control key decisions within the project and have strong ability to facilitate implementation of project tasks and cause others to take action” (Smith, 2000, p. 5). Importance, however,

“indicates the degree to which the project cannot be considered successful if needs, expectations, and issues are not addressed” (Smith, 2000, p. 5). Besides focusing on whose views and/or actions seemed most pertinent, I also interviewed groups and individuals who could offer additional insights, thereby including participants from diverse backgrounds. However, I judged this possible relevancy based on literature and web searches which often offered limited information on potential stakeholders. The table below (Table 22) depicts my understanding of urban forestry in Accra prior to data collection, resulting from the available academic literature, newspaper articles and government departments’ websites. It describes the current situation rather than an ideal scenario of how influence and importance **should** be attributed to create (greater) benefits for a more diverse group of stakeholders.

**Table 22 Potential stakeholders, their interests, importance and influence**

Potential Stakeholders	Stake	Influence	Importance
Environmental Protection Agency	Implement national environmental policy; manage, protect, and enhance the country’s natural resources	High	High
Department of Parks and Gardens	Grow, plant, and maintain trees on public lands	Low to medium	High
Town and Country Planning Department	Develop planning schemes for the city, including areas provisioned for green/trees	Medium to high	High
Department of Urban Roads	Plan and develop road infrastructure; integration of/conflict with roadside trees	Low	Medium
Forestry Commission	Manage the Achimota urban forest	Medium	Medium to high
Department of Physical Planning	Prepare land use/physical plans	Low	High
Legal Department	?	?	?

Sub-metropolitan offices	?	?	?
National Disaster Management Organization	?	Low	Low
School of Horticulture	Educate people on tree-related topics	Low to medium	?
Youth Employment Agency (YEA)	Offer a module for young people to be trained in greening/planting/agriculture	Low to medium	?
Developers (e.g. Wonda World, Clifton Homes)	?	?	?
Youth4GreenGhana	An NGO that has previously planted trees in Accra	Low	Medium
Ghana Youth Environmental Movement	An NGO that works in the environmental area	Low	Medium
Stratcomm Africa, Ghana Garden and Flower Movement	Communication agency that started the Ghana Garden and Flower Movement with an annual Garden and Flower Show	Low	Low
University of Ghana, Legon Botanical Gardens	Research projects on urban trees; children's playground	Low	Low
Mmofra Foundation	NGO that created a children's park in Accra	Low	Low
Ghana Climate Innovation Centre	Business incubator focusing on the 'green economy'	?	?
Centre for Environmental Research and Policy Analysis	Environmentally focused NGO that promotes sustainability through research and education	?	?
General public		Low	Medium to high

Tree/Tree-part salespeople (e.g. seeds, fruits, medicine)	Depend on trees and tree parts for their livelihoods	Low	Low
Faith groups (e.g. in Achimota Forest)	Meet and pray in prayer camps in the forest	Low	Low to medium
Homeowners/Landowners	Own part of the city's land with trees; grow, plant, and maintain trees	Low	High

I interviewed representatives of the major government departments and agencies working in urban forestry, including the Environmental Protection Agency, the Department of Parks and Gardens and the Town and Country Planning Department. I could not interview the Forestry Commission about Achimota Forest due to a ban on discussing its transformation into the Accra Eco-Park (see Chapter 7). These four government departments plan, manage, and maintain the city's urban forest but operate under different ministries. While they divide some forestry-related activities between them (see Section 5.2.1), other tasks are potentially duplicated as both EPA and DPG plan to or currently develop educational campaigns to raise the public's awareness of urban tree benefits. Additionally, I interviewed a representative of the Forestry Research Institute of Ghana (FORIG) and three sub-metropolitan assemblies' environmental officers (Ayawaso East, Central, and West). I also talked to two non-governmental organisations, Youth4GreenGhana and Ghana Youth Environmental Movement and interviewed four Accra inhabitants who depend to varying degrees on the urban forest's natural resources for their livelihoods or activities (a coconut seller, a tree seedling seller, a herbalist, and a pastor). To elicit a picture of the general public's views, I further conducted a household questionnaire in five neighbourhoods.



## **5.2 Urban Forestry in Accra**

### **5.2.1 Organisational Structure and Functioning**

The Town and Country Planning Department was established in 1945 and plans the city's growth and development. The employees design and prepare planning schemes demarcating areas for use as open and green spaces. The Department of Parks and Gardens then ensures that these green areas are established (through tree planting) and maintained. Under the country's decentralisation policy, these two departments merged their activities at the district level, forming the Department of Physical Planning. Previous attempts at such integration have, however, been unsuccessful and remain limited up to today. As of July 2017, 177 people worked in DPG's Accra location, about 100 less than three years before due to a government freeze on employment. Apart from about ten office and managerial staff, everyone participates in growing, planting, and maintaining the trees on the department's grounds and across the city. They water planted trees, occasionally fertilise them and prune or fell them, but their small budget and lack of necessary equipment limits these activities. The interviewee, Mr Awidi, stated a departmental interest in forming public-private partnerships (PPP), a national policy where the private sector partner could support them with funding or technology. Furthermore, DPG also supports individuals, institutions, and other groups with tree planting and maintenance, advising on suitable species and recommended tree care.

The third major actor, the Environmental Protection Agency (est. 1994), emerged from the Environmental Protection Council (est. 1974). Like TCPD, the agency operates under the Ministry of Environment, Science, Technology and Innovations (MESTI) and oversees the implementation of the country's environmental policy. EPA ensures that environmentally responsible behaviour and resource use are mainstreamed into Ghana's development at every level, from community to nation. The interviewee, Mr Fiati, the head of EPA's Natural Resource Department, reported that the agency seeks solutions to natural resource management problems which, regarding Ac-

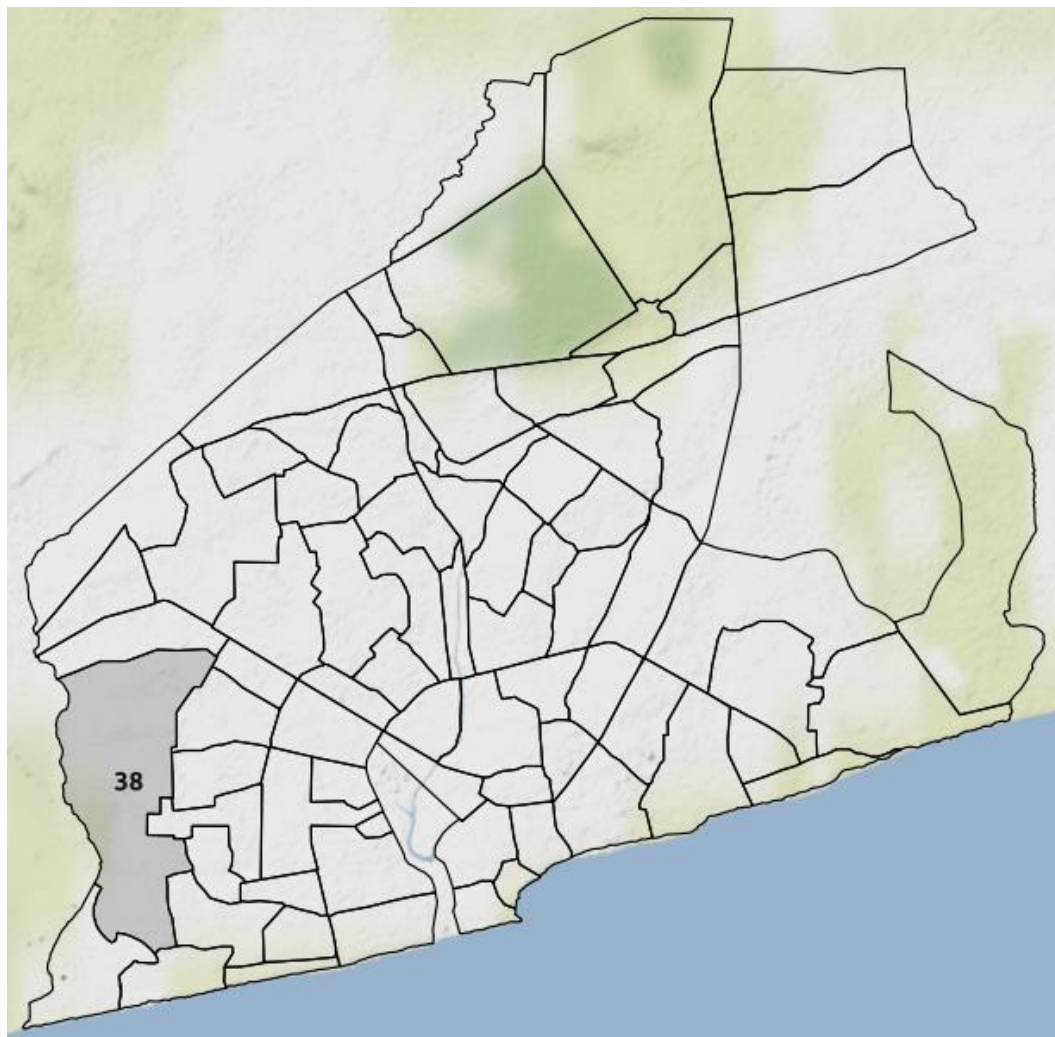
cra's trees, means regulating removal and pruning through a permit system. The Forestry Commission's work focuses on trees outside urban areas but, due to the historical reasons discussed in the previous chapter, includes Accra's Achimota Forest.

Besides these government bodies, several further actors participate in Accra's urban forestry activities. The Accra Metropolitan Assembly (AMA) constitutes one of the 260 Metropolitan, Municipal and District Assemblies across the country. In 2017, Mohammed Adjei Sowah became the new mayor, the Metro Chief Executive, to whom the city's 16 Statutory Departments report. AMA is further divided into sub-metropolitan assemblies, the boundaries and numbers of which have changed several times in the past. I conducted the household survey and case study components in five neighbourhoods spread across Ayawaso East (Nima, Mamobi), Ayawaso Central (Kokomlemlé, Alajo), and Ayawaso West (Dzorwulu) sub-metros. In each of these assemblies, I interviewed an environmental health officer about their tree-related work, which includes promoting and encouraging tree planting, popularising the trees' benefits and minimising their disservices by advocating pruning and clearing fallen leaves. Though located near Kumasi, I also interviewed a researcher of the Forestry Research Institute of Ghana (FORIG), an institute operating under the Council for Scientific and Industrial Research. While FORIG lacks a division devoted explicitly to urban forestry, researchers from various divisions (e.g. Forest and Climate Change; Governance and Livelihoods; Biodiversity Conservation and Ecosystem Services) work on this topic, although they have, by their own admission, focused on Kumasi's trees.

### **5.2.2 Further Stakeholders and Interviewees**

An internet search prior to data collection revealed two NGOs which had worked in urban forestry in Accra. The youth-based NGO Youth4GreenGhana (Y4GG) was established in 2011 and seeks to give back to society and Mother Earth. Focusing on environmental conservation activi-

ties, they planted coconut palms along the beach and 100 seedlings in the Dansoman neighbourhood in 2013 (Fig. 33). Youth4GreenGhana reported that they had received these seedlings for free from the Department of Parks and Gardens, but they had forgotten the trees' species. Despite losing all seedlings due to lack of maintenance and browsing animals, they want to continue their tree planting project in the Dansoman area. They further pursue other related activities and aim to open an organic food shop.

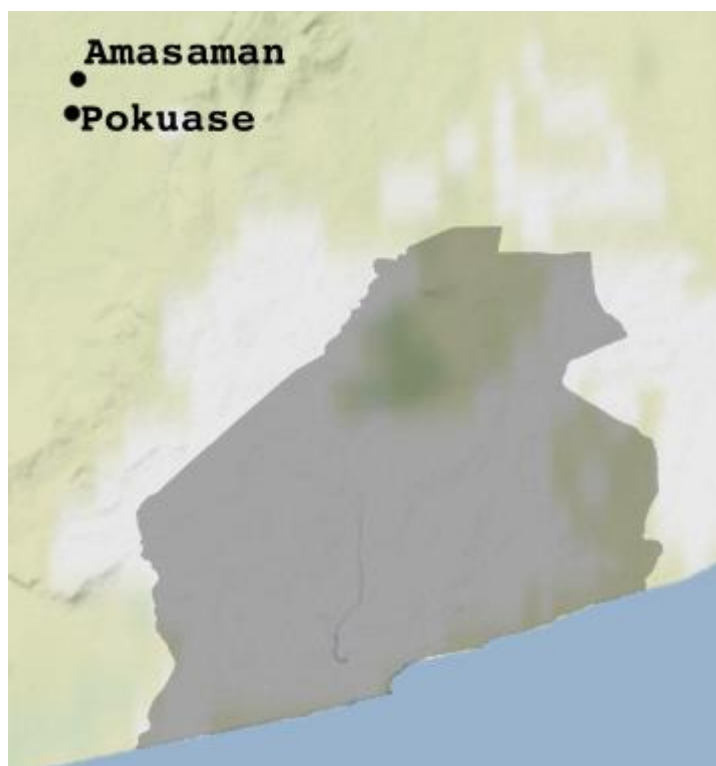


**Figure 33 Location of Dansoman**  
Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL  
38 – Dansoman

The second NGO, Ghana Youth Environmental Movement (GYEM), started in 2012 as an environmental advocacy and campaign group that aims to solve Ghana's sanitation and climate

change problems. They train and educate young people in school clubs, through workshops, conferences, and a book written by the founder. The NGO's steering group decides on campaign design and strategies and then forwards these to members on the ground and an estimated 5,000 online supporters. They ran two campaigns on trees, one in Aburi Garden, where their work stopped tree felling in a reserve. Their other tree-related campaign aimed to protect Accra's only greenbelt, the Achimota Forest, from being transformed into the Eco-Park. However, the government did not react to their petition on change.org and parts of the general public also seemed to support the government's plans. As progress regarding Achimota's redevelopment is slow – the interviewee, Mr Commey, even stating that he doubted it would ever get started – GYEM was in a waiting position as of August 2018.

Further interviewees included a herbalist in Nima, who has obtained part of his raw materials from public and private city trees for about five years. However, the majority (about 95 %) of his supplies originate from rural areas. He estimates that he buys about 70 % of his urban supplies and collects the remaining 30 % for free, calling the easier accessibility of urban sources 'convenient'. For his medicines, he uses neem tree leaves and noni tree fruits (*Morinda citrifolia* L.) from both rural and urban areas. He disclosed collecting some of these fruits and leaves from Pokuase and Amasaman, towns adjacent to Accra and part of the Greater Accra Region, but located outside the study city's boundaries to the northwest (Fig. 34). The herbalist appeared somewhat hesitant to disclose (further) urban collection and purchase locations as he mentioned competing for these resources with his colleagues. He further stated that he believes the medicine from rural products to be of better quality since garbage dumped on urban trees can 'contaminate' them. Additionally, he mentioned that trees from very public and busy areas like Nima could be 'spiritually contaminated' by people with 'evil eyes' or used by malams, spiritual Muslims for their purposes, making them ineffective for the herbalist's medicines.



**Figure 34 Location of Amasaman and Pokuase**

Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL  
Accra highlighted in grey for reference

In addition to the herbalist, I also interviewed a pastor who visits Achimota Forest to meet and pray with some of his church members, and a roadside tree seedling seller. The pastor has been going to the forest with fellow churchgoers for about ten years, leading his own congregation for five. His group constitutes one of the many groups that regularly meet in the forest and for which FC has cleared undergrowth, thereby creating prayer camps sheltered by trees. He visits Achimota on a fixed day each week, as well as at other unscheduled times, and considers Achimota an environment conducive to prayer and spirituality. His church assembly is not involved in any form of forest protection or tree maintenance, as these tasks reside with FC's forest guards. The tree seedling seller, Anasawudu, has been producing and selling fruit trees like mango (*Mangifera indica* L.) and avocado (*Persea americana* Mill.), fruit/ornamental species like Indian almond (*Terminalia catappa* L.) and ornamental palms, such as *Roystonea regia* for some 15 years. He grows his seedlings from seeds recovered from fruits that he eats and obtains additional seeds from DPG

when demand is high. He tends his plants using poultry manure and wastewater harvested from the gutter that runs through his roadside shop. AMA assigned this place to him, and he paid them 200 cedis for a permit to sell his plants.

The interviewed coconut seller, Mr Kwakye, has been engaged in his trade for six to seven years, selling on a bridge in the Nima/Mamobi area. While typically buying his coconuts from surrounding villages, he does obtain some coconuts from urban palms when rural supply is low in June/July or when he sells more than expected and needs to re-stock urgently. He has bought twice (210 coconuts total) from one of my case study households, something he would repeat when necessary. While urban palms allow him to obtain some coconuts quickly, his regular stock exceeds the amount available from nearby city trees. I further base my analysis on information collected during the household survey in Nima, Mamobi, Alajo, Kokomlemle and Dzorwulu. While methodically different from the stakeholder interviews, these views of the general public supplement both the government agencies' 'institutional perspective' and that of NGOs, herbalist, pastor, tree and coconut seller. Successful urban forest planning and management require the public's involvement, but households' views may vary depending on size, economic status or location. Additionally, this stakeholder group includes both people who own trees and those that do not, while some even sell tree products. In reality, therefore, several sub-groups with different views and priorities can be identified in this group.

## **5.3 Stakeholder views – Strengths, Weaknesses, Opportunities, Threats**

### **5.3.1 Strengths, Weaknesses, Opportunities, Threats – The Theory**

Strengths, weaknesses, opportunities, threats analysis (SWOT) is a planning tool that helps to analyse positive and negative internal and external factors to understand the context in which a company or organisation operates. Strengths and weaknesses relate to the organisation's internal

functioning and include human, financial and physical resources, as well as past experiences. Opportunities and threats, in turn, refer to the external environment and include the economy, legislation or demographics. As such, the analysis of the external situation resembles a 'PESTLE analysis', or one of its derivatives, which considers what macro-environmental factors a company works in, analysing its political, economic, social, technological, legal, and environmental context.

SWOT analysis is a tool often used in business management but also applies to analysing industries, countries, or not-for-profit organisations (Helms and Nixon, 2010). While recommended for "its simplicity and value in focusing attention on key issues" (Pickton and Wright, 1998, p. 102), some researchers and practitioners criticise the tool. Users may misclassify threats as opportunities (Morris, 2005) or misuse generic checklists without considering context (Valentin, 2001). Additionally, critics have called SWOT analysis an atheoretic classification system (Grant, 2008). Morris (2005) suggested identifying 'options' rather than 'opportunities' as identifying the latter should be the analysis' final objective. Others have argued that SWOT items lack hierarchy which hinders prioritisation (Helms and Nixon, 2010) and leads to the production of simple or incomplete lists with no further decision-making value (Kangas *et al.*, 2003); or to long and descriptive, irrelevant lists with general and ambiguous terms that detract from what is crucial (Hill and Westbrook, 1997). Further criticisms of SWOT analysis include difficulties in distinguishing internal from external factors (Helms and Nixon, 2010), too much emphasis placed on exploring the positive aspects while failing to address the negative ones related to incompetence and weaknesses (Drago and Folker, 1999), and its questionable usefulness in a fast-paced information and technology age different from when the tool was first developed and utilised (Hill and Westbrook, 1997).

Despite the tool's potential shortfalls, I use it as a first step to obtain an overview of what various stakeholders think, capitalising on its ability to simplify a complex situation. As users conduct a

SWOT analysis at a certain point in time, it needs to be repeated periodically to monitor evolving circumstances (Helms and Nixon, 2010). Here, the approach serves as a starting point, providing baseline knowledge against which future developments can be compared. To off-set some of the problems and improve the utility and practical value of SWOT as a tool, researchers suggested combining SWOT with other approaches (Lee and Ko, 2000; Valentin, 2001; Hai and Tsou, 2009) or using it as “a precursor to strategy formulation, managerial decision making and action” (Pickton and Wright, 1998, p. 102). I, therefore, utilise the strengths, weaknesses, opportunities and threats explicitly identified by the interviewees as a precursor for my analysis of urban forestry in Accra. Based on my findings, I suggest strategies and potential actions for improvement in the concluding chapter.

### **5.3.2 Strengths, Weaknesses, Opportunities, Threats – The Practice**

When analysing interview transcripts for SWOTs, two types of SWOTs need to be identified. First, an interviewee may explicitly state a SWOT, reflecting how the person interprets a given situation, in this case, their urban forestry-related activities and the context in which they operate. The second type results from how I categorise and interpret these responses. My assessment utilised a guide “designed primarily to help municipalities assess the state of their urban forest, identify management concerns, and chart a path forward, step by step, toward long-term sustainability” (Leff, 2016, p. 4). In this document, Leff proposes targets/criteria with key objectives and related performance indicators to assess a city’s forest planning and management activities in three categories. These include the vegetation resource itself, stakeholder engagement and the resource management approach like plans, practices and policies. As my analysis combines interview responses and the sustainable urban forest guide, my interpretations might or might not agree with those of the interviewees. I first summarise some SWOTs that have been explicitly stated by interviewees (first type) to offer examples that cover positive and negative aspects, including disa-



greements and opposing views (Table 23). Though I took these statements from the interviews, how I assigned them to one of the categories involved a level of subjectivity as previously discussed (see Section 5.3.1).

Table 23 SWOTs identified by the stakeholder interviewees

	<b>S</b>	<b>W</b>	<b>O</b>	<b>T</b>
FORIG	All divisions of FORIG are interested in Urban Forestry.	They have been unsuccessful in getting funding for urban forestry research projects.	Urban forestry may become more important in the future: different people/groups are starting to become interested in the topic.	No national policy on urban forestry is part of urban land planning.
Ayawaso Central	He thinks he is well informed about tree-related things and is told everything he needs to know to do his work.		People know they need felling permits and act accordingly: no illegal felling.	Sometimes people put benefits higher than potential dis-services (e.g. do not want to prune to maximise medicinal product yield, but overgrown trees attract potentially dangerous animals like snakes).
Ayawaso East	Their work has had an effect: they convinced people who wanted to fell a tree, not to do so because of the benefits of trees.	They lack resources – e.g. no car, so they need to walk to Nima.	A lot of people/groups do something about the environment.	The majority of trees are replaced by buildings (“development”) – numbers are reducing.

Ayawaso West	Working relationship with EPA and DPG generally good. He thinks they are well-informed.		Ayawaso West inhabitants are knowledgeable about trees, aware of tree-related laws and regulations or open to learning. People follow advice on tree management.	Some parts of the sub-metro are losing trees to construction.
Y4GG	They are determined to continue their work, plant more trees, pursue their dreams.	Difficult to get people's attention (little visibility/presence): website down, no money for offices.	People showed interest when they were planting trees.	There are no similar groups that they could work with.
DPG	Through existing partnerships (Garden and Flower Show, Embassies, YEA), they get workers, tools, and education opportunities.	Number of employees reducing, many are too old (government freeze on recruitment).	Decentralisation is beneficial: employees located at assemblies where they can focus on greening the area.	PPPs take a long time to set up, some departments do their work without including DPG or including them too late.
EPA			Backed by laws (e.g. severe fines for illegal felling; plant two trees when felling one; required number of trees per plot).	Space and shelter in economically depressed communities is a priority – little space for trees (overcrowded) and people focused on other things.

GYEM		He recruits and trains many people, but few then take action.	They are known enough to have e.g. Gesellschaft für Internationale Zusammenarbeit, British Council, or WaterAid approach them and support/finance specific projects.	People tend to be busy in Accra due to the urban lifestyle – no time to join campaigns.
TCPD		No real cooperation with DPG, everybody does their own thing as DPG is not resourced at all.	The new mayor of Accra is interested in trees and wants to develop all open spaces – tasked TCPD to identify them and acquire them	Implementation is difficult because of lack of land ownership.
Herbalist	Being able to get some products from the city is convenient as he does not have to travel far to the villages, reducing acquisition costs.			The quantity he has been taking (for five years) is reducing – thinks because of demand from other herbalists.  Some trees are not suitable as sources of medicinal products because they grow in unhygienic conditions (illegal garbage dumps or urinals).

Achimota visitor/ pastor		He did not resist price changes of entrance fees or the proposed conversion to the Eco-Park, because he, and others like him, are not in a position to change anything/have the power to influence such decisions.	Achimota offers a peaceful atmosphere to pray – fresh air, less pressure, less crowding.	Lack of direct official communication: not informed when entrance fee changed, not informed about Eco-Park plans (just signs/radio).
Tree seller	He has a working maintenance scheme, and less than 5 % of planted seeds die.			
Coconut seller	Getting coconuts from the city can be convenient if close by.		When coconut supply is short in the villages, or there is a great demand, the nuts from the city can help during these temporary shortfalls.	Most places in the city are too small to have a large enough number of coconut palms in one place.

The 100 survey participants' responses complement these perspectives on urban trees and forestry in Accra. Fifty-seven respondents mentioned public trees like neem, coconut, mango, moringa and pine that had caught their attention. They mentioned twelve reasons for noticing these trees, four of them negative (unpleasant scent, causing accidents, fallen leaves, habitat for undesirable

animals<sup>11</sup>). The most common positive reasons included food, medicine, shade, and beautification and apart from four people, all respondents argued in favour of planting more trees. A third of the participants considered Accra's public trees to be in 'a bad state', mainly because they were not pruned or otherwise maintained. Only one respondent thought that the city authorities do not allow unregulated tree cutting and ensured regular pruning. Forty-nine respondents did not think that the city authorities took good care of public trees (35 'yes', 14 'don't know', 2 non-responses), identifying poor maintenance and cutting without replacement planting as a significant problem. In a position of influence, several people would enact tree protection laws and enforce them. Out of the 64 tree-less households, 42 said they would like to own trees, primarily for shade, fruits, and beautification, the same reasons for which questionnaire respondents would also want more trees to be planted on public land.

## 5.4 From SWOT to Themes

Comparing, contrasting, and relating these stakeholder views allows identifying 'themes' or "patterns of *shared meaning* underpinned or united by a core concept" (Braun and Clarke, 2019, p. 593, their emphasis). Thus examining the above interview responses, I identified two main themes, one with two sub-themes, all of which are "produced at the intersection of the researcher's theoretical assumptions, their analytic resources and skill, and the data themselves" (Braun and Clarke, 2019, p. 594). Taken together, they offer creative and interpretive stories about the dataset in question. Unlike the SWOT table above, the following analysis is based on how I interpreted the available data (the second type of SWOTs), which I distinguish from the strengths, weaknesses, opportunities and threats directly and explicitly stated by the interviewees.

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<sup>11</sup> As these were responses in a questionnaire, no follow-up questions could be asked as to the types of animals or the source of unpleasant scent.

## **5.4.1 Theme 1 – The Little That We Have, the Lot That We Have to Do**

### *5.4.1.1 The Little That We Have...*

Interviewees commonly discussed resources – or their lack or absence – identifying their availability as a strength and, in turn, their lack as a weakness. Resources mentioned included monetary funds, personnel (both its quantity and quality), as well as equipment and material/supplies. In most cases, participants explicitly identified these resources as absent or unavailable in the required amounts or conditions. The DPG interviewee, for instance, stated that “staff are ageing and there is urgent need to replace them or to inject young people who have physical strength” (Mr Awidi, DPG). In addition to these direct statements, respondents provided information that I interpreted as either positive or negative, despite not specifically mentioned as such by the interviewee. This includes text passages like the following:

Researcher:           How many members do you have at the moment?

Respondent 1:        About twenty.

Researcher:           Twenty, and how many did you start with?

Respondent 1:        Erm, we were fortunate to have most of the guys turn up day one.

(Interview Y4GG)

While the respondent considered it positive to have started with 20 members/volunteers, my interpretation differed. I considered a constant number of volunteers and the associated inability to mobilise more people, a weakness as they explicitly stated requiring further individuals to support their work and future tree planting activities. Besides the more apparent resources like money and workforce, I identified other inputs which determine urban forestry dynamics in Accra. These resources include connections to other stakeholders, time, or visibility/presence, among others. Below, I provide interview text passages to offer examples and to illustrate my coding approach

(Table 24). The chosen text excerpts reflect how crucial resources are, especially for NGOs, and illustrate how each stakeholder works with a particular set of inputs. Through the process of resource management within each organisation or by each individual, these inputs lead to certain outputs. Here, outputs refer to the urban forestry-related plans and actions that each stakeholder designs or implements to achieve their desired overall objectives. The interviewees, both government and non-government bodies alike, shared the sentiment that resources were generally inadequate to accomplish their respective goals.

**Table 24 Interview text examples for different types of resources**

<b>Resource Type</b>	<b>Text Examples from Interviews</b>
Connections	<p>“so we made it a serious issue, we ran a campaign, we took a lot of photos, we gave it to the media, the media ran a lot of stories, and I think it ceased”</p> <p>(Mr Commey, GYEM)</p>
Time	<p>“For instance, the public-private partnership policy takes a long process.”</p> <p>(Mr Awidi, DPG)</p>
Trustworthiness/ credibility/ legitimacy	<p>“we had a lot of people who disagreed with us because they thought the government was going to do something good because the government’s idea looks good on paper and our idea sounded, sounded very radically [radical], okay?”</p> <p>(Mr Commey, GYEM)</p>
Visibility/ presence	<p>“So we operate from home as of now. But we believe that if we should have an office in town that can also help a lot because like operating from home, a lot of people have not even heard about us.”</p> <p>(Interview Y4GG)</p>
Perseverance/ vision	<p>“But, you know, once we have given ourselves to this, we will keep fighting till one day our dreams become a reality, yeah, so that is it, we will not give up.”</p> <p>(Interview Y4GG)</p>

In many places around the world, a lack of available inputs, especially finance and adequate staffing, threaten sustainable urban forest planning and management. Insufficient budgets hinder urban forestry in European countries (Konijnendijk, 2003) and in Portland (USA)(Driscoll *et al.*, 2015). In Mississippi (Grado *et al.*, 2006) and Pennsylvania (Elmendorf *et al.*, 2003), a lack of financial resources and staffing prevent successful urban forestry. Researchers identified similar problems in New Zealand (Stobbert and Johnston, 2012) and in South Africa, where, in addition to money and staff, equipment was also lacking (Gwedla and Shackleton, 2015). In Kumasi, insufficient funding also threatens the sustainability of urban green spaces (Mensah *et al.*, 2017). Not only do widely dispersed cities share these problems, but researchers have commented on them for a long time (Johnson, 1982). Increasing budgets for the necessary activities, workforce, and equipment could solve these problems. However, as these issues seem common through time and across space, it might be useful to consider if this discrepancy between actual and required inputs constitutes a symptom of another underlying phenomenon.

I suggest that the resource issue has two components: availability and accessibility. While availability determines the general ‘pot’ from which actors may draw, interviewees from government bodies indicated how accessibility is a more determining factor. The Department of Parks and Gardens is, according to its own view and that of other stakeholders, extremely underfunded. For each financial period, DPG forwards its budget estimate to its parent ministry, which then decides on the actual monetary allocation. Thus, while the ministry has a certain budget available, DPG cannot necessarily access enough of this to meet its needs in full. The DPG interviewee describes the reason as follows:

Respondent:                    So if you take the budget, you look at the sectors and their allocations, and we happen to fall under a Ministry that has to deal with district assemblies. Their major



challenge is how to deal with sanitation. Okay, so chunk of their budget [...] is trying to put sanitation measures into place.

(Mr Awidi, DPG)

While there is, theoretically, more money available, the party that decides on how to allocate resources has an order of priorities which puts sanitation measures above trees and green spaces in Accra. The reason for this is also explained by the interviewee:

Respondent: Because [...] what are the immediate returns they are going to get? If somebody picks a container full of rubbish, you can see it. Okay, or if there should be a public place of say convenience built for the people within a certain community, that one, the benefits are there and immediately you can see. But if you say you want to spend so much on planting trees which nobody is really going to benefit from it now, (I mean) the effect, long-term is what we are looking at.

(Mr Awidi, DPG)

Tree planting and care do not offer immediately visible benefits, lessening their attractiveness for decision-makers who prefer concrete evidence of their work. Influential individuals and groups often determine the accessibility of tangible resources like equipment or money. Additionally, they also design the processes and related legal requirements which others need to follow to obtain these resources. One NGO stated how they had to go through a very time-consuming series of actions to obtain a tree planting permit, unable to speed up the process as they could not in-

fluence the pace of government decision-making. Thus, as a result of their dependence, they had to invest an increased amount of the resource 'time' necessary for the successful pursuit of the organisation's urban forest/try goals.

Establishing vertical ties with those who can, directly and indirectly, affect resource allocation may be crucial to increasing one's efficiency. Interviewees in Accra identified political support or, more generally, the backing of powerful individuals and groups, as indispensable to successful urban forestry work, a factor also recognised in other studies (Elmendorf *et al.*, 2003; Driscoll *et al.*, 2015). However, those in dependent positions in such relationships also often fear aligning themselves too closely with the personnel, policy and other intervention priorities of a governing party to avoid being perceived as biased in the event of a change of government. The NGO Y4GG specifically stated that they wanted to stay 'politically neutral':

Respondent:            So we don't want to even touch, you know, it [politics] in some way. We want to be neutral as much as possible because it was not in the era of this government that this NGO was set up. It was in the previous government. So we don't want some political [something political/some politician] to block our way. So anything that is political related, we actually not touch it or talk about it.

(Interview Y4GG)

For similar reasons, FC declined my request for an interview to discuss Achimota Forest/Eco-Park, and other respondents, such as the individual from the government's research organisation FORIG, were reluctant to comment on specific questions which they felt were too political:

Researcher: So there is this Kumasi Urban Forestry Project. Do you know anything about this?

Respondent: I don't wanna talk too much because there is a lot of politics.

[...]

Respondent: There is a lot of politics in it, and I wouldn't want to commit to any political issues, but yes, there is an urban forestry project in Kumasi.

(Researcher, FORIG)

In Accra, some interviewees tried to overcome the potential drawbacks of existing vertical ties by establishing (more) horizontal substitutes to promote interactions of greater interdependence rather than debilitating dependence. Both DPG and TCPD commented negatively on the public sector freeze on employment, a requirement for IMF assistance. Despite a large pool of well-trained and employable individuals, they could not hire the needed personnel. DPG tries to compensate for the lack of personnel, funding and equipment by establishing links with embassies, collaborating with the Youth Employment Agency (YEA), and trying to initiate public-private partnerships. While some of these interactions are less hierarchical than budget allocations between departments and their respective ministry, and ultimately the government, these relationships are still a response to, or requirement of, the political and policy context. They allow access to alternative sources of funding, personnel or expertise and can potentially increase a department's capability and efficiency. However, there remains the need for caution, given how even the seemingly more horizontal of such ties can be affected by unequal power relations, as the respondent from DPG reminds us:

Respondent: For instance, the public-private partnership policy takes a long process. So first, you need to identify a particular project, then when the project is identified, you have to register the project with the Ministry of Finance, the unit that is responsible for that [...]. You have a unit that also analyses the detailed report that you have sent and see whether what you are asking for is feasible. If it's not feasible, then they will look for alternatives.

(Mr Awidi, DPG)

Stakeholders who directly use tree products in their work, such as the herbalist or coconut seller, seemed unconcerned regarding the ongoing availability of and accessibility to these items. They would simply replace the tree products currently acquired within the city with those from rural areas where plentiful supplies remain, and the bulk of their products already originate from. Thus, while they consider sourcing some inputs from the city convenient, saving travel time and money, these supplies constitute an occasional option to be capitalised on when possible. While ‘The little that we have’ is most evident in the presence or absence of physical, human, or financial assets, it is ultimately only the visible manifestation of the underlying structures and processes which mediate access to such assets in the first place.

#### *5.4.1.2 ...the Lot That We Have to Do*

The theme's second part has two further components. The first concerns stakeholder specific, internal views ('What matters?'), while the second ('134 shades of stakeholder interactions') illustrates what happens where different parties interact or, indeed, do not interact. The unequally distributed power prevents a situation where each stakeholder has access to the required money,

personnel, and equipment to meet their objectives. However, this resource scarcity is often artificially created (e.g. by budget allocations), favouring the work of those who can affect resource distribution and may do so for their own benefit or in the pursuit of their specific priorities. As priorities concerning urban forest management differ between stakeholders, there is no agreement on what actually should be achieved with the available resources. Thus the views and objectives of comparatively resource-richer groups/individuals and those in decision-making positions are likely to dominate. This lack of between-stakeholder agreement on urban forestry aims creates a situation in which ‘the lot that we have to do’ is not a single goal pursued by all. Instead, a range of priorities and objectives exist, with those backed by more resources and ultimately more powerful individuals and groups, more likely to actually be achieved. The following two sub-themes consider these issues in more detail.

#### *5.4.1.2.1 Sub-Theme 1 – What Matters? On Views, Objectives, and Priorities*

As part of each interview, I asked the respondents to provide a summary of their tree-related tasks and objectives. The answers show a general agreement on the premise that it is desirable to plant, maintain, and protect trees in Accra and that the many benefits provided by the urban forest justify its establishment and management:

Respondent: As a youth-based non-profit organisation, we are into giving back to Mother Earth. You know, we believe that we have received so much, and it is time for us to give back. [...] So our mission actually is to become an indomitable environmental conservative force in Africa and the world at large. [...] They are cutting our trees down, things are going so bad in this society, when there is rain there is flood here and there. So which organisation

is there on the ground that can help us to prevent or stop all these things? So that is what we stand for.

(Interview Y4GG)

Respondent: Our task is to lead in the conservation of biological diversity and to support efforts to improve human habitation. So, conserving biological diversity, you have urban biodiversity, and one of the prominent things you see is the trees. Yeah, the trees provide significant part of the habitat for urban biodiversity. So apart from providing habitat for biodiversity, it has other direct and indirect benefits for human settlement. So, what we do is to try to manage the urban tree cover within Accra.

(Mr Fiati, EPA)

Respondent: [Y]ou know, trees have environmental purpose, so they are very good to have. We encourage tree planting.

(Mr Sampson, Ayawaso Central)

While they superficially agree on the value of urban trees, a more detailed analysis of implicit and explicit stakeholder views suggest differing opinions as to the trees' role and how they should be planned, used and managed. The following excerpts illustrate some of these conflicting opinions between different stakeholders as even when they agree about the overarching objective, there can be considerable disagreement over how to achieve the objective(s) in question:

Respondent: And the second one had to do with Achimota Forest. We heard that the government of Ghana wanted to do an Eco-Park. We didn't understand what that was, but we need the

Achimota Forest, it was the only greenbelt in Accra, and we wanted the integrity of that to be preserved.

(Mr Commey, GYEM)

Respondent: Yeah, they [Forestry Commission] are saying about it, but what is Eco-Park? Eco-Park for what?

(Mr Yeboah, TCPD)

These two respondents disagree with FC's plans to turn Achimota Forest into the Accra Eco-Park. The Forestry Commission, in turn, considers the development necessary to protect the remaining forest from further gradual but steady encroachment. While all parties aim to preserve the forest area, their views on how best to achieve this diverge. GYEM, TCPD and FC, however, are not the only involved stakeholders, but others feel ill-informed, like the interviewed pastor. He stated that FC did not inform his or any other prayer group, let alone consult them, about the proposed development of which they became aware when a billboard was put up on the site and information broadcast over the radio. He expects FC to plant more trees, which he supports, but also worries that the Commission will deny religious groups access to the new Eco-Park. Thus, instead of considering urban forestry to be a city-level and city-wide endeavour, it consists of many urban forest 'producers', aiming to create a structure that best meets their needs and requirements. This situation is summarised by Mincey *et al.* (2013, p. 561) as the "multifaceted matrix of property rights and management strategies subject to a myriad of actors and their associated governance regimes".

Arguing that stakeholder priorities differ may seem obvious yet important for two reasons. First, stakeholders at the national to international scale seem to agree on the importance of global sustainability. For this objective, (city) green constitutes a vital component for its ability to mitigate

some of the adverse effects of climate change – such as reducing air pollution, storing carbon, decreasing water runoff or reducing ambient temperatures – thereby helping to produce more ‘resilient’ cities (see Section 7.2.4). Such a scalar focus, however, renders invisible the many other benefits which urban trees produce at smaller scales, primarily concerned with household (re)production and individuals’ livelihood strategies. Second, the concept of ‘sustainability’, regardless of scale, is broad, including not just an environmental component but also an economic and social one. The term on its own is, therefore, too unspecific to deduce concrete urban forest planning and management actions, with priorities and paths to reach related goals being actor-specific rather than generalisable. The conflict of scales and priorities then creates a complex system involving numerous actors/stakeholders who follow potentially conflicting strategies both at different stages of the planning and management process and for various land ownership types. Taken together, there are myriad spaces of interaction or possible interaction where these stakeholders disagree, can or should collaborate, or monopolise these spaces.

#### *5.4.1.2.2 Sub-Theme 2 – 134 Shades of Stakeholder Interactions*

Trees in cities are purposefully planted and managed for several reasons. To achieve these objectives, “there needs to be an effective and integrated working relationship across public, private, voluntary and community sectors” (Jones *et al.*, 2005 p. 187). But how can this relationship look like if producers prioritise different uses and operate at various scales while the urban forest transcends the boundary between the public and private domains? In addition, insufficient resources, limited political support, and a lack of interagency or between-stakeholder interaction all explain limited urban forestry success in Ghana and elsewhere. Indeed, better communication and increased cooperation are desirable for and indispensable to positive outcomes (Stobbart and Johnston, 2012; Mensah *et al.*, 2017). Coordination and collaboration, “the collective actions of individuals” (Mincey *et al.*, 2013, p. 555), ensure an urban forest’s robustness and constitute core



elements of approaches and frameworks that have been applied to urban forest management (Lawrence *et al.*, 2013; Mincey *et al.*, 2013; Leff, 2016). These relationships happen within a complex and diversified context of varied stakeholders and resources, contrasting views and priorities, and policies and power relationships which together mediate outcomes. In Accra, several interviewees felt that stakeholder interaction was inadequate:

Respondent:            Yeah, so from Town and Country, I think they have been practising urban forestry, and that tells you the situation, right. That there was never any integration, and that's why maybe Forestry Commission is not even taking part because they haven't been involved [...].

(Researcher, FORIG)

Respondent:            Yes, areas that we think have less canopy, certainly we, once we demonstrate to the public that these are the benefits from the study, the public should be able to cooperate to improve the canopy.

(Mr Fiati, EPA)

Researcher:            Do you feel well informed about what is expected of you in terms of work around trees?

Respondent:            It is not so much. Information on trees are not so much.

(Environmental Health Officer, Ayawaso East)

While this view dominated, some individuals (and the groups they represent) felt adequately informed about current developments and their role in urban forestry:

Researcher: Do you think that you have all the information necessary?  
Do they tell you everything that you need to know for you  
to be able to do your work?

Respondent: Oh, yeah, yeah, yeah.

(Mr Sampson, Ayawaso Central)

However, this last sentiment was voiced by the same interviewee, who was also unaware of the need for individuals to obtain pruning permits for trees on their private land. Though he might feel well informed, the available information suggests otherwise, further supported by his statement that Ayawaso Central used to receive seedlings from the government until about ten years ago but could not provide information on why this had ceased.

Some interviewees explicitly stated that improving working relationships between government departments, consisting e.g. of the exchange of ideas or actual collaboration, would be beneficial and indeed central to sustainable urban forestry in the city:

Respondent: [...] but under the decentralisation programme, we are supposed to merge with Parks and Gardens, but that one has not been materialised. We are still battling with it. [...] But maybe as time goes on, this thing, we will be able to realise, and Parks and Gardens will be part of the Physical Planning Department.

Researcher: Do you think that would be a good thing?

Respondent: I think that will be a very good thing, that will be a very good thing. You prepare the schemes, you earmark a place for greenery. Which department is responsible for that? Parks and Gardens. So that they do it along with

the scheme that we have prepared, and if they are somewhere, you do your thing, and they also do their own thing and then it becomes very fragmented.

(Mr Yeboah, TCPD)

In Accra, the lack of coordination creates various outcomes. Thus crucial information either passes through a long and resource-consuming chain of command or nowhere at all, with sub-metropolitan assemblies, for example, receiving information through their head offices rather than from DPG directly. Alternatively, incorrect information is disseminated (Ayawaso East sending people to DPG for permits when the responsibility lies with EPA), efforts potentially duplicated (educational campaigns by EPA and DPG), or conflicting advice given (EPA stating the need for a pruning permit while Ayawaso Central is unaware of this rule and encourages the sub-metropolitan residents to prune their trees). Each of these situations reduces efficiency and the chance of producing an ‘overall’ urban forest that can provide varied benefits at different scales. I, therefore, suggest considering the nodes of interaction in more detail, as stakeholders/actors and their varied interests and aspirations meet at these locations. As a starting point, I discuss the sizeable number and range of terms that interviewees used to describe interactions or their lack (Table 25, see Appendix 10 for complete list).

**Table 25 Examples of phrases used to describe interactions or their lack**

<b>Phrases</b>
to (not) comply with something
to (not) be part of something
to (not) encourage someone to do something
to (not) control someone/something
to (not) work closely with someone

to (not) educate someone
to (not) channel your ideas into someone else's work
to (not) correct the attitude of someone
to (not) have your work undone

I identified a total of 134 terms and purposefully selected the above examples to discuss three points: first, these phrases are often ill-defined; second, they contain ‘action directions’; and, third, imply different levels of ‘coercive strength’. Interviewees talked about stakeholder interaction at various management stages but often used vague words, which did not offer concrete guidance on what precisely is expected of either stakeholder partnerships or partners. While sub-metropolitan officers stated that it was their job to ‘encourage’ tree planting by the general public, this consisted mainly of environmental health officers talking to people about tree benefits, wherever and whenever seemed appropriate. As only one of many similar examples, these ambiguous terms allow for multiple interpretations or even one of insignificance that may result in these activities being disregarded altogether, with actors focusing on more explicitly stated (job) requirements.

In Accra, official documentation such as an urban forest management plan, which defines actor/stakeholder rights and responsibilities in unambiguous terms, remains unavailable. Instead, especially EPA and TCPD have apparently misclassified the role and position of the admittedly heterogeneous stakeholder group ‘the public’. My analysis suggests that these agencies consider the city inhabitants, specifically the sub-group residing in sparsely greened areas, as (secondary) ‘observers’ or tertiary stakeholders only, rather than as primary, contributing ones. While secondary stakeholders’ “acceptance or compliance is required to sustain the activity”, tertiary ones only “use the output of the activity” (McGrath and Whitty, 2017, p. 732). If planning and management

are based on such a (mis)classification, even if just implicit or subconscious, urban forestry unlikely produces varied benefits and simultaneously runs the risk of increasing social injustices.

The selected terms also highlight how ‘direction’ and ‘coercive strength’ of interaction combine and relate. During the coding process, I noticed how actor relationships fall into three types: partner and cooperate; advise, support and assist; as well as instruct and inform. ‘Instruct and inform’ consists of a one-directional flow of information, or directive for action, with limited to no further interaction between stakeholders. Here, the sending actor already decided on a course of action which the receiver is expected to execute, perform, or simply take notice of (and potentially incorporate into future actions). The level of ‘coercive strength’ varies from low to high, as sub-metropolitan officers might just highlight the trees’ benefits which justify their planting or instruct tree owners to prune overgrown trees on threat of prosecution for failure to comply. As with ‘instruct and inform’, stakeholder interactions of the ‘advise, support or assistance’ kind are uni-directional, with knowledge or some other resource being transferred from one stakeholder to the other one. However, the receiving partner also benefits from whatever resource is transferred. In this scenario, the donor has no further involvement following the transfer, which is thus characterised by little or no ‘coercive strength’. The third type, ‘partner and cooperate’, concerns interactions where at least two stakeholders work jointly to pursue a shared objective, with each actor both contributing to and benefitting from the exchange. Also, as stakeholders often collaborate at different stages of the management process, this interaction tends to be longer-lived than the other types. As partners share a vision characterised by common priorities and approaches, ‘coercive strength’ should be minimal at most.

Dissecting stakeholder interactions draws attention to the various components that can affect these exchanges’ outcomes. Each stakeholder enters the interaction with their specific background of resources, views, and priorities, i.e. the expected or wanted outcome. The power they

have to affect results varies; while some can draw on laws (e.g. EPA), others rely on creating their legitimacy in other ways, e.g. through producing a situation in which they draw on morality (e.g. GYEM). Also, as some interactions may exist over more extended periods as stable partnerships, I suggest that their context reflects their gradual evolution over time. Overall, and taken together, interactions shape urban forest planning and management in Accra and, by extension, the urban forest's structure and benefits while also impacting forest users and their livelihoods. Nonetheless, these interaction spaces require further examination, given that their functioning and dynamics are central to a proper understanding of the strengths, weaknesses, opportunities and threats of and to urban forestry in Accra.

To ensure that my analysis was based on these SWOTs, I used a versus-coding approach which highlighted the importance of two types of interaction spaces: 'empty' and 'colonised'. These spaces most likely emerge or might indeed only become visible from a non-neutral position that explicitly considers justice and equity as a desirable urban forestry outcome and input. An interaction space remains 'empty' when there is no or only one stakeholder present who needs and/or wants to interact with others. While the NGO Y4GG wanted to work with another NGO, they could not find a suitable partner. Often, spaces remain 'empty' when groups or individuals are not recognised as stakeholders either due to oversight or because their influence and/or importance are (falsely) judged as low. In 'colonised' spaces, interactions should take place, but a powerful stakeholder prevents others from entering the node, thereby eliminating the space and assuming decision-making power for themselves. The Forestry Commission not consulting the prayer groups about the Eco-Park plans constitutes an example of a 'colonised' space. As the interviewed pastor asked: "Who are we? If Forestry Commission decides to do something, then we have no power to do anything about it" (Interview Achimota visitor/pastor). In all instances, analysing how power dynamics create a node and determine the rules of engagement therein is central, an argument also made in participation research (Cornwall, 2002).

### **5.4.2 Theme 2 – The Long Road from Awareness to Action**

In this section, I outline why some interaction spaces in Accra's urban forestry remain 'empty' or are 'colonised'. To do so, I use a model common in marketing research that belongs to the 'hierarchy of effects' models, describing how a (potential) customer passes through several steps before eventually purchasing a product. I decided to use this model when I analysed interview transcripts and noticed some frequently used words. The earliest examples of such models appeared at the beginning of the 20<sup>th</sup> century, theorising that "salespeople had to attract attention, maintain interest, and create a desire to be successful" (Barry, 1987, p. 252). This original Attention, Interest, Desire, Action model has since been modified and developed further, with authors adding steps or replacing them (Barry, 1987). In 1961, Lavidge and Steiner initiated what Barry terms the 'modern development phase' of these models, proposing six steps: awareness, knowledge, liking, preference, conviction, purchase. They further relate their six steps to three major functions of advertising and behaviour (Table 26). These distinctions are "more than a semantic issue, because the actions that need to be taken to stimulate or channel motivation may be quite different from those that produce knowledge. And these, in turn, may differ from actions designed to produce favorable attitudes toward something" (Lavidge and Steiner, 1961, p. 60-61).

Table 26 People's possible positions regarding the purchase of a product or service

Lavidge and Steiner's Steps	Functions of Advertising	Dimensions of Behaviour
1. "Near the bottom of the steps stand potential purchasers who are completely <i>unaware of the existence</i> of the product or service in question."	/	/
2. "Closer to purchasing, but still a long way from the cash register, are those who are merely <i>aware of its existence</i> ."	Information or ideas about the product	Cognitive (intellectual, mental, rational state)
3. "Up a step are prospects who <i>know what the product has to offer</i> ."		
4. "Still closer to purchasing are those who have favorable attitudes toward the product – those who <i>like the product</i> ."	Create favourable attitudes or feelings towards the product	Affective (feeling or emotional state)
5. "Those whose favorable attitudes have developed to the point of <i>preference</i> over all other possibilities are up still another step."		
6. "Even closer to purchasing are consumers who couple preference with a desire to buy and the <i>conviction</i> that the purchase would be wise."	Produce action	Conation (striving or behavioural states)
7. "Finally, of course, is the step which translates this attitude into actual <i>purchase</i> ."		

According to Lavidge and Steiner (1961, p. 59, their emphasise)



In the case of urban forestry, the ultimate objective is not for another party to purchase a product but to figuratively buy into a 'product' or proposed action or strategy. This may include supporting an NGO's work (with the organisation and its work as the product), not encroaching on land demarcated for greenery in planning schemes, or applying for a permit before felling a tree. The keywords that make this model relevant revolve around awareness, knowledge, interest and preference, which, as the excerpts below show, interviewees used in several instances. Though they sometimes mentioned these words directly and explicitly, sometimes I had to interpret the text passages and their context before they became pertinent:

Respondent: Oh, cool! Cool, cool, cool. Dansoman [neighbourhood of Accra], we wanna make Dansoman greener, that's what we want. So right now, er, anybody who wanna come on board and support us to give that kind of face to Dansoman is welcome, is welcome.

(Interview Y4GG)

Researcher: So there are a lot of these plans? Plans like this with green space and trees?

Respondent: [...] The whole place is supposed to be a green area, see the green? Green, green, green, it's supposed to be a green area, see the football pits? Yes, it's supposed to be green, the whole area is green area, the green is taking about eighty per cent of it. But you go there now, and it's a different, a completely different thing. So it tells you the difference between the implementation and the scheme. We prepared the scheme all right.

(Mr Yeboah, TCPD)

Researcher: So from your experience, people in neighbourhoods or parts of the city with more trees are more likely to care about them and protect them?

Respondent: Yes. Exactly. Exactly, exactly. So, middle-class are more likely to take care of the trees and value the trees, the lower class not so much. Yes, particularly in depressed communities, the most important thing is to have your shelter and the space. For them, space is so critical, and so you see buildings flock together: Nima, Mamobi, but as you move out you begin to see trees, of course, you find some avenue trees along the streets, yes, you can find some, but within the community, in the yards, the density is quite low.

(Mr Fiati, EPA)

In these examples, one can identify desired results (the ‘purchases’) such as ‘take care of the trees and value the trees’, or, respectively, the absence of these (‘But you go there now and it’s a different, a completely different thing’). Additionally, some terms refer to (the absence of) interest (‘anybody who wanna come on board’) or liking/preference (‘the most important thing is to have your shelter’). Applying this model to urban forestry, we then have a range of ‘vendors’ (such as government departments or NGOs) who try to ‘sell’ their ‘products’ to other actors and stakeholders. If the ‘vendor’ correctly identifies the current positions of the potential ‘customers’, activities and initiatives can be tailored to move them up the steps towards purchase. However, and I suggest this is common in urban forestry in Accra, if ‘vendors’ misclassify ‘customers’ regarding their current position, the former may waste resources or create interaction spaces, which remain ‘empty’ or end up being ‘colonised’. As an example, I use the very generic ‘maintaining trees for their benefits’ as an end purchase which government bodies like EPA, TCPD and DPG want the

general public to buy into (Table 27). The text passages illustrate at which steps various actors believe the general public, or a sub-group of it, to be currently located at.

**Table 27 Hierarchy of effects model with an urban forestry example**

Steps	Interview Excerpts
<b>Awareness</b>	"[B]ut the awareness creation is ongoing. We have some flyers that we have prepared that we issue out to educate people about the importance of trees."
↓	(Mr Fiati, EPA)
<b>Knowledge</b>	"[...] those who are not aware we are making effort to sensitise them."
↓	(Mr Awidi, DPG)
<b>Liking</b>	"Now speaking and researching and working in the setting, I realised that what people really care about is their socio-economic status, like how they can make ends meet. If they are not able to do that, other issues hardly strike them, you know, like they hadn't taken notice of other issues when they haven't been able to feed themselves, haven't been able to take care of their children."
↓	(Mr Commey, GYEM)
<b>Preference</b>	"The other day somebody, we were going down this way around Dzorwulu, and somebody was like 'you know, some time ago this whole area used to be bush and now the area is so beautiful, nice buildings'. They say 'wow, it's beautiful' and I say 'yes, but nice buildings without vegetation doesn't make it beautiful'. But anyway, that's it."
↓	(Researcher, FORIG)
<b>Conviction</b>	
↓	
<b>'Purchase'</b>	<b>Maintain trees for their benefits and services</b>

Some interviewees, especially from government departments, located a large proportion of the general public in the first stages, suggesting that people need to be educated and informed on ur-

ban trees and forests. The interviewee from EPA discussed how his department, together with the Environmental Education department, was preparing flyers as part of an education campaign. Such campaigns may have the desired effect if people are indeed unaware or uninformed. However, they unlikely produce positive results if other stakeholders, like the diverse ‘general public’, simply prioritise differently and focus on feeding their families or paying their children’s school fees, as suggested by the interviewee from an NGO (Mr Commey, GYEM).

Comparing stakeholder interviews with the household survey reveals an intriguing situation in Accra: the survey (and household case study) suggests the general public to be aware and well-informed on urban tree benefits, which explicitly includes residents of high-density and less green areas. Another recent study investigated ‘slum’ residents’ perceptions of urban green spaces in Nima (and Agbogbloshie) and corroborated my findings, concluding that “results from the household survey show respondents demonstrated a reasonable understanding of green spaces and their importance” (Cobbinah *et al.*, 2021, p. 6). Yet, many government bodies seem to focus on flyer campaigns or one to one conversations to ‘educate’ and ‘sensitise’ the city’s residents on the merits of urban forests. The disparity between actual stakeholder position within the hierarchy of effects model and assumed position as seen by the ‘vendors’, likely reduces the latter’s ability to sell their ‘product’ with potentially negative effects on sustainable urban forestry.

Not all public actors/stakeholders, however, support this view of the widespread need for further educating the city’s inhabitants:

Researcher:            So when you talk to people about trees, do you feel that they are aware of the benefits of trees?

Respondent:           Yes.[...]Sometimes, when you ask some of them to even trim their trees, then they [don’t want to]. Medicinal purpos-

es and other things, yes, it's true, but it doesn't mean it should be overgrown.

(Mr Sampson, Ayawaso Central)

Researcher: And when you do that, do you feel that people are aware of the benefits of trees?

Respondent: Oh, people, those that we talk to, know very well that trees are great to plant.

Researcher: So people are not resistant to listening to you talking about tree benefits?

Respondent: No, no, no, no, no.

(Environmental Health Officer, Ayawaso East)

My household survey, which elicited the public's views on urban trees and their functions on public and private lands (see Section 3.3.2), reflects the experiences of these two sub-metropolitan officers. Right at the beginning of the questionnaire, and before the following questions would suggest any possible answers, I asked survey participants to list urban tree benefits. Every household could name at least one benefit, with many people listing significantly more, on average three. Furthermore, people were also aware of maintenance activities and some even of the more common laws and rules surrounding urban forestry.

Why, despite evidence to the contrary, does this narrative of the unaware and unknowledgeable public prevail with activities of government organisations primarily tailored at educating and sensitising people? My data suggests three possible explanations. First, it might be an innocent oversight, potentially due to a lack of data, which creates 'empty' or 'colonised' interaction spaces as

the city's population remains unacknowledged as a potential partner. Second, educating the public could be a makeshift solution as most government departments lamented the lack of resources. Flyer campaigns and other sensitisation campaigns offer a comparatively cheap option to give the appearance of activity and involvement and might receive less (overt) resistance than more extensive interference in people's lives. Furthermore, government employees themselves are not generally able to affect the available budget and might feel disempowered, lacking financial means for alternative approaches. However, a third explanation involves power dynamics and the ability to create and enact the rules which generate and shape interaction spaces. When the general public is constructed as ignorant, there is little or no justification for recognising this stakeholder as a legitimate potential interaction partner, except as one in need of edification via the simple remedy of flyers and other forms of public 'education'.

Should actors like EPA, TCPD or DPG acknowledge that private individuals' decisions result from other priorities rather than reflecting unawareness, colonising supposed spaces of interaction would be morally less defensible. These decisions include both the direct and active participation in tree-related activities as well as seemingly unrelated actions which, however, 'replace' the former (e.g. using resources to obtain money to pay school fees rather than planting trees). Ultimately, individuals compare their options' opportunity costs and potential benefits. Especially resource-poor groups will more commonly decide against the tree-related option. It might be more useful, though, to re-frame this as not so much a decision **against** active tree care but as one **for** other activities with lower opportunity costs and more immediate benefits. Such an approach could start a constructive dialogue focused on devising strategies that incentivise residents' participation in urban forestry but requires engaging meaningfully with all stakeholders. It would, however, require acknowledging that decisions regarding tree management largely result from complex and dynamic structures and processes of socio-economic and environmental change. These processes have made living conditions and livelihood circumstances less secure for

many individuals who have to invest available resources first and foremost into meeting basic sustenance needs, rather than in urban tree care for the medium to long term, even though the two are not necessarily mutually exclusive.

Though I adopted and applied Lavidge and Steiner's model in response to the interview transcripts, it still leaves the question of whether the model is sensitive enough to the variety of behaviour this chapter tries to explain. For, as the text makes clear, even though all forest management institutional actors seek to convince Accra inhabitants to maintain and/or propagate trees, the specific interventions they promote to pursue this goal in the short term vary noticeably. While they share tree protection goals, the means and methods for achieving these differ. In Accra, the various forestry institutions encourage people to 'buy in' to slightly different options rather than simply acquiring 'end products'. The relative importance accorded to considerations like awareness, knowledge or motivation in such rankings might not necessarily correspond with their position in the model hierarchy. This is explained by the variety of activities being 'bought' and 'sold' and by their diversity which, in practice, means 'purchasing' decisions are not necessarily based on like-for-like comparisons.

Thus in promoting urban forest conservation, people are sometimes *actively encouraged* to maintain trees by undertaking particular tasks. At other times, to prevent damage to or threaten the survival of trees, they are *explicitly discouraged* from undertaking particular tasks, including tree felling. On yet other occasions, the requirement is for people to go beyond protecting and maintaining to *actually propagating* or *planting* seedlings. Similarly, encouraging a landowner to prune trees in their spacious private garden requires a different 'sales pitch' from that aimed at a squatter in their self-built shack needing to be 'nudged' into accepting the legal requirement to pay a fee for a permit. Its overall utility notwithstanding, Lavidge and Steiner's market model's capacity to cater for complex non-market considerations, including trade-offs and opportunity costs between different

forest management options and for different demographics and neighbourhoods, appears somewhat limited. Equally justifiably, one might argue that such a capability was incorporated into neither the model's initial design nor its original purpose. Either way, this could be a ready-made subject for future research.

## **5.5 Chapter Conclusion**

In this chapter, I introduced the organisational structure of Accra's urban forestry, outlining the roles and management objectives of various stakeholders. A SWOT analysis served as the starting point for considering tree-related planning and management in the city, showing how some problems are commonly experienced across various stakeholder groups (e.g. lack of resources). Other strengths, weaknesses, opportunities, and threats are unique or experienced more strongly by specific actor types. The chapter illustrated how formal and informal rules and mechanisms produce spaces of interaction, a key element through which one can try to understand the complexities of urban forest structure and its dynamics over time and across space. Additionally, these spaces also allow scrutiny of the management process and how to improve it both in Accra and elsewhere. If the government wants to increase people's involvement in tree planting and care, it needs to recognise that these activities are best understood as part of complex and dynamic individual and group livelihood calculations, including the use of private land and trees/shrubs as livelihood resources. Seen this way, multi-purpose urban forestry becomes integral to processes, which aim to diversify and thereby render urban livelihoods more sustainable.



## 6 URBAN TREES – URBAN LIVELIHOODS

“Menni adeε pɔtee ɛntia mani gye ɛndua ho, ɛye adeε a mani gye hoo kɛkɛ.”

“I just can’t say why I particularly like trees... I just like them.”

**John Yetsovodo (Household 2, Person 1)**

In this chapter, I discuss the various livelihood roles and functions of urban trees and their products. Rather than simply quantifying how trees contribute to urban livelihoods, the household case study elicits an in-depth understanding of human–tree interactions in urban settings. Among others, this includes information on why and how people use tree benefits and their choices regarding tree protection, propagation and maintenance. Centring city residents’ lived experiences, who are generally found at the receiving end of policies, laws and rules made by EPA, DPG or TCPD, it complements the previous chapter, which focused on government departments and NGOs. After introducing important concepts and their definitions, such as ‘urban’, ‘household’, and ‘livelihood’, I then discuss the Sustainable Livelihoods (SL) Approach. Subsequently, I focus on the four case study households, for which I provide a tabular overview for quick reference and more detailed, descriptive information. I then discuss two topics in more detail. First, I consider three different livelihood functions of urban trees, i.e. trees for subsistence use, as a source of cash income and in the production of social capital. Second, I discuss tree caring activities, such as propagation, fertilisation or pruning, both topics also offering insights into intra-household dynamics.

## 6.1 Urban Lives

Investigating urban trees' functions for city residents must commence with a definition of 'urban', a core component of both 'urban forestry' and 'urban lives and livelihoods'. However, different countries define 'urban' in varying ways, thereby complicating cross-country comparisons (Satterthwaite, 2010). In Ghana, localities with at least 5,000 inhabitants are officially defined as urban (Ghana Statistical Service, 2014b). Such a threshold is considered rather low and may be "less reliable to distinguish between 'rural' and 'urban' settlements *in an economic functional sense*" (Potts, 2018, p. 968, their emphasis). Thus Ghana's Statistical Service notes that "an area could easily attain the 5,000 threshold population to qualify as urban but still maintain its rural outlook based on the economic activities the residents may be engaged in" (Ghana Statistical Service, 2014b, p. 4). While the Statistical Service suggests reviewing the classification for future censuses, with several million inhabitants, these definitional changes will not affect Accra's classification as 'urban'.

Despite existing definitions, some researchers argue against viewing 'urban' and 'rural' as two distinct concepts (Wratten, 1995; Cohen, 2004; Potts, 2017). Wratten (1995, p. 20), for instance, argues that "[a] strong case can be made for treating the urban–rural divide as a continuum rather than as a rigid dichotomy. [...] The cut-off point for any such division is bound to be chosen arbitrarily". Migration, seasonal labour, or family support networks link rural and urban areas and "[i]ntervention in one part of the system will have a range of repercussions, affecting other parts of the 'same sector' as well the 'other sector' (Wratten, 1995, p. 20). The interviewee from the Department of Town and Country Planning also commented on these interdependencies, arguing that Accra's growth had changed peri-urban areas. In these places, the expanding city constrains crop cultivation and farmers are then "forced to come to the city to sell on the streets and the rest. So if we don't strategise very well, then we always have a compounded situation in Accra with respect to problems" (Mr Yeboah, TCPD). Various social, economic, ecological, and politi-

cal linkages, therefore, connect different settlement types and affect urban lives and livelihoods. However, some specific traits do distinguish cities from smaller, rural settlements, especially when looking at Accra, with a population significantly exceeding the definitional threshold.

Urban and rural areas may differ in some regards, but neither is homogeneous. While cities' average population densities exceed rural ones, some neighbourhoods may be well above and others well below this value. Similar spatial variation can exist for income, land use, and neighbourhood formality (Farrington *et al.*, 2002) or, as already seen, in terms of tree cover. Wratten (1995, p. 21) suggests that “[o]nce the city is studied as a series of interrelated but heterogeneous neighbourhoods or districts, the dichotomous categories of urban and rural become less relevant”. Instead, she proposes to use different categories to classify, and to illustrate, variation at sub-city level. In the case of Accra, its early development from Ga villages into seven city quarters (eleven when including Osu/Danish Accra/Christiansborg) preserved the areas' political, ethnic, and kinship-related fragmentation for some time (Parker, 2000). Additionally, the city's continuous expansion incorporated rural fringe areas into the growing town, and these places often retained some characteristic features of non-urban lands (Doan and Oduro, 2012; Gaisie *et al.*, 2019). Thus, when discussing urban lives, livelihoods, views on, and uses of urban trees, possible intra-city differences should be considered.

Regardless of sub-city variation, some settlement and lifestyle characteristics are more prevalent in cities than in the countryside. These often include certain types of modern infrastructure and facilities in the areas of education, health, energy or environmental services (Ghana Statistical Service, 2014b). However, housing costs, even in unplanned residential areas with limited access to these services, can account for a large proportion of household income, sometimes combined with insecure tenure. Furthermore, higher crime rates and social diversity and fragmentation can also characterise urban living (Wratten, 1995). Cities “attract rural migrants and refugees with dif-

ferent ethnic, cultural and linguistic origins”, thereby creating ‘heterogeneous melting pots’ (Wratten, 1995, p. 23). This diversity can create tensions and impersonal relationships as “[l]ifestyles, kinship and neighbourhood support networks are different from those in rural areas” (Wratten, 1995, p. 24). Additionally, more immediate contact with state agents and policies, which can be oppressive (Wratten, 1995; Beall and Fox, 2007), can make urban residency more demanding. Both these positive and negative features can affect people’s lives and livelihoods and the role of trees within.

## **6.2 Livelihoods – Urban Livelihoods – Sustainable Urban Livelihoods**

In the last three decades, much research and many policy, programme, and project interventions have targeted livelihoods (Small, 2007; Zhang *et al.*, 2019). While exact terms and definitions vary, a livelihood is a means to a living (Chambers and Conway, 1992; Scoones, 1998). People pursuing a livelihood utilise their tangible and intangible assets, sometimes also called livelihood capitals, which can take the form of stores, resources, claims or access to these. Types of capital (or asset categories) typically include natural, economic/financial, human, social, physical and political capital (Scoones, 1998; Krantz, 2001; Farrington *et al.*, 2002) on which people draw to make a livelihood. A ‘sustainable’ livelihood, in turn, can “cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation” (Chambers and Conway, 1992, p. 6). While Chambers and Conway add a further sustainability criterion, a livelihood contributing “net benefits to other livelihoods at the local and global levels and in the short and long term” (Chambers and Conway, 1992, p. 6), this is both difficult to assess and achieve (Scoones, 1998).

Two elements are central to sustainability. A livelihood can be *environmentally* sustainable “in its effects on local and global resources and other assets” and *socially* sustainable, i.e. “able to cope with

stress and shocks, and retain its ability to continue and improve” (Chambers and Conway, 1992, p. 9). While the first aspect evaluates a livelihood’s external impacts, the second one considers its internal capacity to cope with pressures from the outside (Chambers and Conway, 1992). Social sustainability can be either reactive or proactive and dynamic “in adapting to, exploiting and creating change, and in assuring continuity” (Chambers and Conway, 1992, p. 10). To cope with stresses and shocks, people employ different strategies, including stinting, hoarding, protecting, depleting, diversifying, claiming, and moving (Chambers and Conway, 1992). A diversified asset portfolio and response repertoire then allow households (or other study units) to “respond more effectively and with less loss” (Chambers and Conway, 1992, p. 11) to changing circumstances. Furthermore, external interventions, such as public actions (e.g. flood reduction), can also reduce livelihood vulnerability.

Most SL approaches use households as their unit of analysis, which can mask an individual’s labour or how resources, or access to them, differ within. As with ‘urban’, different definitions of what constitutes a household exist (Beaman and Dillon, 2012; OECD, 2013). Fundamentally, though, it is a (political) economic concept that “implies a domestic unit with decision-making autonomy about production and consumption” (Guyer, 1981, p. 89). However, decades of research in African countries have demonstrated the concept’s problem “of designating complex collectivities as units” (Guyer, 1981, p. 104) that jointly decide on resources and their allocation. In the 1980s, (rural) forestry and agroforestry research showed how “complex structures and processes were governing the gendered division and sharing of resources” (Rocheleau and Edmunds, 1997, p. 1352). Similar dynamics might also affect urban forestry, though ‘age’ or ‘interest’ could be further variables to consider in addition to ‘gender’. The Ghana census defines a household as “a person or group of related or unrelated persons who live together in the same housing unit, sharing the same housekeeping and cooking arrangements and are considered as one unit, who acknowledge an adult male or female as the head of the household” (Ghana Statis-

tical Service, 2014a, p. 4). While my household questionnaire aggregated at this level, I specifically focused on intra-household differences in the case study.

Although livelihood thinking initially developed in relation to rural society, economy and nature, researchers and practitioners also applied its insights to urban contexts. As the models are conceptually broad and context-specific (Farrington *et al.*, 2002), they can be adapted to reflect the different conditions in city environments. Thus, urban-focused versions of SL approaches (e.g. Moser 1998; Meikle *et al.*, 2001) highlight access to housing or the greater reliance on cash (Satterthwaite and Tacoli, 2002). The approach's strength lies in how it demonstrates that people employ different strategies – located within the political, social, economic, environmental, or legal context – to make a living. It illustrates that poverty is not just a problem of low income (Wratton, 1995) but rather requires a holistic view to understand what resources people draw on to construct and maintain a living. The following part, my household case study, now considers the roles of urban trees and their benefits within such a framework. Descriptive accounts of who does what, how, where and when are followed by an analysis of the trees' multiple livelihood functions, conflict and cooperation evolving around them as well as their network-creating potential.

### **6.3 Household Case Study**

A single older man, two nuclear families with smaller children, and a woman with her teenage and young adult sons living with her extended family, all of these households pursue a livelihood in Accra. Benefitting from the city's opportunities, they simultaneously find themselves largely dependent on cash and market exchanges, limited by land shortages, and potentially disconnected from the wider family and other social ties. To make a living, they draw on various capitals/assets, including their compounds' trees. However, not every individual participates in any or

all tree-related activities, either because other household members exclude them or simply because they lack interest. At certain times, they might cooperate and divide work along gender lines. At other times, some tasks, often the more cumbersome ones like picking up and disposing of leaves and branches, might be laid on younger children. These same children though, as teenagers and young adults, can become the sole responsible party for tree propagation and care, both grown out of an interest in the environment and economic considerations. Dynamics evolving around tree care and their benefits are not just limited by household affiliation but can extend to other family members, neighbours, friends and even strangers. Social interactions in the trees' shade or gifts, sales and exchanges of tree products create networks among city residents, sometimes with branches spreading to nearby peri-urban and rural areas.

The four selected households (HH) are located in Nima, Mamobi, and Kokomlemle, which received a very high (class 5), high (class 4), and low (class 2) poverty rating, respectively. However, a household's specific socio-economic conditions can differ significantly from these neighbourhood ratings. As the table below illustrates, the Mamobi household had a considerably higher PPI score than the Kokomlemle one (Table 28). The table also summarises information both on participants and their trees, while Appendix 11 provides further tree data, such as height, DBH, or crown spread. Besides describing each household, I also provide compound maps, which indicate locations of buildings, trees, and other relevant elements. I have attempted to balance detail with the need to protect participants' identities, as there was only one household where all members opted to have their names attached to their data (HH 2).

Table 28 Summary information on the four participating households

	Household 1	Household 2	Household 3	Household 4
<b>Area</b>	Nima	Mamobi	Nima	Kokomlemle
<b>PPI</b>	60	81	63	67
<b>Members</b>	<p>Person 1</p> <ul style="list-style-type: none"> <li>• Head of Household (HHH)</li> <li>• male</li> <li>• 65 to 70 years</li> <li>• born and raised in Accra</li> <li>• used to work as an electrical engineer, now retired</li> <li>• 2 children in their 20s who live outside Accra</li> </ul>	<p>Person 1 (John)</p> <ul style="list-style-type: none"> <li>• HHH</li> <li>• male</li> <li>• 40 to 45 years</li> <li>• electrical technician, sells water and coconuts, rents out accommodation</li> </ul> <p>Person 2 (Christine)</p> <ul style="list-style-type: none"> <li>• wife of HHH</li> <li>• 30 to 35 years</li> <li>• takes care of children and house duties</li> <li>• operated a grocery store before having children and plans to do so again when they are grown</li> </ul>	<p>Person 1</p> <ul style="list-style-type: none"> <li>• HHH</li> <li>• male</li> <li>• 35 to 40 years</li> </ul> <p>Person 2</p> <ul style="list-style-type: none"> <li>• Wife of HHH</li> <li>• 30 to 35 years</li> <li>• takes care of children and house duties</li> <li>• cleaning job once/week</li> <li>• other days fries and sells yam, also produces and sells bead articles</li> </ul> <p>Person 3, 4 and 5</p> <ul style="list-style-type: none"> <li>• children of person 1 and</li> </ul>	<p>Person 1</p> <ul style="list-style-type: none"> <li>• HHH</li> <li>• female</li> <li>• 45 to 50 years</li> <li>• sells beverages</li> <li>• cooks for the whole household in the evenings</li> </ul> <p>Person 2 and 3</p> <ul style="list-style-type: none"> <li>• children of person 1</li> <li>• 15 to 20 years</li> <li>• attend school and university</li> </ul> <p>Person 4</p> <ul style="list-style-type: none"> <li>• brother of person 1</li> </ul>

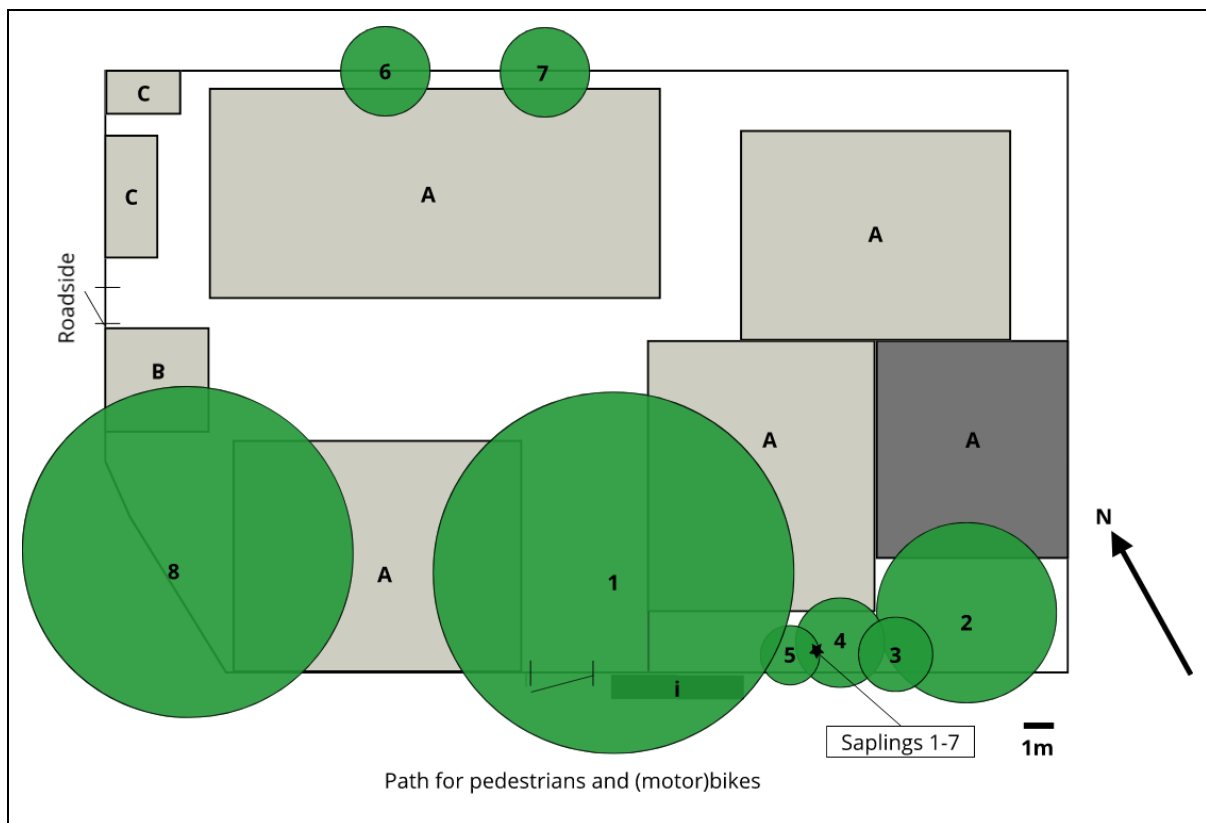


		<ul style="list-style-type: none"> <li>• sells water if husband is not around</li> </ul> <p>Person 3 and 4</p> <ul style="list-style-type: none"> <li>• children of person 1 and 2</li> <li>• under six and newborn</li> </ul>	<p>2</p> <ul style="list-style-type: none"> <li>• between 4 and 10 years</li> </ul>	<p>Person 5 and 6</p> <ul style="list-style-type: none"> <li>• sisters of person 1</li> <li>• own and sell in the shop next to the compound</li> </ul> <p>Person 7 and 8</p> <ul style="list-style-type: none"> <li>• children of person 6</li> <li>• under 5</li> </ul> <p>Person 9</p> <ul style="list-style-type: none"> <li>• mother of person 1, 4, 5, 6</li> <li>• 70 to 75 years</li> </ul>
<b>Living situation</b>	<ul style="list-style-type: none"> <li>• landlord of the compound</li> <li>• used to be father's land</li> <li>• mother lives in same compound</li> <li>• 7 other households in the compound</li> <li>• everybody in compound can take from trees</li> </ul>	<ul style="list-style-type: none"> <li>• person 1 is landlord of the compound</li> <li>• land originally bought by father when he retired from the military</li> <li>• 8 other households in compound</li> </ul>	<ul style="list-style-type: none"> <li>• live in compound where all people are part of extended family</li> <li>• everybody in compound can take from trees</li> </ul>	<ul style="list-style-type: none"> <li>• compound with mostly family members</li> <li>• some trees planted by late father of person 1</li> </ul>

<p><b>Trees</b></p>	<p>8 trees</p> <ul style="list-style-type: none"> <li>• mango (1)</li> <li>• avocado (1)</li> <li>• <i>Terminalia catappa</i> (1)</li> <li>• <i>Newbouldia laevis</i> (5)</li> </ul> <p>7 saplings</p> <ul style="list-style-type: none"> <li>• mango (1)</li> <li>• soursop (4)</li> <li>• velvet tamarind (1)</li> <li>• unknown species (1)</li> </ul>	<p>43 trees</p> <ul style="list-style-type: none"> <li>• coconut (24)</li> <li>• oil palm (3)</li> <li>• papaya (1)</li> <li>• neem (1)</li> <li>• <i>Newbouldia laevis</i> (14)</li> <li>• <i>Ficus capensis</i> (1)</li> <li>• <i>Hippocratea sp.</i> (2)</li> </ul> <p>10 saplings</p> <ul style="list-style-type: none"> <li>• coconut</li> </ul>	<p>3 trees</p> <ul style="list-style-type: none"> <li>• avocado (1)</li> <li>• moringa (2)</li> </ul>	<p>20 trees</p> <ul style="list-style-type: none"> <li>• coconut (8)</li> <li>• oil palm (2)</li> <li>• mango (1)</li> <li>• <i>Annona squamosa</i> (1)</li> <li>• moringa (8) – planted by Mr Mamattah, a neighbour/friend with no space in his own compound</li> </ul> <p>3 seedlings</p> <ul style="list-style-type: none"> <li>• lemon (3)</li> </ul>
<p><b>Uses</b></p>	<p>Own</p> <ul style="list-style-type: none"> <li>• medicine</li> <li>• spiritual cleansing</li> <li>• shade</li> <li>• windbreak</li> <li>• food</li> </ul> <p>Other</p> <ul style="list-style-type: none"> <li>• gifting</li> </ul>	<p>Own</p> <ul style="list-style-type: none"> <li>• food</li> <li>• medicine</li> <li>• spiritual cleansing</li> </ul> <p>Other</p> <ul style="list-style-type: none"> <li>• sell coconuts</li> <li>• sell seedlings</li> <li>• gifting</li> </ul>	<p>Own</p> <ul style="list-style-type: none"> <li>• medicine</li> <li>• food supplement</li> <li>• food</li> </ul> <p>Other</p> <ul style="list-style-type: none"> <li>• gifting</li> </ul>	<p>Own</p> <ul style="list-style-type: none"> <li>• food</li> <li>• medicine</li> <li>• shade</li> </ul> <p>Other</p> <ul style="list-style-type: none"> <li>• sell mangos</li> <li>• sell coconuts</li> <li>• gifting</li> </ul>

### 6.3.1 Household 1 – Nima

The first case study household in Nima is located at one of the major roads and approximately 600 m<sup>2</sup> large (Fig. 35). The participant (HH 1, P 1), a retired male and the compound's landlord, shares the plot with seven other households. While he mentioned a wife and two children in the questionnaire, his adult son and daughter had moved out, and he avoided discussing his wife. He resides in his late father's place, and his mother, whose poor health impeded interviewing her, also lives in the compound. A wall of about 1.6 m in height, built from purple-grey stones, surrounds the compound. Though a small gate on the compound's west side opens directly to the main road, both visitors and residents commonly enter through the red south gate that connects to a smaller foot sand path.



**Figure 35 Compound layout (Household 1)**

Buildings:	<b>A</b> – Houses <sup>12</sup>	<b>B</b> – Shop	<b>C</b> – Bathrooms	
Trees:	<b>1</b> – Mango	<b>2</b> – Avocado	<b>3 to 7</b> – <i>Newbouldia laevis</i>	<b>8</b> – Umbrella tree ( <i>Terminalia catappa</i> )
Saplings:	<b>1</b> – Mango	<b>2 to 5</b> – Soursop	<b>6</b> – Velvet tamarind ( <i>Dialium guineense</i> )	<b>7</b> – Unknown
Others:	<b>i</b> – Benches			

<sup>12</sup> case study households in dark grey

Entering the compound, one immediately faces a large mango tree (1) whose branches extend over both the surrounding houses and the wall, casting shade on to large, self-built benches just on the wall's outside. Initially, the participant had two such benches within the compound and one outside, but as more and more people came to rest on the outside bench, he added another one to give more space. As these benches were already old, he eventually replaced them with those from within the compound and dismantled the broken outside ones, giving the wood to a neighbour who used it for her food preparation business. As the participant's father and brother both worked as carpenters, he had learned some basic skills, and his late father had left him his tools. Most of the wood he had acquired for free from carpenter friends in the area or taken from construction left-overs. The participant constructed these benches as he felt that the air inside the compound was too warm and not fresh, and he now spends a lot of his leisure time resting, eating, and talking to people on these benches. Often, other compound residents, neighbours, friends, and even random passers-by also rest or socialise on these benches. Underneath the bench is a little seedling, possibly an avocado, growing from one of the many seeds discarded by the landlord when eating fruits while sitting on his bench.

According to another compound resident, Mr Agbobli, an old friend of the landlord, his father planted the mango about 80 years ago. Up to about 1.8 m in height, there are signs of pruning on the mango's stem where bigger branches had been removed to allow people to pass through. The landlord, and later a friend, removed branches about three to four times per year to prevent causing damage to the surrounding houses. However, five years ago, the friend died, and the landlord neither owned the required equipment nor felt healthy enough to prune the tree himself. Further up, the mango spreads into two larger stems, one of them growing towards the house where people made a hole into the metal sheet roofing for the branches to grow through. Residents have attached several lines to the tree, some to hang washing while others presumably seem to be electricity wires. While compound residents do not regularly water the mango, I observed how

wastewater from household use was disposed of on the tree's base on more than one occasion, one of the few open spaces in an otherwise overbuilt place. Every compound resident may collect fruits from the tree, and when passers-by inquire, they are also allowed to pick some mangos. The landlord's accommodation is separated from the other houses by a low wooden fence located on the right-hand side when entering the compound. In front of his entrance door grows an avocado (2) which he planted about 12 years earlier, hoping to obtain some avocado fruits. So far, the tree did not bear fruits, even when he tried to prune it, and he now considers replacing it with a hopefully more productive seedling. There are also three *Newbouldia laevis* trees (3 to 5) and several saplings of various species around which he built some planters of 0.5 m by 1.2 m and 0.5 m height to protect the roots from exposure. He planted all these seeds less than a year ago, and now all plants have grown to between 0.8 m and 1.2 m in height. Two *Newbouldia laevis* trees are also found at the compound's opposite end (6 and 7), growing behind one of the houses. Just outside the compound wall, located at the main road but on his land, is a large umbrella tree (8) which the participant planted in 1979.

### **6.3.2 Household 2 – Mamobi**

The second case study household is located in Mamobi, a neighbourhood directly north of Nima. The household's head is John Yetsowodo (HH 2, P 1), a middle-aged man who lives with his wife Christine (HH 2, P 2) and two young children under six. They live in a large compound of about 1,660 m<sup>2</sup> (Fig. 36) that is visible from afar due to the many high coconut palms which stand out in an area otherwise sparsely covered by trees. The other accommodations are rented out to eight households to which they are not related.

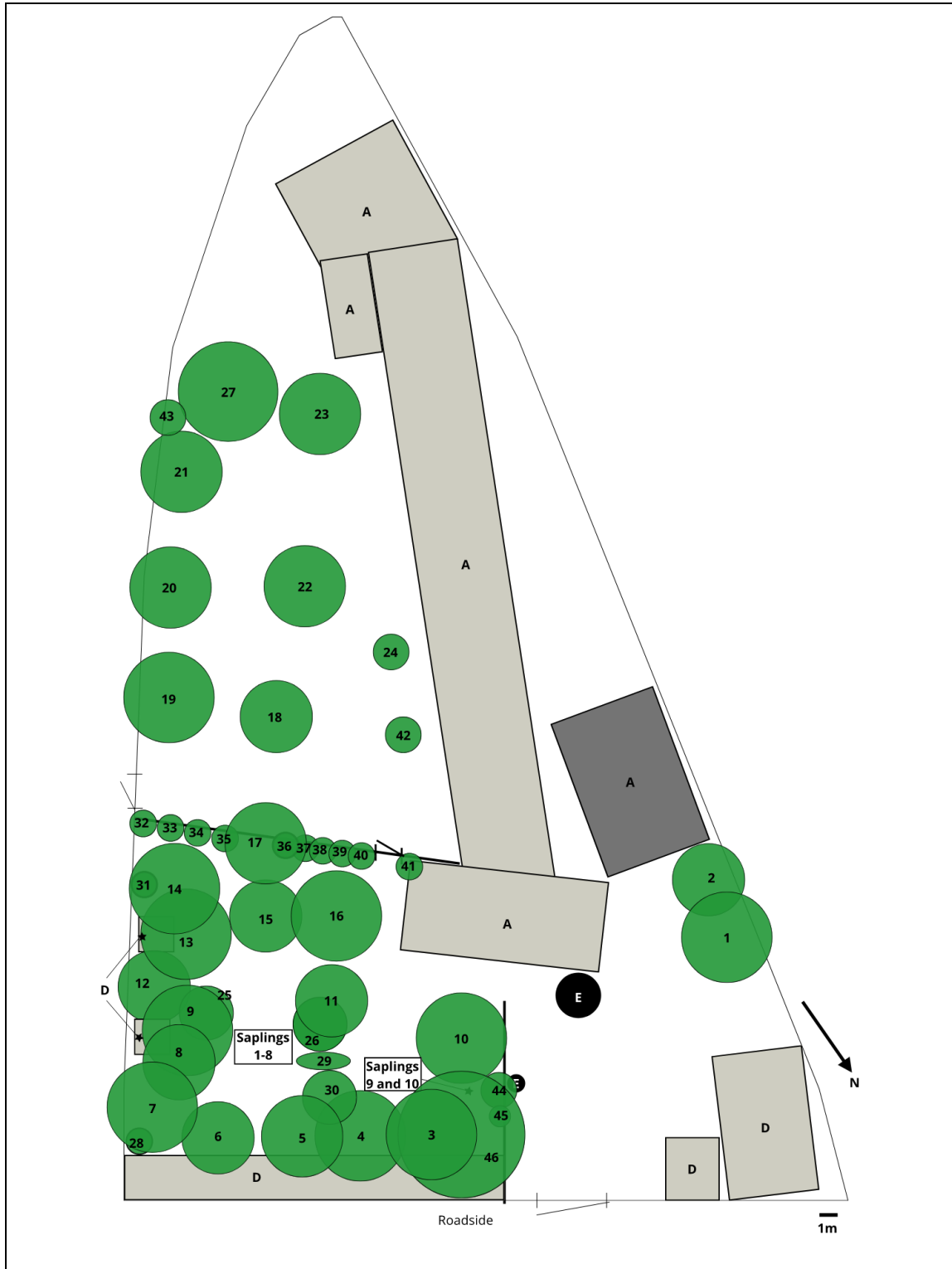
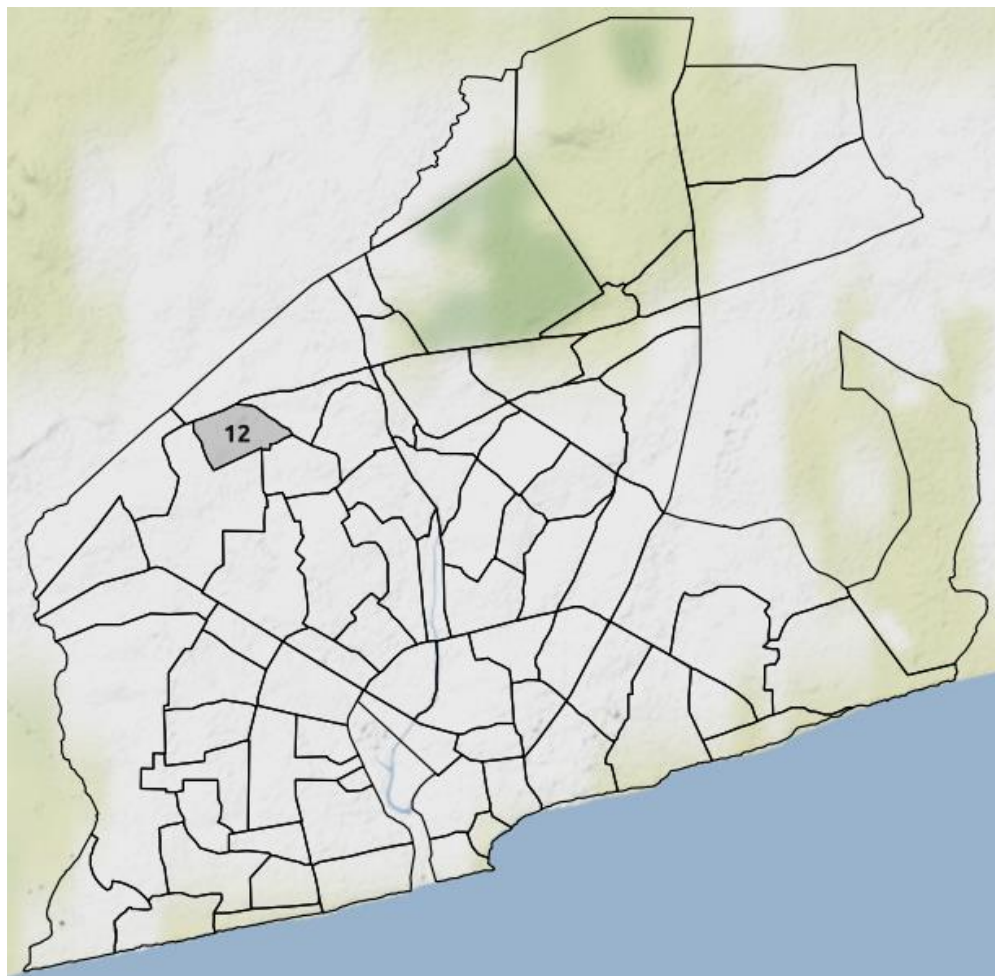


Figure 36 Compound layout (Household 2)

- |            |                                     |                                   |                            |           |
|------------|-------------------------------------|-----------------------------------|----------------------------|-----------|
| Buildings: | A – Houses                          | D – Shack                         | E – Water tank             |           |
| Trees:     | 1 to 24 Coconut                     | 25 to 27 – Oil palm               | 28 – Papaya                | 29 – Neem |
|            | 30 to 43 – <i>Newbouldia laevis</i> | 44 to 45 – <i>Hippocratea</i> sp. | 46 – <i>Ficus capensis</i> |           |
| Saplings:  | 1 to 10 – Coconut                   |                                   |                            |           |

John grew up about 200 m away from his current place with his parents and two siblings. When he was still young, his father bought the land John currently resides on to farm and garden on it. As his father lacked the money to build a house, he fenced his land with coconuts and planted about 90 of them, which he brought from his own father's village in the Volta Region. After school, John and his two siblings would help their father weed, plant, and maintain the plantains, bananas, corn, and oil palms he also planted. Around 1998, John started to cut down some palms to make space for rental accommodation, and when he and his wife expected their second child, they also moved to the new compound. John's father has since died, and his (step)mother lives in Lapaz (Fig. 37).



**Figure 37 Location of Lapaz**

Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL  
12 – Lapaz

John works as an electrical technician but pursues a range of other income-creating activities. Besides renting out accommodation on his land, he sells water from a large tank in his compound and another one at a marketplace. He also regularly sells coconuts and runs some unspecified errands. Christine usually sells groceries but stopped working for some time to tend to their newborn. When John is out, she sells the water but does not participate in the coconut sale. While John used to be part of a neighbourhood support group in the 1990s, these activities stopped when the group collapsed. He belongs to the Ethiopian World Foundation but has not attended any of their meetings in the past three years. However, in 2011 members of a US Rasta Union came to Ghana and collaborated with his local group in some tree planting activities around Korle Gonno and Bu (Fig. 38) in which John also participated.



**Figure 38 Location of Korle Bu and Korle Gonno**  
Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL  
61 – Korle Bu 74 – Korle Gonno

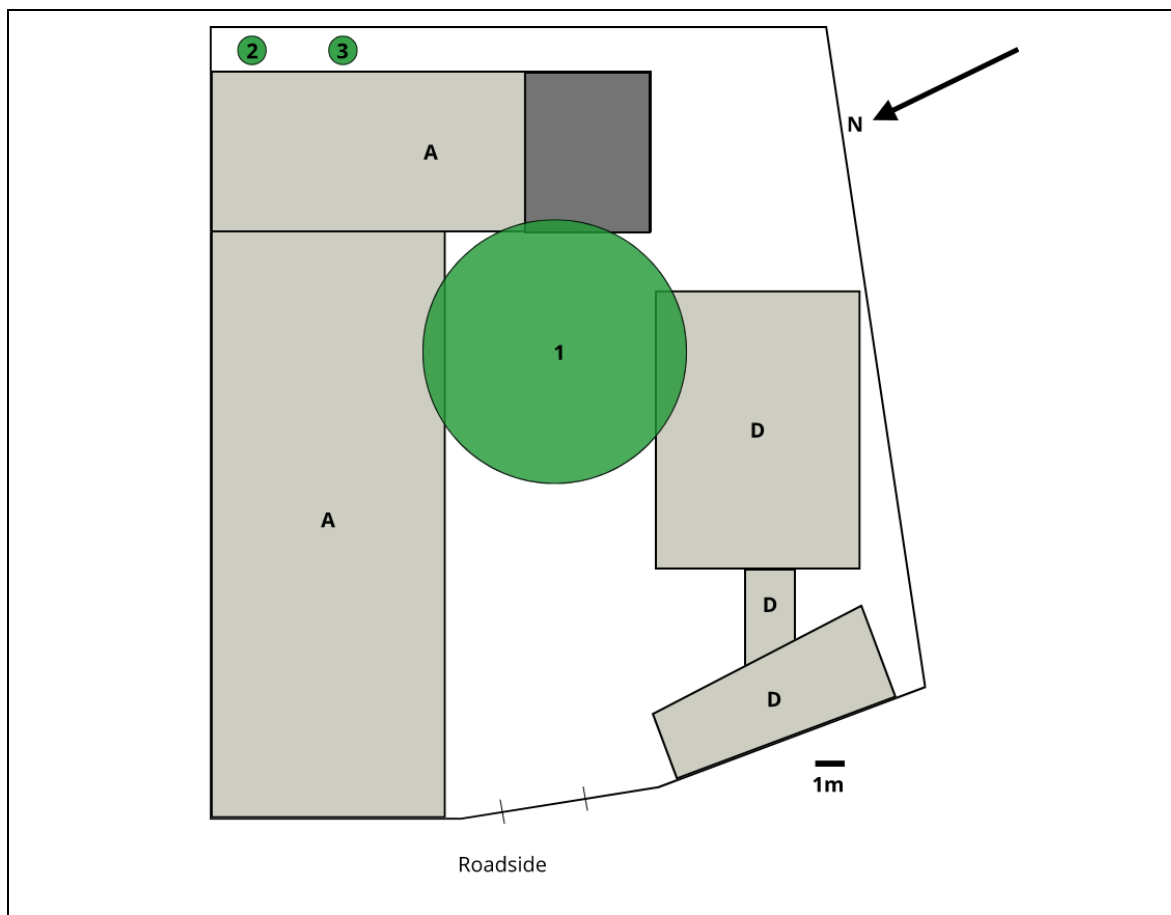


Entering the compound through the main gate, one immediately faces a large water tank, and during data collection, several people came to buy water from him. Initially, his father had dug a well from which he sold the water before John dug a mechanised borehole and added pumps and pipes. Today, the Ghana Water Company's pipes reach their place and provide the water. On the left-hand side of the gate, there is a high wall that only has a small passage to the other side of the compound, right next to the water tank. Several trees/palms (10, 44 to 46) are overgrowing the wall, the large *Ficus capensis* (46), a species that can be deciduous or evergreen, however, had shed most of its leaves at the time of data collection. The head of this case study household reported that both the *Ficus* and the *Hippocratea* (44 and 45) trees had not been planted but regenerated naturally. They were left standing as people from the area asked for leaves and bark for medicinal and spiritual purposes, which is how the landlord and his father learned about the uses of these specific species. The majority of the compound's trees are located in the bottom left part, where coconuts, neem, oil palm and *Newbouldia laevis* form an almost closed canopy, the latter (32 to 41) planted along another fence which separates the left bottom and left back part of the compound. In the bottom-left part of the compound, the landowner also grows several coconut saplings. He had also once planted mango and plantain, which were eaten by goats from another house that entered through the side gate and came to the bottom left part as the wall at that time did not have a door.

### **6.3.3 Household 3 – Nima**

The third case study household also lives in Nima and consists of a young married couple with three younger children between the ages of four and ten. The compound covers approximately 580 m<sup>2</sup> and the other residents are mostly relatives. The woman (HH 3, P 2) was born in Nima and lived nearby until 2008 when she moved to her current compound to join her husband. She usually performs all household duties and prepares the children for school, but one day per week,

she has a cleaning job in Madina, just north of Accra. On the remaining days, she fries and sells yam in front of her house or beads sandals or bracelets for sale. Her husband works long hours and does not participate in decision-making around the compound's trees. Entering through the gate, one faces the large avocado tree (1) around which the houses are arranged (Fig. 39). When the fruits are ripe, every compound member may collect what they want and, according to the participant, there have never been conflicts concerning the fruits' distribution. Before she joined the compound, the residents had used building bricks to form a circle (diameter: 2 m) around the avocado's stem to avoid extensive sweeping in that area which might lead to soil erosion and expose the roots. When she joined the compound and realised that some blocks had broken, she replaced them with stones from the neighbours who were just rebuilding their wall and had some leftovers.



**Figure 39 Compound layout (Household 3)**  
 Buildings:        **A** – Houses        **D** – Shack  
 Trees:            **1** – Avocado        **2 to 3** – Moringa

At the back of the houses, a former resident and family member planted three moringa trees about six years earlier to use their leaves for medicinal purposes and as a food supplement. He did not obtain permission from the other compound residents, but the moringa trees were common property, and anybody could use them as they wished. In 2016, however, one resident cut one of the trees to allow more light into her building. Additionally, she also preferred to plant plantain for direct consumption, and while she approached each compound household and informed them of her decision, she did not specifically ask for permission. The two remaining moringa trees had been topped off at about 1.5 m height and were now resprouting, providing the compound residents with leaves. Generally, the available growing space between the backside of the house and the compound wall leaves little space for the trees to mature.

#### **6.3.4 Household 4 – Kokomlemle**

The fourth case study household is located in the Kokomlemle neighbourhood, bordering Nima on the west. Household members include a middle-aged female head of household (HH 4, P 1), her two children (a teenager and a young adult), as well as her mother, brother and two sisters, one of whom has two small children of her own. Their compound's size equals about 1,000 m<sup>2</sup> and is surrounded by a high wall (Fig. 40). The household's head usually sells beverages around the Accra Technical Training Centre in Kokomlemle but has been unable to exercise her profession for about a month due to ill-health. Her sisters, also traders, operate a small shop just outside the compound walls where they sell a variety of everyday items, including bread and preserved food and drinks. The younger children visit school, while the older son (P 2) attends university. The household head's late father bought the land several decades ago and started planting trees on it until he could afford to construct accommodation. Each time the man's wife gave birth, he also planted another tree on the land, and 30 years ago, the family moved there.

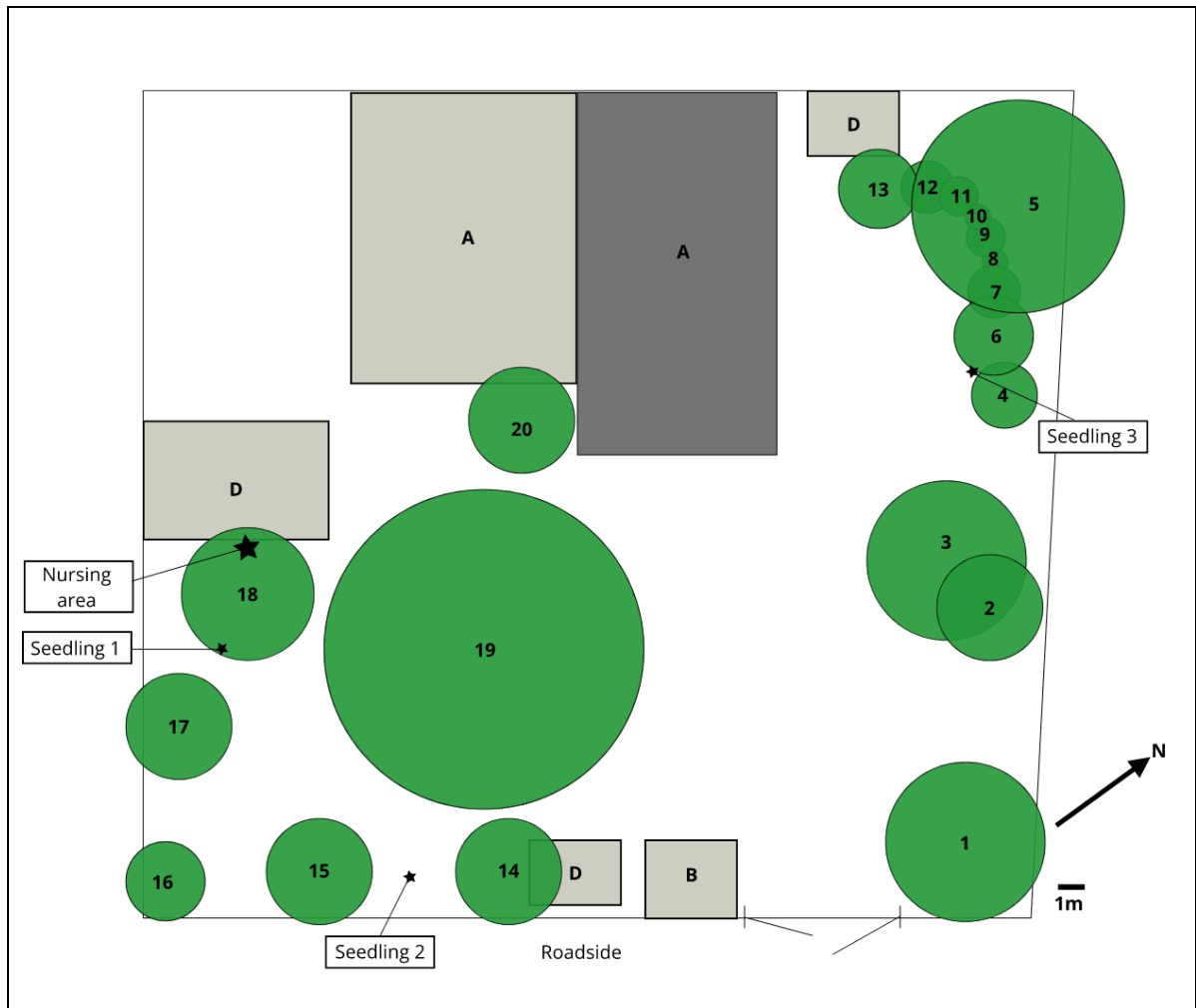


Figure 40 Compound layout (Household 4)

- |            |  |                        |                          |
|------------|--|------------------------|--------------------------|
| Buildings: | <b>A</b> – Houses                      | <b>B</b> – Shop        | <b>D</b> – Shack         |
| Trees:     | <b>1, 2, 4, 14 to 17, 20</b> – Coconut | <b>3, 5</b> – Oil palm | <b>6 to 13</b> – Moringa |
|            | <b>18</b> – <i>Annona squamosa</i>     | <b>19</b> – Mango      |                          |
| Seedlings: | <b>1 to 3</b> – Lemon                  |                        |                          |

The small proportion of built-up land within the compound creates an ‘open’ and spacious feeling though old cars in various stages of repair take up some of the compound’s area. The household has rented out one of their buildings to a household with no family connection to them. The large mango tree (19) towards the compound’s centre is in the process of dying and has not given fruits in the past seven years. Along the walls, the residents have planted coconut and oil palms but, due to their height, they provide limited shade to the compound. In the *Annona squamosa*’s (18) shade, the household head’s children nurse lemon seedlings (see Section 6.4.2), three of which they have already planted out. Two avocado trees also used to grow in the compound,

but one had died due to old age or possibly termite damage, while the other was removed when a former tenant complained about its shade depriving his accommodation of natural light. In the compound's top right part, a neighbour/friend of the head's brother has planted eight moringa trees (4 to 13)(see Section 6.4.1). He has planted them in his friend's compound as he is only renting his own place and does not want to plant on land he does not own. Additionally, there is limited space to plant in his rental accommodation, and the landlord's previous actions did not suggest that they were particularly interested in trees.

## **6.4 Tree Use and Care in the Case Study Households**

Over the course of about two weeks, I spent several hours with the above-introduced households, interviewing individuals and observing their tree-related activities. To compare and contrast household and intra-household views, activities and dynamics, I summarised information on various topics (e.g. tree care, sale, gifting and different tree benefits). These topics are reflected in the semi-structured interview guide and draw on the literature about urban tree use and aspects in the sustainable livelihood framework. I now discuss two topics in more detail. First, I outline the various ways in which household-owned trees and their products serve as assets, including their domestic use, as a source of income and as part of the process of creating or maintaining social capital. After that, I compare and contrast tree propagation, care and management of the four case study households, including observed intra-household dynamics.

### **6.4.1 Trees as Assets**

Within a sustainable livelihood approach, trees constitute a form of natural capital/asset and provide various benefits. In Accra, city residents use tree products such as leaves or fruits for medicinal and alimentary purposes. A more diverse diet and improved health, in turn, strengthen the

workforce, i.e. the human capital, which possibly expands production or enhances productivity. Additionally, tree owners sell products, generating financial capital to spend on physical capital like construction timber, building poles, furniture wood and a range of household and other utensils and tools. As fuelwood and charcoal, wood is also a common source of domestic energy in Accra, like elsewhere in African cities (Zulu, 2010; Kimemia and Annegarn, 2011; Cline-Cole and Maconachie, 2016). The natural asset 'urban tree' finally also creates social capital, both as tangible products are gifted to family, friends, and even strangers, and as a provider of shelter and shade underneath its crown, which often serves as a pleasant meeting place for social interaction and/or exchange. The respondents' views suggest that they mostly perceive compound trees as positive and desirable.

#### *6.4.1.1 Trees for Subsistence and Own Domestic Use*

Urban inhabitants obtain medicine, food, fuelwood, fodder, and materials for decoration, construction or spiritual and religious activities from both public and private trees in places as varied as South Africa (Kaoma and Shackleton, 2014; Shackleton *et al.*, 2015), Nigeria (Kayode, 2010; Agbelade *et al.*, 2016), and US America (Poe *et al.*, 2013; Synk *et al.*, 2017). In Accra, questionnaire respondents mentioned these same benefits and 92 out of 100 participants reported having used products from public or private trees within the previous 12 months. While the previously listed studies discuss and quantify tree product use or private households' species compositions, qualitative and in-depth information on how humans and trees interact in urban settings remains limited. My household case study offers this detailed information on why and how people consume tree products, use their benefits and protect, propagate, and maintain them. Not only did I converse with household members of different gender and age but also observed their every-day and tree-related activities over the course of two weeks. For further context, I also interviewed other

compound residents and associated individuals to create a more holistic understanding of the complex tree-related networks between the city's inhabitants.

Respondents from all four case study households reported that they used trees for medicinal purposes or as part of their diet, acquired tree parts from both public and private trees, and listed a wide range of specific applications for these products. Avocado seeds were used to reduce high blood pressure, mango leaves for sores and wounds, *Terminalia* seeds for eye diseases, mango tree bark for dental problems or roots, bark, and leaves to treat fever, typhoid, malaria, stomach or joint pain. Some parents had treated their children with these herbal medicines, a common practice identified by Asase and Kadera (2014), who listed 42 medicines of these types, which parents used to treat 20 child health conditions in Accra. In their study, the most frequently used tree species included neem, *citrus aurantiifolia* (lime) and mahogany, while papaya and oil palm were included but considered of lesser importance. Leaves were the most commonly used medicinal tree product identified by Asase and Kadera. As the tree species in question grow on public lands from which EPA does not sanction the harvesting of small quantities of leaves for personal use, they can be collected by individuals who do not own trees and/or lack access to trees and tree products on private land.

Family members, friends, neighbours, and even strangers widely exchange herbal medicine related knowledge. Indeed, the interviewed herbalist confided that for simple treatments, he simply explains to his clients what products to obtain and how to prepare and use them. Nonetheless, some respondents used such traditional pharmacopoeia rarely, only twice in 30 years (HH 4, P 1, P 5 and P 6). However, others valued tree medicine, taken against hypertension, for supposedly fewer side effects like headaches or dizziness (HH 4, P 9), a common benefit identified by other users of alternative medicine in Accra (Aziato and Antwi, 2016). Regardless of how widely household members used such 'traditional medicine', they also visited physicians and took

'pharmacy drugs', especially if symptoms were unspecific (HH 2, P 1) or severe and people apprehensive about treating themselves (HH 1, P 1). Commonly, younger individuals relied exclusively on pharmacy drugs (HH 3, P 2), a tendency corroborated by the interviewed herbalist. His typical clientele tends to be over 30 years old, while younger people prefer what he calls 'European' medicine. While some individuals would combine tree and pharmacy medicine (HH 4, P 1), the herbalist advises against this approach. One respondent (HH 3, P 2), however, described how she follows pharmacy medicine with herbal one to 'finish off' the last remaining symptoms and conclude the treatment, an approach widespread in the Greater Accra Region (Agyepong and Manderson, 1994). Thus, using free and accessible plant materials for medicinal purposes can help to sustain human capital while reducing monetary outlay, which market purchases would otherwise require.

All four case study households lived in compounds with fruit and other food-producing trees, although frequency and intensity of reported use/consumption varied widely. Some respondents consumed non or few fruits either because they disliked particular food items (HH 2, P 2) or because they lacked the equipment and skills to harvest them, such as coconuts from tall palms (HH 2, P 1; HH 4, P 2). Alternatively, products like oil palm fruits, an ingredient of palm nut soup, were underutilised because they need to be processed before they can be cooked (HH 2, HH 4). Alternatively, households readily consumed avocados or mangos, which require little to no preparation (HH 1, HH 3). As trees often produce more fruits than an individual (HH 1) or household (HH 3) can consume, respondents often shared left-overs with other compound residents (HH 1, HH 2, HH 3) and family members (HH 4). No participant reported any conflict over access to and distribution or consumption of these resources as they perceived it as shared (HH 1) and equitable (HH 4). While potentially reluctant to discuss quarrels with a stranger, they could have preferred the socially accepted and non-committal response. However, their com-



ments suggested that they felt to have both unimpeded and sufficient access to the trees' products to meet their immediate needs, as well as surpluses for sharing with other individuals.

Tree product distribution depends, among others, on the products themselves, household composition, and living arrangements. In HH 1, the respondent explained that any compound resident could freely collect mangos. In Mamobi (HH 2), where professional harvesters climbed the coconut palms to obtain fruits for sale, John kept some fruits for his family and distributed further fruits among the compound occupants. He usually gifts about three coconuts to individuals and small households, while those with at least five members receive about ten. Exact numbers, however, depend on how many ripe fruits were harvested. Household 4, also owning coconut palms, equally distributes those fruits not for sale among its members, including the older children. With palm nuts, though, the household head first processes them into concentrate before sharing it, including with the wider family. Unlike in rural areas, where trees can be a central livelihood asset, urban residents with limited land tend to accommodate them around more essential infrastructure like houses. While city trees provide fruits or medicine, they are not cash crops like cocoa and sold, if at all, in small quantities (but compare to HH 2). When private landowners' tree-related needs are met, they seem to willingly share 'left-overs' as the trees' main values seem to be subsistence use and their role in creating social capital (see Section 6.4.1.3).

Fruit-bearing and otherwise edible tree species were widespread in the four study households. These species choices mirror findings from Kumasi (Nero *et al.*, 2018a), where edible species like oil palm, mango, avocado, coconut, and orange constituted the five most common species in urban home gardens. Elsewhere in Accra, Nero *et al.* (2018b) reported that 66 % of trees in home gardens in six study neighbourhoods cutting across income zones were edible. Here, the most common food included mango, oil palm, coconut, papaya, Indian almond, and *Moringa oleifera*, the last one described as a leafy vegetable or food supplement in stews and soups (HH 3). House-

holds in Accra ration food as a coping strategy when financial shortfalls limit their purchasing abilities (Maxwell *et al.*, 2000). Having access to free fruits can thus positively impact human capital by contributing to a more diverse and healthier diet. As a proactive rather than reactive strategy, obtaining free fruits can reduce spending in this area, freeing financial capital for expenditure on other essential needs or investments. This appeared to be the logic driving two members of HH 4 who decided to tend lemon trees to obviate the need for their mother to spend money buying lemons in the market.

Though the potential effects of public and private food trees might seem limited at first, Accra's households spend on average 54.5 % of their households' budget on food, the single largest item (Maxwell *et al.*, 2000). "Urban food expenditure patterns in Accra are characterized by heavy dependence on purchased food commodities, including a substantial amount of street foods" (Maxwell *et al.*, 2000, p. 59). While richer households' diets were diversified and included fruits, vegetables, meat, fish, eggs, dairy, and non-alcoholic drinks, the diets of lower-income ones relied primarily on staples like grains and cereals (Maxwell *et al.*, 2000). Relatedly, 70 % of the sampled low- to middle-income households in Accra were mildly to severely food insecure (Tuholske *et al.*, 2020). While household trees can mitigate some of these issues, access to public fruit trees could benefit a larger share of the city's residents and improve their diet, especially as fruits sell at comparatively high market prices (Codjoe *et al.*, 2016; Stevano *et al.*, 2020).

The government departments responsible for managing public lands do not favour fruit-bearing species. While EPA currently investigates the trees' shade effects on increased road longevity and reduced energy spending, DPG focuses on selecting species for shade and beautification. Though naturally regenerating fruit trees grow on public lands and are, according to EPA, free to be harvested by anyone provided the plant remain intact, the government does not prioritise food trees on public lands. While DPG does suggest fruit trees for use in private homes, this creates two

problems. First, it disadvantages residents of densely populated neighbourhoods with limited outside or compound spaces for tree plantings. Second, the large amount of renters depends entirely on their landowners' goodwill, notably their attitudes towards tree planting, but also their preferred species. Interviews with case study household associates living in compounds 1 and 2 revealed how these tenants often refrain from even considering planting trees. Not only do they assume that they would be forbidden to plant, but they were convinced to move away before being able to reap the benefits of the investment that tree planting and tending would represent.

The time lag between tree planting and produced benefits, however, might only be a partial explanation. The interviewed tenants had lived in their accommodation for ten and 20 years, respectively, and the city's severe housing shortage "limits access to both homeownership and rental tenancy" (Arku *et al.*, 2012, p. 3178). Land in and around Accra sells at a premium, and even if renters should obtain a plot of their own, they would still have to invest in accommodation. However, savings are often scarce as landlords and -ladies charge high advance rates, even for low-quality housing. Additionally, tenants make heavy "advance lump-sum rental payments covering a period of about two to five years" (Arku *et al.*, 2012, p. 3178) when entering a rental contract. Even when landowners allow renters to plant (HH 1) or consider their tenants' wishes, such as HH 4, who removed a tree upon a renter's request, tenants remain at the owner's goodwill, themselves lacking control over the resource. When control over land is lacking, some individuals find alternatives, such as the tree-planting enthusiast whose landlord did not desire trees in his compound. Instead, the tenant approached his friend/neighbour (HH 4, P 4) and obtained permission to plant on his land. While such arrangements do not grant him ownership rights over the trees he planted, he benefits from close to unlimited access or usufructuary rights to the moringa trees for as long as the friendship between landowner and tree planter lasts.

Besides the four case study households and their members, most questionnaire respondents also exhibited an interest in urban trees as food sources. While case study participants often preferred planting fruit-bearing species if space were available (HH 1, 2, and 4), most household questionnaire respondents shared these views. Out of 100 respondents, 54 mentioned these potential alimentary benefits in the introductory section, where I asked them to list all tree benefits they could think of. In another survey section, I also asked if they had noticed particular trees, both in their neighbourhoods or elsewhere in Accra, if they wanted to increase the city's green cover or own trees or land with trees. In each instance, respondents cited the food-producing potential of urban trees (Table 29). However, not all respondents' answers indicated why they noticed or wanted trees as they simply referred to their wide range of benefits. Within a survey model, however, I was unable to ask follow-up questions. The numbers below, therefore, potentially underestimate people's values attached to trees' food-producing abilities. In essence, the government's (species) decision-making criteria seem to differ noticeably from how important many city residents perceive a range of further specific tree functions.

**Table 29 Questionnaire respondents who mentioned food-producing tree benefits**

	<b>No. of respondents</b>
Noticed public trees in their neighbourhood due to the fruits/food they produce	18
Noticed public trees elsewhere due to the fruits/food they produce	8
Named fruits/food as reason to want more public trees in Accra	8
Named fruits/food as reason why they would like to own land with trees/trees	14

#### *6.4.1.2 Trees as a Source of Income*

In addition to contributing to subsistence consumption and use, trees can also function as a source of income. Two households (HH 2, HH 4) had reported during the survey that they sell tree products, and I further enquired about these activities. John's compound (HH 2) in Mamobi is large with ample space to plant trees, in this case mostly coconuts. As I reported in the introductory chapter, I was able to observe coconut harvesting in person. While I did not see a coconut sale in HH 4, its members reported that sellers enquire about purchasing ripe fruits, signalling their interest to harvest them. However, their compound is smaller than compound 2 with fewer palms, possibly reducing how frequently coconut harvesters/sellers approach the household about the fruits. John (HH 2) reported catering to regular coconut buyers and random opportunistic passers-by looking to acquire fruits for resale at least three times per month. In contrast, HH 4 sells much smaller amounts to a transient clientele monthly to bi-monthly. Other than the children, all household members can negotiate with harvesters/traders at their own discretion, while in John's household, his wife Christine is no longer allowed to sell coconuts due to an incident where coconut harvesters deceived her and claimed that they had already paid her husband.

Household 4 usually also retains some harvested coconuts for household consumption, commonly earmarking about three to four fruits per person. While both households initially charged 0.5 cedis/coconut, they doubled their prices when roadside coconut sellers increased theirs from 1 to 2 cedis. While John estimated earning around 150-200 cedis/coconut palm/year, contributing about 10 % to his annual income, HH 4 could not provide such estimates. In their household, all coconut sale income goes towards person 9, the head's mother, for whom this is an irregular but welcome source of cash. Household members support this distribution as all other members have their own/other sources of income. While both households also sell/sold additional tree products, including coconut seedlings (HH 2) and mangos (HH 4), the obtained income was negligible.

In both households (HH 2, HH 4), members sell trees and tree products as one of many income-earning strategies. Nonetheless, coconut sales alone contribute about 10 % to John's income, suggesting that it plays a non-negligible role in subsidising individual and group livelihoods. Yet, as with all livelihood activities, John (HH 2) constantly reviewed the trees' role and their relative importance. To obtain a tenth of individual livelihood income from coconut sales requires copious fruiting palms that, despite their slender growth habit, take up valuable compound land. As the landlord already rents out accommodation, he knows about the higher income-earning potential of property rental over selling coconuts. Lacking the means to construct further houses for tenants, he plans to lease out portions of his land for other people to build their houses on. As accommodation in Accra is highly sought after, leasehold rent would provide him with a higher and more secure income than coconut sales. However, re-structuring the compound would require felling a number of palms and other trees to clear land for accommodation. His expressed care for trees and their multiple benefits would not deter him from replacing them with alternative land uses that generate more income.

Several households had cleared trees in the past to provide construction land or reduce some of the trees' disadvantages, like unwanted shade. Similar to HH 2, HH 1 also desired to increase its rental accommodation, for which the household's head would also consider removing compound trees. Like John (HH 2), he also lacked the required large-up front investments and seemed to have no concrete plans for raising such funds. However, recent Google Earth imagery indicates that he not just felled the avocado that failed to fruit but that further ongoing developments alter his compound. In 2018, the large umbrella tree outside the compound's wall was heavily pruned and then removed after. Images from 2020 show about one-third of the road-facing compound's side to be under construction. Due to the images' relatively low quality, I cannot comment on the exact changes taken place. These examples, however, illustrate landowners' varied and complex decision-making processes regarding the compounds' land use and their associated vegetation.

They also suggest that, while cash returns can be limited, investing in single or a few trees can constitute a promising strategy, particularly where financial resources for potentially more profitable investments are lacking. Furthermore, the case studies indicate that taste and preference, combined with means and opportunity, are likely to have a more significant effect on private urban forest structure in Accra than (a lack of) community or popular awareness and knowledge, as many official institutions and representatives insist.

#### *6.4.1.3 Trees and Their Products as Social Capital*

Trees and their benefits can affect a livelihood's base in a third form. Both tangible products like fruits, leaves and bark and intangible ones such as a tree crown's shade can create and maintain social capital, which, in turn, can potentially sustain or enhance other livelihood assets. Within a livelihood approach, social capital describes networks, relationships, affiliations, or social claims, which people utilise to pursue their selected livelihood strategies (Scoones, 1998). Social capital is not just fundamental in sustainable livelihood frameworks but also in economics and other social sciences, creating various definitions. These multiple interpretations have questioned the concept's meaningful use (Robison *et al.*, 2002). Researchers also debated in how far social capital is 'capital' in the word's economic sense (Arrow, 1999; Solow, 1999; Adler and Kwon, 2002) and argued about its origins and development to clarify its meaning (Harriss and de Renzio, 1997; Woolcock, 1998). After outlining some definitional basics, I return to those discussions relevant to this research.

Commonly, individuals do not own social capital, which only comes into existence through the relationship of at least two people, thus being a relational construct (Robison *et al.*, 2002; Vemuri *et al.*, 2011). Definitions in political science, sociology, and anthropology vary but often describe social capital as "the set of norms, networks, and organizations through which people gain access

to power and resources that are instrumental in enabling decision-making and policy formulation” (Serageldin and Grootaert, 1999, p. 45). Others centre the sentiments that underlie these relationships and the access they facilitate, seeing social capital as “a person’s or group’s sympathy toward another person or group” (Robison *et al.*, 2002, p. 19). While some even name it ‘goodwill’ – “the sympathy, trust, and forgiveness offered us by friends and acquaintances” (Adler and Kwon 2002, p. 18) – it fundamentally “highlights the importance of nonmarket social interactions in socioeconomic outcomes” (Quibria, 2003, p. 20). In what follows, I draw attention to the multiple ways in which trees and their benefits form part of social interactions in an urban setting, highlighting what can be easily missed due to the unremarkable, everyday nature of many of these activities.

Like other widely used concepts, researchers have criticised ‘social capital’ for its perceived shortcomings. Some object to the use of the economic term ‘capital’ though consider the underlying ideas relevant (Solow, 1999). Others suggest that ‘social capacity’ (Smith and Kulynych, 2002) or ‘social networking’ (Taormina *et al.*, 2012) could replace the economically connoted term ‘capital’ or simply recognise it as a metaphorical rather than a literal concept (Adler and Kwon, 2002; Uphoff, 1999). Researchers and practitioners have further criticised social capital’s often overlooked capacity to both include and exclude individuals and groups, thus potentially limiting access to material and non-material livelihood assets and choices for the excluded. As Portes (2014, p. 18407) has observed, such ‘excessive communitarianism’, or social capital’s anti-social tendency, may extend to other areas with the potential to “produce harm instead of welfare” (Ostrom, 1999, p. 198).

Ben Fine, one of social capital’s most outspoken critics, questions whether “social capital add[s] anything other than a new name to old analysis (how individual and social variables impact upon the political process)”, wondering about the legitimacy of “such an approach to the political pro-



cess given its bias towards being insensitive to context, content and contingency?” (Fine, 2002, no page number). Fine objects to the term glossing over and replacing a more nuanced understanding of the underlying complex issue of social stratification (according to, e.g. class, race, ethnicity, gender, or age), a blanket approach that contains a “remarkable absence of *power* and *politics*” (Navarro, 2002, p. 427). For Fine (2002), therefore, any capital, including physical one, is a relationship rather than a resource and thus all forms of capital are inherently social, and he thus argues for abolishing the concept. While I disagree with the idea of abolishing the concept of ‘social capital’, it requires being located within a broader context that recognises power dynamics’ relevancy. However, most common SL approaches seem, at least theoretically, sufficiently attentive to such contextualisation, which is why I use the idea of urban tree-related ‘social capital’ in this section.

As Fine suggests, ‘social capital’ can mask other variables of stratification and in Accra, politicians and voters use indigenous exclusion/inclusion norms to “mobilize voters and select their political candidates” (Paller, 2019, p. 43). Paller illustrates how clientelism, often involving members of the same ethnic group, can guide city development. Though much Ga land (see Section 4.1.2) had been alienated over the centuries, several ownership claims over now centrally located and developmentally attractive land remain with members of this group. Paller’s ‘Everyday Politics’ illustrates how “Ga dominate Accra Metropolitan Assembly (AMA)”, forming “a strong interest group when it comes to development policy and urban development” (Paller, 2019, p. 159). Another study’s interview respondents, implying the influence of nepotism, noted that “[a]ll the departmental heads come from the Ga areas” (Nathan, 2019, p. 257). When specific interest groups dominate government organisations and their members live close to each other, such configurations can affect intra-city resource allocation and prioritisation, directly and indirectly, to the cumulative benefit of specific neighbourhoods. Regarding trees, group dominance may influence investment patterns or the protection of and access to public urban trees and their benefits, both

reflecting and reinforcing opportunity inequalities between and within Accra’s neighbourhoods and inhabitants.

In Accra, numerous interactions, events, and processes can create tree-related social capital. A group of friends sits in a large tree’s shade and discusses religion, while someone else may ask their neighbour for some neem leaves to make medicine. Meanwhile, a teenager offers his visiting friend one of the coconuts that had just been harvested from a household palm. Many tree-related interactions may seem unremarkable when regarded on their own but gain importance when considered within the context of using one’s assets to pursue a sustainable livelihood strategy. The list of ways in which tangible and intangible tree benefits sustain or enhance the social capital base of Accra’s case study households and their members is extensive (Table 30).

**Table 30 Tree-related social interactions**

<b>Ex.</b>	<b>HH</b>	<b>Trees and Tree Products as Social Capital or in Social Interaction</b>
1	2	John’s compound is large, and several parts are not easily visible from his house. In the past, some coconut sellers had convinced his wife that they had agreed upon sale terms with John. However, they ended up defrauding them by not paying for the fruits they had collected. The wife is no longer allowed to sell coconuts now, and as John has a lot of outside activities and spends little time at home, their palms are often unsupervised. Fortunately, they have a neighbour who keeps an eye on the sections of land that they cannot see, and she contacts John whenever she observes coconut harvesters on his land to confirm that they have been authorised. In return, John occasionally gifts her some compound coconuts, recognising her ongoing help.
2	4	When this Kokomlemle household harvests palm nuts, they divide them into four equally sized piles. They keep the first one for the household (the head then prepares soup for all) while they gift the remaining piles to a neighbour and two distinct relatives living in Adenta, just north of Accra. Although these relatives have only ever asked for some palm nuts once, they now receive gifts of palm nuts after every harvest.

3	1	<p>The household's landlord (Nima) owns several trees within his compound. However, one of them also grows adjacent to the external wall, just outside his compound. The large <i>Terminalia</i> tree casts shade on both his compound and nearby public lands. When I visited the household for data collection, I often observed a group of four to six middle-aged men sitting on chairs underneath its crown. One of them has owned a nearby shop for about ten years, during which time the others have regularly come to visit him. They know that the tree belongs to the case study participant, but about once every year, they cut back some of the lower branches hanging over the road, posing a risk to passers-by. As they are all Muslims, they often discuss religious issues, read the Quran together and, during Ramadan, break their fast under the tree.</p>
4	3	<p>Friends sometimes visit the adult woman in this other Nima household to whom she offers free avocados from the compound's tree (when ripe). Some visitors enjoy the taste so much that they also want to plant seedlings in their homes. She grows the plants from seeds in empty water sachets, regularly watering them with the kitchen's waste water. She does not charge for the seedlings as she incurs little monetary costs in producing them and because they are destined for friends.</p>
5	1	<p>About ten years ago, person 1 built a large wooden bench that he put just outside his compound walls where he felt the air was fresh and temperatures cooler. He positioned the bench in the mango tree's shade and started to sit there in his leisure time. After a while, people from his neighbourhood joined him, some even bringing their own chairs and benches. They first small-talked but later replaced the topics with discussions about politics as their friendship developed. As most people came every afternoon, he constructed a second bench for them to sit on. Sometimes, occasional acquaintances or strangers also stop by to rest or participate in ongoing conversations.</p>
6	2	<p>As John's wife had recently given birth, several visitors brought gifts of toiletries and baby products like soap or diapers. To some of these visitors, they gifted coconuts in return, and while some asked explicitly whether they could obtain a coconut, many did not but were still offered household surpluses nonetheless.</p>

These examples demonstrate urban trees' multiple 'social capital' functions. Tree products (Examples 2 and 6), whole trees (Example 4), and the 'socio-ecological' space created by the trees' shade (Examples 3 and 5) facilitate interactions between family members, friends, neighbours, and even strangers. This type of access to both information and the circulation channels (Example 1) can mediate livelihood decision-making (Coleman, 1988; Lin, 2000). As Coleman (1988, p. 104) argues, "acquisition of information is costly. At a minimum, it requires attention, which is always in scarce supply". Indeed, John and his wife's vigilant neighbour relieves the owners of the need to guard the palms and, in the process, frees them to pursue other, potentially more productive, livelihood activities. In several examples (1, 2, 4, 6), participants gifted tree products or seedlings to people ranging from casual acquaintances to family members. Some case study participants linked these presents to items they themselves had previously received (Example 6). Others, however, had not reciprocated (yet), or at least nothing in 'kind'. As Sobel (2002, p. 151) notes, drawing on Marcel Mauss' widely-known work on gift-giving, "offering a gift creates both an obligation to accept and an obligation to reciprocate". Creating and maintaining these relationships between individuals and groups represents, in essence, the idea of 'social capital'.

Tree-related social capital in Accra is not just produced by exchanging and gifting tangible products but by how the trees create 'interaction spaces'. Due to the city's climate, tree canopy shade provides possibly *the* most favoured benefit. Seventy-eight of 100 survey respondents mentioned it when asked why they would desire more trees. People congregating underneath trees when spending time outside is a common sight, and they network, establish and strengthen connections (Examples 3 and 5) or share intelligence and gossip. Residents in temperate places like Chicago (Coley *et al.*, 1997), the Netherlands (Maas *et al.*, 2009), and Baltimore (Holtan *et al.*, 2015) interacted in similar ways, and their social activities increased due to "neighborhood common spaces that are made more hospitable because of tree canopy" (Holtan *et al.*, 2015, p. 518). Researchers have documented the importance of social relationships in facilitating access to livelihood oppor-

tunities through knowledge disseminated via people's networks in many urban locations (Beall 1995; Beall 2001), including in Ghana (Hanson, 2005; Oberhauser and Hanson, 2007; Yeboah, 2010). Tree-related social capital seems integral to many city inhabitants, improving access to material and non-material livelihood capitals that may positively affect the overall asset base or livelihood potential of individuals and groups.

## **6.4.2 Tree Propagation, Care and Management**

In this section, I discuss compound tree care and use, both within and between households. Participants identified a range of tree-related management and care activities, including seed collection and planting, seedling/tree protection, watering, fertilising, pest control, and pruning. As tree propagation, care and maintenance activities are closely interlinked, I do not attempt to discuss them separately but loosely arrange them by how these topics interact with each other.

### *6.4.2.1 Growing Trees*

All four households were or had been involved in producing tree seedlings, albeit for different reasons: own use (HH 4); own use and gifting (HH 1); sale (HH 2); and gifting (HH 3). Within households, enthusiasm for and participation in tree management varied between members and included the heads (HH 1 and 2), the head's wife (HH 3), or the head's children (HH 4). Thus of Household 4's nine members, only the teenager and young adult produced and tended trees. Growing lemons from the seeds of market-bought fruits, they hope to eventually replace the regular supply their mother purchases from the market. Creatively, they planted the seeds in various available containers, including small plastic bags or buckets, but also old tyres and even discarded shoes. While they share responsibility for tending to the seeds and planting them out in the compound, the younger brother takes full responsibility, notably for daily watering, when his sibling is

away at university. As other household members lack interest in tree propagating, including their mother as household head, the brothers pursue their interest independently of family supervision or input. When some of the lemon seeds germinated and reached a certain height, they also decided, without consulting others, where to plant the seedlings out in the compound.

In the two other multiple-member study households (HH 2 and 3), interest in raising trees also varied. In household 3, where person 2 grows avocados from seed, she started her nursery operation when visiting friends enjoyed the fruits and asked for seedlings to plant in their homes. As she had lacked experience, she refined her technique through observing the operations of roadside tree seedling vendors, who also recycle old plastic bags as seedling containers. As she has no further space to plant trees in her compound, she produces the seedlings entirely to order and in small numbers. John in Mamobi (HH 2) also produced tree seedlings for which he built a nursery planter. He, as well, did not grow the coconut seedlings for compound planting, even though he had previously planted some of his seedlings on his land. As he already earmarked land for leasing, he did not want to cover more of his compound with trees, thus producing all seedlings for sale. However, trade has been less than brisk lately, possibly because he had recently increased his asking price by a third, from 15 cedis to 20 cedis per seedling, a significant increase and a relatively high asking price.

The first household's head also reported lacking further planting space in his compound and the desire to re-develop it, which trees might impede. Nonetheless, he does produce some seedlings in a planter in front of his house. He had grown mango, avocado and soursop seedlings for a while but more recently also started experimenting with 'blackberry' (velvet tamarind). Although his acquaintances do not solely visit him to obtain seedlings, they appreciate the offer of free plants to take home and grow in their compounds. When people visit, they do not come for specific tree species but take what the man is currently growing. Usually, they hear about him propa-

gating trees at social events like funerals and weddings. Recipients of his free seedlings sometimes express their appreciation by offering him small sums of money (about five cedis) ‘to buy beer’, which he considers compensation for, and recognition of, the time he invests in producing, rather than as payment for the plant material.

#### *6.4.2.2 Maintaining Trees*

Case study households also seek to improve all-around tree health and vitality, for example watering, fertilising, or treating for pests, to maximise overall productivity. When maggots infested HH 3’s avocado tree some ten years earlier, compound residents worried about the animals spreading to their houses. However, they only monitored the situation, waiting and hoping for the maggots to disappear on their own. Person 2 reported that they were not concerned about the tree’s health itself, and therefore did not act, involving potentially unnecessary outlays of time and money. But when a chemical-selling friend visited the compound sometime after, he recommended and supplied a product that exterminated the maggots within a few days of spraying the tree. The compound residents, however, were significantly more proactive when they noticed that the tree had produced fewer and smaller avocados than previously. After discussing amongst themselves, the residents agreed to attempt to restore the tree’s full productivity. Their plan would have the men loosen the soil around the trunk and add compost, while the women would collect free cow dung from a cattle-rearer in the neighbourhood. The men would then add the mixed compost and dung to the aerated and fertilised soil around the tree roots. While the plan had not been executed when I collected the data, person 2 was hopeful that the planned intervention would eventually take place.

Other case study participants also debated whether to fertilise (some of) their trees or spend time and money otherwise. In household one, the head’s brother, who used to live in the compound,

chemically fertilised the mango tree in 2015, and the respondent noticed an increase in yield in the subsequent year. Since then, however, fruiting vigour again declined, and the tree had not produced any fruits during the harvest season prior to data collection. While the household head attributes the mango fruits' absence to a lack of pruning, he also believes that fertilising the tree would help. However, he has delayed treatment, missing the required funds to pay for chemical fertilisers. Though he enjoyed eating the mangos, he considers the financial investment unwarranted. A large mango tree also grows in household four, in Kokomlemle, and the household's head reported that increasingly fewer fruits had been growing on the plant over recent years. She attributes this decline to the tree's advanced age and concluded that any treatment would be pointless as the mango was in the process of dying. As the tree exhibited few leaves and considerable branch dieback, her assessment appears accurate.

Especially in warmer climates, trees need to be regularly watered during their establishment phase. In household one, the large mango tree occasionally received left-over household water, but the landlord frequently watered the plants in front of his home's entrance, including the seedlings and saplings. Additionally, he sometimes fertilised them with ash from incinerated household and compound waste. While the avocado growing lady from the third household also used left-over water, she mentioned that some seedlings had died when she left town for several days, and nobody paid attention to watering the plants. The two younger men in household 4 were also well aware of the need to regularly water their lemon seedlings. However, all case study participants, in addition to stakeholder interviewees, affirmed that established trees no longer require this watering level and 'will just grow on their own'. In how far climate-change induced changes in rainfall patterns may affect these assumptions should be investigated. While researchers have developed a climate–species–matrix for Central European urban trees (Roloff *et al.*, 2009), drought resistance matters, especially in (sub)tropical climates. Thus selecting suitable species and planting sites is essential to create a sustainable urban forest in Accra.



Pruning constitutes another essential urban tree maintenance procedure. In household one, a carpenter, who is the landlord's friend, pruned the mango about three to four times per year until he died five years ago. Ever since, the owner has resorted to removing only small and very low-hanging branches, reachable without any tools. His approach corresponds to John's (HH 2), who removes only dead/dying coconut fronds within his reach while the professional coconut sellers tidy up the tall palms when harvesting the fruits. In the third household, compound residents limit pruning to avocado branches that have grown too close to the ground and block people's way. The side on which the branches overgrew determines the responsible household (man) to cut them off. In HH 4, coconut harvesters also prune leaves as part of their service and person 4, the head's brother, used to cut avocado tree branches when they interfered with household/compound life. His nephew (P 2) then picked up the branches and burned them in the compound's corner. These examples illustrate how maintaining household trees depends on, e.g. physical ability and age, available equipment, and the (gendered) distribution of chores. In general, access to and control over livelihood and other resources; the ability, knowledge and willingness to perform the required tasks; perceived outcomes; and potential returns of invested time, money, knowledge and non-material claims determine urban tree-related choices and interventions.

## **6.5 Chapter Conclusion**

Researchers have investigated trees and forest products' roles in rural society, economy, nature and livelihoods (Fisher, 2004; Paumgarten, 2005; Shackleton *et al.*, 2007; Babulo *et al.*, 2009; Kamanga *et al.*, 2009; Rayamajhi *et al.*, 2012). Recently, related to a perceived growing urbanisation of poverty, interest in how city trees might or might not perform similar livelihood roles has increased (Kaoma and Shackleton, 2014; McLain *et al.*, 2014). Previous work, however, has focused on quantifying tree benefits' contributions to livelihoods. My case study, though, uses a

qualitative approach to shed light on often mundane and overlooked urban human–tree interactions. Accra residents consume tree products for subsistence or sell them for cash, two of the major livelihood functions of rural trees (Angelsen and Wunder, 2003; Babulo *et al.*, 2009). Additionally, these public and private urban trees create and maintain social capital. I neither want to participate in exaggerating “claims for the universal efficacy of social capital” (Ostrom, 1999, p. 173) nor suggest it as a universal remedy (Durlauf, 1999). Instead, I propose to increase focus on urban trees’ multiple ‘social capital’ function(s). As the concept’s critics rightly argue, this requires a framework that recognises that access to capital “can be accounted for largely by structural constraints” (Lin, 2000, p. 793; also Ferragina and Arrigoni, 2017). Using insights from SL thinking as part of a broad political ecology approach should direct attention to questions of this kind.

When compound trees are absent, renters and individuals that lack tree access through relationships or networks depend on public trees to obtain their benefits. However, naturally regenerating seedlings aside, government departments choose both species and planting sites for public trees, and their urban forestry agendas may differ from how ordinary Accra residents prioritise tree use and care. Furthermore, all main state actors involved in Accra’s urban forestry (EPA, DPG, and TCPD) aim to increase green cover and protect existing public trees from damage and felling. While large-scale felling might be more commonly associated with companies/developers rather than individual city inhabitants, people excluded from private urban forestry resources or depending on space for their livelihood activities (e.g. roadside sellers) could (involuntarily) encroach upon the existing vegetation. State and parastatal agencies need to consider the full range of trees’ social and ecological functions when assigning roles in regional planning and landscape management to urban forests. This can only be achieved in a meaningful way when taking into account the needs, views, and preferences of Accra’s rich, not-so-poor, poor, and very poor.

My second case study's contribution lies in how it explicitly examines intra-household and compound dynamics. While tree planting, care and use in relation to socio-economic variables have been widely examined, the existing studies tend to aggregate at a neighbourhood-scale (Summit and McPherson, 1998; Vogt *et al.*, 2015). Though some researchers looked at finer scales (Shakeel and Conway, 2014; Conway, 2016), their works combine at the household level and largely disregard structures and dynamics within. Following Rocheleau and Edmunds (1997), who questioned the oversimplified concept of 'household', I suggest investigating 'gender' or 'age' as further factors since the case study has demonstrated how engagement and interest in tree-related activities vary between household members. Together, this and the previous chapter now form the basis on which to read the following one that examines the potential effects of current and proposed urban forestry-related activities on the general public's ability to incorporate urban trees into a livelihood strategy effectively.

## **7 URBAN FORESTRY INTERVENTIONS: THEIR LIKELY SOCIO-ENVIRONMENTAL EFFECTS**

“And we will use our permitting system to increase the cover [...].”

**Mr Fiati, EPA**

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“[T]he purpose is several-fold: [...] we want to use it [tree inventory] to determine what we call a green index so that we can evaluate how our permitting process is impacting on tree cover within the city and to be able to tell whether it’s leading to depletion or improving tree cover. So that is the primary reason why we are taking this inventory.”

**Mr Fiati, EPA**

In this chapter, I discuss five current and proposed urban forestry-related events and processes. The design and implementation of these activities illustrate how the government actors’ focus on national to global scale tree benefits limits their functions at the individual to local scale. I suggest that the involved state actors should rethink and rebalance their management priorities and recognise the trees’ direct livelihood role in household (re)production and in mitigating some negative effects of poverty. Centring smaller scales and focusing on social justice could also eventually increase benefits at higher scales through a ‘trickle-up’ effect. I first discuss the current development of Accra’s tree stock, outlining why I refrained from using iTree Eco’s ‘forecast model’. After that, I analyse five interventions: EPA’s and DPG’s forest inventories and management plans, TCPD’s attempt to re-evaluate planning schemes for which I combine a theoretical discussion of participation and the new planning guidelines with information obtained from interviews, and recent changes to tree-related laws. Further interventions include tree planting activities in Accra

and FC's plan to turn Achimota urban forest into the Accra Eco-Park. While all discussed activities directly include urban trees, developments in seemingly unrelated sectors should not be ignored. Anticipating these possible in-between sector interactions is vital though considerably more difficult, requiring not just insight but also speculation in a dynamic and multifactorial context. To conclude, I consider how state actors could more effectively incorporate urban trees into broader poverty reduction strategies. Discussing the current and proposed activities, I adopt a non-neutral perspective that follows current models of sustainable urban forestry, which include environmental justice and equity, as well as citizen involvement as a core feature (Leff, 2016).

### **7.1 The Natural Resource Base – Development of Tree Stock**

The iTree Eco tool contains a 'forecast' component that allows the user to run models which predict how the urban forest structure may develop under various scenarios. In the default setting, 'forecast' uses a 30 year period, 150 frost-free days per year and base annual mortality rates related to tree health ratings, each manually adjustable. While running different scenarios seems appealing, considering the limited available data on Accra's urban forest structure, I decided against this as the model lacks the input necessary to obtain a meaningful output. Below, I discuss three reasons why I refrained from using 'forecast', as basing management decisions on unrealistic and unreliable numbers may create more harm than benefit in Accra.

The first problem revolves around how the model excludes natural regeneration when predicting future tree numbers. While users can manually add it as a form of 'tree planting', research on regeneration remains limited and showed a significant variance of 'planted vs naturally regrown' ratios between cities and land-use types within the city. As the only existing reference study researched North American towns (Nowak, 2012), different climatic conditions, among other factors, limit its applicability to Accra. Second, the model currently includes few 'extreme events'.

Though users can add storms and pest/disease outbreaks (Morgenroth and Armstrong, 2012; Leksungnoen *et al.*, 2017), adding further disturbances like earthquakes or flooding would increase the model's value for Accra. The final reason why I decided against using this application to forecast developments in Accra is its use of mortality rates. The default values' origins remain somewhat unclear but seem to originate from a single study of maple street trees in one US American city conducted by Nowak in 1986 (Roman *et al.*, 2016; Steenberg *et al.*, 2017). Studies on mortality rates are both limited in number and mainly devoted to North American cities in climate zones markedly different from that of Accra (Hilbert *et al.*, 2019). Furthermore, mortality rates vary widely, and an array of biophysical and human factors further influence them (Hilbert *et al.*, 2019). As the forecast's accuracy depends on these numbers, the model is unlikely to provide useful information and might instead misguide planning and management decision-making.

Simulating how an urban forest might develop is nonetheless important as structural changes affect the location, quality, and quantity of the trees' ecosystem services. In place of a complex model, I then combine information from interviews, the survey, case study, and both iTree Canopy and Eco with the existing literature. I thereby illustrate an overall trend of forest structure development rather than predict exact numbers. Green space in Accra is declining (Stow *et al.*, 2013; Owusu, 2018) and as trees constitute one component of such spaces, tree cover, in particular, is also likely to be declining. Interview and case study respondents supported this hypothesis, citing urbanisation and related construction and infrastructure development, lack of tree maintenance and animal browsing as possible reasons. Very few people felt that the tree population was stable, and not a single participant thought that numbers were increasing. Unless proven otherwise, the following section assumes that current and proposed urban forest interventions are happening within the context of declining tree cover in Accra.

## **7.2 Current and Proposed Interventions and Their Possible Impacts**

Several factors influence urban forestry in Accra or could do so in the future. I selected five current or planned events and processes to analyse how they might affect people's ability to integrate trees, and their use and management, into livelihood activities. These five topics emerged during interviews and represent a range of relevant themes, perspectives and concerns, and cover interventions and initiatives at various stages of the planning and management cycle. In this section, I first introduce EPA's and DPG's data collection plans and discuss possible problems. I then discuss TCPD's attempts to re-evaluate their planning schemes, paying special attention to the question of participation. The third topic considers recent changes to tree laws, while the fourth one presents tree-related environmental initiatives. Finally, I look at the Forestry Commission's plan to turn Achimota Forest into Accra Eco-Park.

### **7.2.1 Urban Forest Inventories and Management Plans**

Urban forest planning and management decisions require baseline information for initial assessments and continuous monitoring, including data on the current tree stock. This information is indispensable to the proper functioning of organisations responsible for urban forests. In Accra, previous research investigated green space at the neighbourhood and city-scale (Stow *et al.*, 2013; Owusu, 2018), but no inventory offers tree-level data such as species, height, location or DBH. During interviews, both EPA and DPG expressed needing this type of data. While EPA was already running a pilot inventory, DPG was hoping to collect such information in the near future. This information would enable the department to produce a plan for re-developing the city landscape and creating an elaborate and proactive tree maintenance scheme, including regular pruning and irrigation during the establishment phase and tree cover increase through afforestation. Below I discuss these activities in more detail to highlight the objectives and questions they raise before suggesting how their possible impacts on human–tree interactions in the city may look like.

Although DPG aims to promote landscape beautification and tree maintenance, its personnel feel unable to do so efficiently, lacking baseline information to inform a routine maintenance scheme. Currently, DPG reacts to problems in an *ad-hoc* manner, such as sending units when trees have sustained storm damage and need pruning or felling to protect property and people. However, the interviewee mentioned that “the department is on the verge of developing a strategic plan to take a look at the entire city landscape maybe for the next five years” (Mr Awidi, DPG). EPA, on the other hand, was already conducting a pilot study that involved two employees geocoding each tree’s location in Accra’s ‘Ministries’ area. During the interview, the respondent mentioned three main purposes. First, they aim to establish a green index to evaluate the permit system’s impact on tree cover. Second, the agency wants to evaluate how trees affect air quality and, in turn, public health (respiratory diseases). Lastly, they want to investigate whether the presence of roadside trees increases road longevity through the trees’ shade and associated lower temperatures. Both interviewees recognised the need to collect further data to facilitate the development of their respective management plans.

While the interviewees explicitly mentioned some problems related to their activities, I inferred further ones from their statements. Though DPG knows about the need for a proactive maintenance approach, it lacks resources for most of its tasks; thus the realisation of their proposed plans seems unlikely. The department’s parlous funding situation is common knowledge in Accra, and other interviewees called them “under-resourced” (Mr Yeboah, TCPD), as well as “there on paper” and “kind of dormant” (Interview Y4GG). Additionally, journalists also share these sentiments and “wonder whether the Department of Parks And Gardens still exists” (Daily Guide, 2017), calling it “neglected” (Daily Graphic, 2013a) and “dead or dying” (Daily Graphic, 2017a). The DPG interviewee repeatedly supported these statements, stressing their financial and human resource constraints. While not explicitly framed as a problem, EPA also faces issues with their ongoing project. Though two employees currently geocode trees, they do so for only part of the



working week. As they tag every tree in the pilot area, they will unlikely finish this time-consuming process soon, further impeded as the agency shares equipment between projects, making the GPS devices unavailable at times. The lack of resources to initiate or complete such data collection exercises promptly hinders the production of a city-wide management plan.

Designing an urban forest management plan for Accra not only requires certain types of currently unavailable information, but I suggest that EPA's approach also limits the usability of the data they currently acquire. According to the EPA interviewee, the employees only collect the trees' GPS locations, as they had not received the requisite training to collect data on other variables and characteristics like species composition. Even though EPA claims to know what kind of public trees are growing where, variables like species, DBH, and tree health/condition constitute the minimum requirements of a credible tree inventory (Leff, 2016). Currently, EPA spends scarce resources on collecting data that fail to meet the basic standards for meaningful data analysis, as provided ecosystem services depend on tree species, size, and state/health. Since establishing the GPS location requires approaching each tree, employees should collect further data, although this would indeed require further training for this expanded responsibility. If this additional information cannot be obtained in the current inventory, subsequent visits should be arranged to collect this data as the extra expense seems manageable and well worth the improved output. Alternatively, EPA could enlist individuals with a horticultural education, trained by the Youth Employment Agency as part of their 'Youth in Greening Ghana' module, or collaborate with DPG who already have suitably trained personnel but seemed unaware of EPA's pilot project.

To assess the possible effects that these activities might have on people's ability to utilise trees as part of a livelihood strategy, it is worth considering what EPA and DPG propose to use the data for and what this might signify in terms of likely species and site selection. EPA focuses on the trees' health impact as they absorb pollutants and how tree shading, and reduced temperatures,

could increase the road surface's longevity. These regulating ecosystem services tend to require a scalar approach at the neighbourhood level or above, with trees established along major roads and in larger open spaces suitable for clustered planting. Such a pattern is unlikely to significantly increase cover in the densely populated neighbourhoods, which already tend to be devoid of trees. Thus, EPA's plan may have little or no positive impact on the availability and accessibility of services produced at smaller scales for the benefit of individuals, households or compounds. Though the EPA interviewee mentioned the need to increase canopy cover in less green areas, he seemed sceptical about achieving this objective, identifying high rates of illegal felling due to a perceived low local valuation of trees as a major cause of concern.

The Department of Parks and Gardens, for its part, selects species based on their shading and beautification potential. This, again, reflects limited ambition: they prioritise a restricted set of benefits while refraining from planting fruit-bearing species on public lands. Additionally, resource shortage has restricted their activities to areas in the department's vicinity, where they plant trees along major roads and on government lands. The DPG respondent also noted a departmental objective to specifically green those areas which currently lack trees, benefitting from the government's decentralisation policy, because "officers who are going to be positioned at those less green areas they can work together with the assemblies" (Mr Awidi, DPG). However, as observed by TCPD, the structures in these places are weak and accommodating staff a major problem. Neither EPA's nor DPG's plans may directly reduce canopy cover in the 'poorer' neighbourhoods. However, focusing on areas surrounding DPG and neighbourhoods with better structures can nonetheless increase intra-city differences when green cover in 'richer' neighbourhoods increases further. Additionally, the proximity to trees determines the ability to benefit from its shade or beautification potential. The proposed activities appear to maintain or reinforce both people's dependence on privately owned trees in the more densely populated areas and their inability to obtain access to the services of trees they might not own.

### **7.2.2 Re-Evaluation of Planning Schemes and Participation**

In Accra, many planning schemes are not realised on the ground. While TCPD designates at least 17 % of Accra's land area for public open spaces, these areas are rarely converted into fully functioning green spaces. Although 'the green' constitutes an integral part of the department's spatial plans, in practice, buildings ('the brown') dominate the landscape. To assess this incongruence, TCPD intends to review its schemes. The respondent identified a preference for the conventional land-use planning approach as responsible for the mismatch between theory and practice. In this standard model, a professional planner/expert identifies problems and devises appropriate solutions without consulting the public (Mahjabeen *et al.*, 2009). According to the interviewee, this approach has led to residents being unaware of scheme provisions, making them (sometimes unknowingly) encroach on public green spaces and/or fail to report such unlawful encroachment. However, a different form of urban planning which emerged as long ago as the 1960s recognised that a "successful democratic planning process, like a successful democratic government, must allow for the representation of the interests and identities of its subcommunities" (Godschalk and Mills, 1966, p. 86; see also Healey, 1997; Margerum, 2002). By adopting a more participatory type of planning, which the interviewee called a 'paradigm shift', TCPD hopes to increase conformity between plans and their implementation in Accra.

Over time, community participation and its synonyms turned into a core element of a diverse set of policies and projects in and outside forestry. Governmental and non-governmental actors alike incorporated participation in sectors ranging from education to health, conservation, agriculture, and sanitation (Abbot, 2013). However, involving the community might not necessarily be the most appropriate or useful approach in all cases. Researchers and practitioners have questioned the efficiency of such projects as they tend to require more resources, both time and money, than their non-participatory counterparts (Margerum, 2002). If donors, practitioners, or 'beneficiaries' measure success based on the speed of service delivery, time-consuming participation and seem-

ingly little visible and tangible progress can deter the project's continuation (Botes and Rensburg, 2000). Though resources saved at the implementation and evaluation stages may offset higher initial costs, extensively involving people is often seen as “not cost-effective, because participation in practice is always a slow and uncertain process” (Botes and Rensburg, 2000, p. 50). While I work within a research paradigm that centres participation, its possible added value, in all contexts, depends heavily on how this approach is conceived and implemented, or indeed why it is adopted.

#### *7.2.2.1 Participation's Context: Spatial Planning in Ghana*

Participation's ubiquity “reflect[s] the ideological range of interpretations of development and different approaches to planning” (Moser, 1989, p. 81). Following Moser, this raises four questions – why participation, when participation, whose participation, how participation – which offer a framework to explore what aspects influence participatory project design and implementation. After outlining the history of physical/spatial planning in Ghana to provide the required context, I discuss each of these four questions and then suggest how a more participatory approach might affect people's ability to utilise the city's trees. In this section, I combine a theoretical discussion of participation with information obtained from the TCPD interviewee and the country's most recent spatial planning guidelines.

As remarked upon earlier, physical planning started under colonial rule (see Section 4.4.1). The promulgation of the Town and Country Planning Ordinance (CAP 84) in 1945 served as the basis on which independent Ghana performed “a series of plan-making projects at the national level and for the country's major towns and cities” (Acheampong, 2019, p. 30). Acheampong notes that long-term planning was largely absent between 1966 and the late 1980s when mostly military takeovers followed one another in short succession. In 1992, decentralisation introduced a form

of planning that “almost eliminated spatial planning from policy discourse and rendered the institutions with competences in the field weak to carry out their mandate effectively” (Acheampong, 2019, pp. 30-31). Only in 2007 did the government implement reforms pertaining to the Land Use Planning and Management Project (LUPMP), which rekindled spatial planning in the country.

Though considering Ghana’s land-use planning in detail falls outside the scope of this section (see Acheampong, 2019), I want to briefly note three aspects. First, early planning systems, such as CAP 84, limited stakeholder ‘participation’, restricting it to informing citizens about declared planning areas in newspapers and on public notice boards. Only part of the population, the one able to read in English and understand technical documents, could access this information. Second, the shift towards decentralised governance in the late 1980s aimed to increase/facilitate participation in development processes at the local level. However, legal and institutional restructuring processes meant that “[s]patial planning was essentially neglected at the national and regional levels of political administration” (Acheampong, 2019, p. 46). While planning at the local level generated schemes for cities and neighbourhoods, they were unconnected to the larger-scale socio-economic situation, resulting in two disconnected types of planning (Acheampong, 2019). Though increasing participation constituted a key element of the restructuring process, it took the form of “consultations through representation” (Acheampong, 2019, p. 159) as “heads of technical departments [...], elected officials representing various communities within the assemblies and other unelected opinion leaders would be invited on an ad hoc basis” (Acheampong, 2019, p. 158). Third, LUPMP in 2007 aimed to reform spatial planning in the country, explicitly introducing a three-tier system “based on consultative and participatory approaches” (Acheampong 2019, p. 48). As part of this process, ‘The New Spatial Planning Model Guidelines’ (Ministry of Environment, Science and Technology – Town and Country Planning Department, 2011) were developed and supposedly guide today’s planning approach.

### 7.2.2.2 *Why Participation?*

Researchers and practitioners have criticised traditional forms of project design and implementation for various reasons. Public interests can be underrepresented or not included at all, no information exchanged between professionals and the public, or strong interest groups can dominate proceedings (Moote *et al.*, 1997). Involving the community, in turn, can increase accountability, with the public taking ownership of the project (Botes and Rensburg, 2000). Furthermore, participation may cause the adoption of more relevant policy and incorporate local knowledge and preferences (Rydin and Pennington, 2000). **Why** a participatory approach might be favoured affects a project's design and, relating back to Moser, also determines who can participate, how and when. These reasons can be categorised using either Paul's (1987) five objectives of community involvement or by distinguishing between participation as a means or an end (Nelson and Wright, 1995). Analysing World Bank projects, Paul identified five reasons for adopting a participatory approach, including improved efficiency, cost-sharing, effectiveness, building beneficiary capacity and empowerment. In the means/end division, Paul's first three objectives coincide with participation as a means, with the latter two associated with participation as an end (Moser, 1989). These distinctions are important as they relate to the community's level of involvement and the question of 'power' and its transfer.

A project designed to involve the community to share costs will likely differ from one with empowerment as a core objective. While in some cases, participation includes a transfer of power away from professionals that used to decide on their own, others consider asking for the public's opinions as sufficient (Habraken, 1986). Besides the five objectives of community involvement, Paul (1987) also identified four levels of intensity. These range from information sharing and consultation, which according to Habraken, lack a transfer of power, to the public making decisions and initiating action, which involves power being transferred to the community. Similar ideas are also found in Arnstein's (1969) famous ladder of citizen participation. The many possible

combinations of objectives and intensities illustrate the complexities of discussing ‘why participation’. Imprecisions around terminology can be consciously utilised to protect hidden agendas as “participation is often used by governments as a means of legitimizing the political system and as a form of social control” (Botes and Rensburg, 2000, p. 45). Or, as Cooke and Kothari (2001, p. 14) argue, the ‘tyrannical potential’ of community participation relates to its proponents often being “naive about the complexities of power and power relations.”

The Department of Town and Country Planning aims to shift towards a participatory planning approach to increase congruency between schemes and the situation on the ground. In their new guidelines, they argue that “plans so often fail in their realization because key stakeholders are not adequately involved in the plan preparation process” (Ministry of Environment, Science and Technology – Town and Country Planning Department, 2011, p. 3). I argue, however, that their ideas may fail to empower the community as they see participation as a means rather than an end, focusing on building beneficiary capacity to share costs. As I built my assessment on the interviewee’s comments, I provide a more extensive excerpt below to help support my evaluation.

The TCPD respondent stated:

Respondent:            [...] the conventional approach to spatial planning, we prepare the schemes with direct cause to the beneficiaries, especially the community members, we don't consult them, and they don't really know the provisions in the scheme, so if I am living in a community I don't even know that this area has been earmarked as maybe a public park.

Respondent:            So somebody will start developing there because I don't know, I cannot report or stop the person but if we all prepare the scheme and we all know the provisions in this

scheme, and we all approve it, then, of course, everybody can keep an eye on what is going on within the community.

Respondent: [N]ow we are trying to review the schemes, and we want to do it in a participatory manner whereby we will go to the communities, present to them the existing situation and then the scheme that was prepared for the area because if you go through Accra now, the existing situation is really at variance with the approved scheme that you have, so we have to adapt the existing situation but we will have to let the community know what we are going to do there and they will give their inputs so when it is approved then, of course, we make also copies as billboards within the communities. So if it's an open space earmarked green the people will know that 'oh, this place' and we have to also [inaudible: one word] a signpost that this is a public park, keep off. So the people themselves, cause we don't have the personnel to always go around the city, but the communities themselves can really monitor when we involve them. And that is the paradigm shift, that is what we want to do now.

(Mr Yeboah, DTCP)

It seems that residents are primarily involved to increase adherence to designated land uses and have people report illegal developments. Through this form of 'participation', the department can extend control where its own mechanisms are insufficient due to limited resources. While they seek people's inputs, they do so after preparing schemes, suggesting little actual participation in the early phases. Rather, they attempt to "sell a prepared plan" (Godschalk and Mills, 1966, p. 86), a form of pseudo-involvement or tokenism on Arnstein's ladder where participation is



“submerged in a culture of powerful political structures and institutions (Mahjabeen *et al.*, 2009, p. 46).

The department’s plans do not seem to fundamentally question issues of power since people’s knowledges and lived experiences are not considered sufficiently. Instead, TCPD simply “let[s] the community know what we are going to do there” (Mr Yeboah, TCPD). If the department only informs the community on new planning schemes and then imposes them, like previous ones, the public’s interest to refrain from encroaching and to monitor and report misuse is unlikely to increase. Furthermore, the guideline displays a patronising tone, stating that participation “affords actors the opportunity to learn, and hence, own the process and break and transform past habits in order to achieve the desired objectives of the plan” (Ministry of Environment, Science and Technology – Town and Country Planning Department, 2011, p. 43). Such a view may put people off from engaging with or accepting any resulting plan. Additionally, one might consider the incongruence between plans and reality to be a symptom of current city planning – and urban forest structure as part of it – not meeting the population’s needs. Business as usual, disregarding people’s inputs in the planning and design stages, combined with enforcement issues, may cause problems as it can prevent the utilisation of the urban trees’ full potential both for individual/group livelihood purposes as well as in response to the global climate crisis.

### *7.2.2.3 When Participation?*

‘Why participation’ closely relates to ‘when participation’, which refers to a project’s different stages, such as planning, financing, implementing, monitoring or evaluating. While the community may participate in any or all stages, the above-discussed objectives and intensities determine the exact configuration. Based on the interview statements, TCPD seems to involve Accra inhabitants at a limited number of stages and mostly at the implementation/monitoring phase to share

costs through unpaid labour. Indeed, the planning guidelines state that involving stakeholders “serves the purpose of ensuring that the plan reflects the stakeholders needs but also that the stakeholders are aware of their obligation to invest in the realisation of the plan” (Ministry of Environment, Science and Technology – Town and Country Planning Department, 2011, p. 37). Such wording suggests limited community involvement in the planning or design phase beyond being at the receiving end of information sharing.

The new guidelines recognise three types of plans, the spatial development frameworks, relevant at the national, regional and district level, while the other two types, structure plans and local plans, are prepared at the city to neighbourhood level. The two latter types require stakeholder consultation at various stages, e.g. when presenting data analysis, after developing a draft plan and at the final plan and report stage (Ministry of Environment, Science and Technology – Town and Country Planning Department, 2011). If TCPD were to work with city occupants on a plan to efficiently and sustainably incorporate green spaces into the cityscape, the department would have already decided that such a plan should exist in the first place, as well as on its purpose and extent. This limits the opportunity for more fundamental and potentially creative ways of re-imagining urban human–tree coexistence from a bottom-up perspective. Though I do not want to exclude the possibility that the approach might provide for community decision-making power at various stages, the interview responses indicate otherwise.

#### *7.2.2.4 Whose Participation*

Close examination of community participation requires that I attend as much to the concept of ‘participation’ as to that of ‘community’. Involving the public in planning and decision-making processes now often constitutes an essential component in striving towards democracy, justice, and sustainability, both in urban planning and other areas (Mahjabeen *et al.*, 2009, p. 46). Howev-

er, communities and their knowledge base are inhomogeneous and include a diverse range of people, whose internal power relationships might exclude women, the elderly, or minority groups more generally (Mosse, 2001). Thus, who participates affects whose knowledge becomes visible. If design and implementation disregard community heterogeneity, only sections of such a community may be empowered or associated costs shared inequitably.

Besides intra-community power relationships, we need to consider other aspects when asking 'whose participation'. In almost all situations, apart from when users initiate action (Paul, 1987), a government department or a non-governmental organisation acts as a 'provider' of participation. In these situations, the provider occupies a powerful position, able to affect the programme. The provider can then construct participants as 'beneficiaries', 'clients', 'users' or 'citizens', which "influences what people are perceived to be able to contribute or entitled to know or decide, as well as the perceived obligations of those who seek to involve them" (Cornwall, 2002, p. 8). Additionally, the providing/initiating party may also define and create the space for participation which is pervaded by power relations (Cornwall, 2002). Thus, Gaventa (2004, p. 35) argues that we need to ask ourselves "how they [spaces for participation] were created, and in whose interest and with what terms of engagement".

As I lack information on how TCPD plans to inform people of these participatory approaches, I cannot comment on how they attend to the issue of community heterogeneity. Nonetheless, I suggest that the process will likely happen in 'invited spaces' (Cornwall, 2002; Gaventa, 2004), as the department itself proposes to involve the potentially affected and/or supposedly benefitting citizens. Even though spaces for participation offer possible places of resistance (Cornwall, 2002), 'inviting' participation "may have the effect of neutralising energy for engagement outside them [spaces] and may render other spaces for voice illegitimate" (Cornwall, 2002, p. 8). I suggest that TCPD's plan – limited community involvement in the planning phase combined with ex-

pected strong presence at the implementation and monitoring stage – merely maintains the status quo. A status currently characterised by high levels of community non-compliance within the context of low governmental enforcement capacity.

#### *7.2.2.5 How Participation*

Lastly, ‘how participation’ considers participation’s practicalities, such as the location of meetings, their size, time or type. These aspects closely relate to ‘whose participation’, as certain times of the day or weekdays might exclude specific groups, while large-scale meetings might favour some voices over others. In re-developing their planning schemes, TCPD wants to focus on low conformity areas. These places tend to be located in neighbourhoods of lower socio-economic status, where people often work long hours in the informal sector and have limited time to attend meetings. The guidelines envision “a departure from what in the past has been mere consultation and information provision which often came as ‘fait accompli’” towards a situation where “[p]articipation may involve information sharing, consultation and collaboration” (Ministry of Environment, Science and Technology – Town and Country Planning Department, 2011, p. 43). The planning guidelines list affected community residents as a group mandatorily to be involved in local plans. However, there is no indication that efficient mechanisms address issues of availability or intra-community power relationships, creating a danger of ‘participation by representation’ for certain sub-groups. The currently envisioned approach seems to lack any incentive for participation and appears unlikely to increase green cover and its protection in the city. With public urban trees, the department further faces the problem of ‘free riding’ as non-participating citizens can also benefit from collective goods like pollution reduction or shade, without incurring any costs, such as time spent, for getting involved (Mincey *et al.*, 2013).

### 7.2.3 Tree Laws and Tree Law Changes

In Accra, several laws and regulations<sup>13,14,15</sup> guide tree planting, removal and maintenance. Revisions to some of these laws in December 2015 changed the requirements for obtaining a permit to fell or prune a tree. While the fees for cutting a tree amounted to two cedis for domestic purposes and three cedis for commercial purposes, it now costs 80 (domestic) and 150 (commercial) cedis to cut a large tree (70/100 cedis for medium-sized and 60/80 cedis for small trees, see Fees and Charges Amendment Instrument, 2015 (LI 2228), p. 15<sup>16</sup>). Failure to obtain a permit and being caught felling illegally now results in punitive fines, officially designated as ‘administrative charges’, that were absent before the laws’ revisions. These ‘charges for non-compliance’ amount to 240/450 cedis for large, 210/300 cedis for medium and 180/240 cedis for small trees (Fees and Charges Amendment Instrument, 2015 (LI 2228), p. 31). According to the EPA respondent, this change simplified urban forest management, as previously people would simply cut trees not fearing any punishment, and “those who applied paid and those who didn’t apply just fell the tree, no charges” (Mr Fiati, EPA). However, the recent modifications likely affect people’s use of trees due to the increased costs, the onerous process of obtaining a permit, and the attached conditions. I now discuss each of these aspects in more detail, focusing on privately owned trees on residential plots.

EPA claims that the permits’ increased price and related fines for illegal cutting also increased their ability to manage Accra’s urban forest. However, the 40-fold rise (from two to 80 cedis) is excessively high for part of the city’s population. As values of self-reported income often suffer

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<sup>13</sup>Accra Metropolitan Assembly (Environmental Protection) Bye-Laws, 2017 – No. 8 to 11, available at: <https://ama.gov.gh/doc/bye-laws.pdf> (Accessed: 12.02.2021)

<sup>14</sup> Environmental Assessment Regulation, 1999, LI 1652, available at: <http://epa.gov.gh/ghanalex/acts/Acts/ENVIRONMENTAL%20ASSESSMENT%20REGULATION,1999.pdf> (Accessed: 12.02.2021)

<sup>15</sup> Fees and Charges (Amendment) Instrument, 2015, LI 2228, available at: [http://www.epa.gov.gh/epa/sites/default/files/downloads/publications/Approved%20Fees%20and%20Charges\\_LI%202228\\_\\_0.pdf](http://www.epa.gov.gh/epa/sites/default/files/downloads/publications/Approved%20Fees%20and%20Charges_LI%202228__0.pdf) (Accessed: 12.02.2021)

<sup>16</sup> The interviewee only mentioned 80 and 150 cedis and did not refer to tree size. I found this additional information when consulting the LI 2228 document.

from measurement errors (Moore *et al.*, 2000), previous research produced varying values for Accra. Tuholske *et al.* (2018, p. 6) report an average monthly household income of 890 cedis in low- and middle-income neighbourhoods of Accra, similar to a mean monthly income of about 612 cedis<sup>17</sup> in Accra's Jamestown neighbourhood (Tutu *et al.*, 2019, p. 64). These values differ significantly from an average annual household income in the Greater Accra region of 1529 cedis, translating to only 127 cedis per month (Rachmadyanto *et al.*, 2016, p. 248). The region, though, includes rural areas, which might partly explain the lower figure. Even for the highest reported income, 80 cedis for a tree felling permit equals about 10 % of the average monthly income. Therefore, residents in low- and middle-income neighbourhoods are unlikely to be able or willing to pay for a license.

Private individuals can plant a tree on their property at little or no cost, but the expectation of potentially having to pay 80 cedis for felling it might deter people from growing trees. Though it might take decades before the fee accrues, tree pests or damage to surrounding structures could necessitate early removal. Additionally, landowners become inflexible as to how they use their land, as previously planted trees can impede infrastructural developments on their plots, an issue brought up by several case study participants. Indeed, permit fees could easily reach four-digit numbers, as in the case of John (HH 2), who owns more than 40 trees and plans to clear land and lease it out for people to construct houses. Furthermore, payment is also due for pruning because “[y]ou have taken off some of the branches and the services that those branches are to provide for the general good of the public has been taken away by one person. So you must compensate” (Mr Fiati, EPA). This maintenance operation will become necessary at certain points, most likely earlier and more frequently in densely populated and built-up areas. Assuming that people know about these regulations and want to adhere to them, the anticipated spending for permits might

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<sup>17</sup> The study reported a value of US\$154 which was equivalent to 612 cedis when Tutu *et al.* conducted their research.

prevent cash-poor individuals from growing trees on their premises. In practice, however, illegal pruning or felling on private property might go unnoticed due to limited official surveillance.

Contrary to expectations, the EPA interviewee reported an increase in permit applications which he attributed to the penalties for illegal felling. Moreover, he stated that “most people prefer to plant because there are direct benefits apart from beautification. [T]here is shading, and the aesthetics, and the wood. Yeah, most people would like some trees in their home” (Mr Fiati, EPA). Though not representative, case study participants’ responses suggest that this might be a misconception. One participant would refrain from further planting if these laws were properly enforced as the permit’s cost exceeds the monetary income she could realise from the tree products’ subsistence use or commercial/market exchange (HH 4). She questioned the system’s utility and efficacy, given that nobody had ever tried to enforce the law in her neighbourhood. Another participant shared her sentiments, being dismissive of the regulations and convinced they were too impractical to be enforceable (HH 2). The new system’s effects might emerge as both more complex than assumed and not entirely positive for long-term green cover sustainability. The revised laws increase EPA’s tree management options and demonstrate the value the agency attaches to urban trees. However, a paradoxical effect might occur if the law deters tree planting on private property, thus negatively affecting people’s ability to include trees in their livelihood activities. Even though the building code stipulates that each plot must contain at least three trees, the law’s enforcement seems insufficient to counterbalance financial (and administrative) barriers to tree planting for individuals of (very) limited economic means.

Apart from the high fees, the process of obtaining a permit could further discourage applicants. As described by the EPA interviewee, it is time-consuming and includes several restrictions and conditions. The procedure starts with an application form that requires information on the location, type and number of trees to be felled and the justification for the proposed felling. An EPA

employee then inspects the plot within two days “to establish whether the reason for deciding to remove the tree is valid” (Mr Fiati, EPA). If deemed invalid, the inspector might recommend pruning instead of felling. After the site visit, the employee prepares a report which passes through several levels of vetting until the executive director either grants or denies permission. While the EPA interviewee considers the application form easy to complete, it might represent a significant barrier for illiterate people faced with the option of investing monetary and other resources in obtaining a permit or cutting illegally. Additionally, applicants need to travel often long distances to the agency to acquire the relevant papers, requiring further expenses of time and money on top of the actual felling fees. These processes effectively marginalise and undermine the capacity of low-income earning individuals, those working long hours and/or residing in distant neighbourhoods, from productively engaging with a public institution.

EPA exerts a high level of control and decision-making power at all stages of the permit process. As summarised by the EPA interviewee, “we do an assessment, we check the site, we check the kind of trees, and if it is agreeable with us, then we issue the permit” (Mr Fiati, EPA). Even while recognising that the agency’s mission to protect the environment entirely justifiably leads to refusal of some permit requests, the process nonetheless disadvantages sections of Accra’s population. When considering an application, agency officials also consider the surrounding area’s tree density and “[i]f it’s very sparse we are less likely to grant it unless we think that there is an imminent threat to life or property” (Mr Fiati, EPA). Thus, EPA’s approach reduces the chance of obtaining a permit in comparatively less green areas, which tend to correlate with lower socio-economic neighbourhoods. Thereby, they introduce uncertainty over whether tree owners can legally prune, pollard or completely remove their trees in the future. Furthermore, applicants have to pledge to plant two trees for each one cut, de facto increasing the number of trees on the land. In densely populated neighbourhoods, these conditions might further deter tree planting. While EPA allows replacement planting on public spaces or school grounds, these arrangements require



further resource commitments on the part of residents to work with DPG to locate suitable sites or places.

The recent changes have over-complicated the permit process and created a system that disadvantages and deters certain population groups from planting trees. As the chapter's introductory quotes indicate, EPA itself seems unsure of the system's impact as they conduct their current tree inventory to analyse if the new permit process depletes or improves tree cover. To simplify the process and increase the likelihood of it having a positive effect on the city's green while minimising the costs to the city's poor, I suggest three changes. First, application forms should be obtainable at readily accessible locations across the city. Second, the required information should be easy to assemble and report. Third, prices should be tiered to avoid the risk of impoverishing sections of the population or forcing them to break the law for lack of resources. Additionally, EPA might need more personnel to process applications thoroughly and promptly to avoid delays. This example illustrates through which mechanisms a government agency can affect land-use decisions on private property. Focusing on the intended outcome – in this case, to protect and increase tree cover on private land – while failing to create a feasible process to achieve this objective, however, might have unintended consequences. In the worst case, actual effects might be opposite to the intended ones, such as a decreasing or stagnating tree cover on private land rather than increasing planting activities.

#### **7.2.4 Tree Planting and Other Environmental Initiatives**

Large-scale tree planting exercises have recently been announced for Ghanaian cities, including Accra. 'The Green Republic Project', a youth-driven grassroots effort, aims to plant 20 million trees between 2018 and 2028. Tamale's Metropolitan Chief Executive announced plans to add 20 million trees to the city within a single year in 2015 (Daily Graphic, 2015). The Kumasi Metropol-

itan Assembly aims to restore its garden city label through planting programmes, and AMA wants to plant 100,000 trees a year, starting in 2018. Nationwide, several other projects include tree plantings, such as the ‘Greening Ghana’ initiative, a joint effort between FC and YEA, which aims to employ 15,000 people in its ‘Youth in Agriculture and Afforestation Module’. While similar projects elsewhere have succeeded in planting the stated number of trees (e.g. in New York), others, like Los Angeles or Kumasi, have fallen short of their targets (Daily Graphic, 2017b). The number of trees to be planted is often absurdly high, especially considering the lack of personnel or volunteers. Furthermore, such programmes require suitable land and resources to maintain the seedlings. How such projects are designed and implemented affects the types, location, quality and quantity of produced ecosystem services. In this section, I illustrate why existing initiatives may fail to produce individual scale, livelihood relevant benefits, specifically for low-income residents. As such, these projects often miss the opportunity to utilise urban trees as part of a poverty reduction approach.

Over the years, Accra has participated in several initiatives incorporating trees and green spaces. The BreatheLife Accra Project forms part of the Urban Health Initiative supported by the World Health Organization. It focuses on improving air quality, including via tree planting in selected schools. The EPA interviewee also discussed this tree benefit, as the agency’s tree inventory data will be used to analyse the relationship between respiratory diseases and canopy cover. But Accra is also a member of the global C40 Cities climate leadership group, which addresses climate change and the 100 Resilient Cities (100 RC) programme that aims to increase cities’ resilience to physical, economic, and social shocks and stresses. The TCPD interviewee stated:

Respondent:            I think there is a paradigm shift now worldwide, and we are talking about globalisation. So Accra is not an isolated place, we are battling with resilience, resilient cities, 100 Resilient Cities, and Accra is part of it.

C40 is also being some projects [...], and greenery is an important aspect of it. [...] the green is very, very important to us and we want to really re-vitalise Accra with respect to greenery, and I have told you the mayor's vision is to make sure that all the open spaces we develop it into greenery and also trying to plant and nurture trees along the streets in the communities. So that is the vision. So greenery is very, very important.

(Mr Yeboah, DTCP)

In 2014, Accra joined the 100 RC network and developed the Sustainable Greening and Beautification of Accra' project (SGBA), a component of its resilience strategy. The network receives financial support from the Rockefeller Foundation and offers its members financial and logistical guidance to establish a Chief Resilience Officer position, support for developing a resilience strategy, and access to partners that can help develop and implement such a strategy. In 2019, Accra released its strategy, which also aims to contribute to achieving the UN Sustainable Development Goals that Ghana committed to. At the national level, these global objectives form part of several policies, including the President's Coordinated Programme of Economic and Social Development Policies (2017-2024) (Akufo-Addo, 2017) or the Medium-Term National Development Policy Framework (2018-2021). The latter specifically mentions the promotion of urban forestry as one strategy within the focus area of 'Climate Variability and Change' (National Development Planning Commission, 2017, p. 189). By reducing greenhouse gases, the country's national policy aims to make human settlements inclusive, safe, resilient and sustainable. While the documents name FC and EPA as collaborating agencies, they explicitly mention neither DPG nor TCPD, though they might also participate, as their ministries, MLGRD and MESTI, are part of the process.

As part of the resilience strategy, SGBA contributes to the broader aim to “[d]esign and adapt infrastructure to maximise co-benefits and simultaneously address Accra’s flooding, waste, sanitation, and climate challenges” (AMA and 100 Resilient Cities, 2019, p. 38). The trees in green spaces and parks are supposed to reduce flooding and improve air quality (AMA and 100 Resilient Cities, 2019, p. 60), two problems that caused the premature death of several thousand inhabitants (Asumadu-Sarkodie *et al.*, 2015; World Health Organization, 2016). This activity’s timeline is defined as ‘short-term’, signifying a length of 1–2 years, and its status is described as ‘on-going’ (p. 60). Further information about the project’s specifications remains limited, but groups like the Bank of Africa, Ghana Commercial Bank, Ecobank, or the Church of Jesus Christ of Latter-day Saints have pledged their support and ‘adopted’ certain spaces as part of their (corporate) social responsibility. The Metropolitan Assembly’s webpage<sup>18</sup> describes the project as “aimed at beautifying the metropolis”, a cultural ecosystem service, with no reference to provisioning services. Accra’s network memberships, interview excerpts, and national policies demonstrate an orientation towards the national and international scale, prioritising related tree benefits rather than focusing on, or at least including, provisioning services for individuals to benefit from directly.

Due to urban forestry’s multipurpose nature, individuals could also benefit personally and directly from trees planted for climate change mitigation, provided they are accessible and grow in reasonable proximity. However, SGBA’s geographical focus prohibits this option as it aims to “transform the Independence Avenue through the Ridge enclave to the Ako Adjei Interchange and the environs of the Accra Sports Stadium”<sup>19</sup>. While these are pilot areas<sup>20</sup>, they suggest a focus on major roads and on already comparatively green areas like North Ridge, with the necessary

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<sup>18</sup> <https://ama.gov.gh/news-details.php?n=cnMybzU5MnFuc3A2NDIxMDc3cDEycDJycW5xcnJxNXBzMXI5cHI4MA%3D%3D> (Accessed: 10.02.2021)

<sup>19</sup> <https://ama.gov.gh/news-details.php?n=cnMybzU5MnFuc3A2NDIxMDc3cDEycDJycW5xcnJxNXBzMXI5cHI4MA%3D%3D> (Accessed: 10.02.2021)

<sup>20</sup> <https://www.todaygh.com/ama-launches-greening-accra-project/> (Accessed: 19.01.2020)

public spaces available. As I demonstrated in Chapter 4, levels of canopy cover and socio-economic status tend to correlate, implying that the residents who could benefit from additional trees will find it difficult to access the new plantings. Additionally, the project also includes “community durbars, house-to-house sensitisation on protection of environment, promotion of green space development and the improved awareness”<sup>21</sup>. These activities relate to my argument in Chapter 5, where I suggested that several government actors misclassify the public’s different priorities as a supposed lack of awareness and knowledge.

The ambitious SGBA project ties in with the mayor’s and president’s aim to green and clean Accra. However, its ability to make available and accessible tree benefits of direct livelihood importance seems limited. In this project, DPG is responsible for maintaining the green spaces, which it considers an opportunity to re-vitalise the department. Considering its resource situation, I question the sustainability of these activities as they already lacked financial resources, employees, tools, and equipment to adequately maintain the city’s existing tree cover. Unless the government increases the department’s budget, it seems unlikely that ongoing and proposed interventions will create lasting effects. Furthermore, DPG’s inefficient tree propagation method, which does not produce enough seedlings for larger-scale afforestation schemes, has so far also impeded their desire to green Accra. Pressured by the project’s short timeline, DPG might focus only on the selected areas, further decreasing their ability to green the city more equitably.

### **7.2.5 Achimota Forest Turns Eco-Park**

Achimota Forest, managed by the Forestry Commission, is located in the city’s north and covers approximately 3.6 km<sup>2</sup>. In the early 1920s, the British established the forest as a fuelwood plantation, at that time located well outside Accra’s boundary. Following a series of species tests, they

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<sup>21</sup> *ibid*

restricted nursery propagation and plantation stocking to neem and *Cassia siamea* (PRAAD, ADM 5/1/84), as other species failed to establish due to scarce and irregular rainfall (PRAAD, ADM 5/1/80). Over the years, the forest lost its role as a peri-urban firewood plantation and became incorporated into an expanding capital city. While Achimota previously covered almost 5 km<sup>2</sup>, the area has gradually but steadily lost land to encroachment, a fate shared with the Kumasi Forest Reserve (Ahmed and Puppim de Oliveira, 2017). Today, individuals and groups use the forest for recreation and as a spiritual retreat. FC reports that Achimota hosts 20,000 visitors annually, generating a revenue of US\$60,000 from entrance fees. Recently, there has been much debate about FC's plans to transform Achimota Forest into something called the Accra Eco-Park. As FC refused to be interviewed on the topic, and official information remains unavailable, I base this section on newspaper reports and interview statements from third parties. To suggest how the project might affect people's ability to use the forest, I first discuss the issue of participation before outlining how the proposed changes might also change the forest's user base.

Over the past decades, Accra's urbanisation caused rapid and unplanned developments, resulting in encroachment on the forested area. In 2009 FC consulted stakeholders like the Ministry for Lands and Natural Resources to investigate how to protect Achimota against further conversion and degradation (Daily Graphic, 2016a). FC's Chief Executive stated that there was a "need to undertake innovative ecotourism development as a means of safeguarding the ecological integrity of the forest" (Daily Graphic, 2014c). They further stated that they "looked for success stories in ecotourism development elsewhere" and shared their findings "with major stakeholders in a consultative process that was transparent" (Daily Graphic, 2014c). Besides protecting the forest, FC expects to create hundreds of new jobs and further revenue from tourism. In November 2011, the Forestry Commission supposedly obtained the public's support through a consultative process (Daily Graphic, 2016b). The Commission agreed with a private partner, Aikan Capital Limited, on a ten-year lease, with the Ghanaian company responsible for designing, building, and op-

erating the park. Total project costs amount to US\$1.2 billion, of which the private partner will cover 45 % and FC the remaining 55 %. While the project's construction, estimated to take about seven years, supposedly took off with a sod-cutting ceremony in August 2016 (Daily Graphic, 2016c), I noticed no real progress when collecting data in 2017.

#### *7.2.5.1 Lack of Participation*

The Forestry Commission's Chief Executive stated in a newspaper article that they had consulted major stakeholders before drawing final design plans (Daily Graphic, 2014c). Nothing indicates, however, that the Commission included members of the public. One interviewee, the Achimota visitor/pastor, confirmed that FC excluded the prayer groups, which regularly frequent the forest, from decision-making. He described how he visited Achimota one day and saw a sign at the entrance announcing the area's transformation into the Accra Eco-Park. Neither the respondent nor anyone he knows protested as they consider themselves lacking the power to do anything against FC's plans. Trying to resist the project, a group of four individuals took FC, Lands Commission and EPA to court, as they feared the project would harm the environment, increasing health risks and other hazards, which the city's inhabitants would have to contend with (Daily Graphic, 2016d). At the same time, in 2016, a newspaper article argued how "the people of Accra will not be given the opportunity to comment, get involved, participate in, understand and benefit from a project that is going to affect their lives forever" (Daily Graphic, 2016e). Based on the available information, I conclude that FC excluded at least one major stakeholder, the general public, from participating and that the process was intransparent.

Though several government agencies like EPA, the Tourist Board, or the Ministry of Lands and Natural Resources support the project, others oppose the plans. The Minister of Environment, Science, Technology and Innovation, for example, does not think the park's supposed environ-

mental benefits justify its creation (Ghanaian Times, 2017). Concerns have also been voiced by the National Development Planning Commission, which warns that the transformation may cause increased flooding as the planned structures replace tree cover, thereby reducing the soil's absorptive capacity and generating greater run-off (Daily Graphic, 2016f; Daily Graphic, 2016g). The TCPD interviewee shared these sentiments, strongly opposing the project. He described how FC, in 2016, contacted the department and asked for a change of land-use demarcation, which TCPD refused. While the respondent stated that FC could not develop the forest unless his department approves of the land-use changes, several interests compete, and it remains unclear which interest and, therefore, vision will prevail. The latest online newspaper article on the Eco-Park project specified that FC was currently reviewing the terms for the construction with the investor (Daily Graphic, 2018).

#### *7.2.5.2 Change of Users – Change of Use*

Achimota forest currently houses many prayer camps, tree-enclosed areas of varying sizes where FC has cleared the undergrowth, providing space to religious groups to hold their services. Eco-Park plans also include a place for prayer, described as a spiritual enclave with worshipping areas, a pavilion, and a grotto. However, plans further outline an amusement park, a cultural village, a walkway, a drive safari (Daily Graphic, 2013b), eco-lodges, camping sites, a restaurant, and a butterfly sanctuary (Daily Graphic, 2013c). Considering that the available area amounts to only 3.6 km<sup>2</sup>, it remains unclear how these facilities can be accommodated, especially since one million trees are also earmarked for planting in the park (Daily Graphic, 2018). In 2013, Papa Kwesi Nduom, the founder of the Progressive People's Party, the country's third-largest but number-wise insignificant one, urged the then-president not to allow the forest's conversion to proceed. He mentioned the lack of government support for other parks in the country and questioned the



proposed development's feasibility. In his opinion, the development would turn the forest into an amusement park, defeating its purpose as a greenbelt (The Chronicle, 2013a).

Besides potentially reducing tree cover, the costly Eco-Park would likely increase the current entrance fee of 0.5 cedis. According to the interviewed pastor, entrance previously cost 0.2 cedis and the higher price already excluded some people. A further (drastic) rise will change the visitor profile from a predominantly local population to a more international eco-tourism clientele with higher purchasing power, even though FC stresses the importance of local patronage.<sup>22</sup> In the view of FC's Chief Executive Officer, "families who are often stranded for lack of place for real relaxation will soon have something to smile about" (Daily Graphic, 2013c), and the Deputy Minister for Lands and Natural Resources added that the park would offer Accra residents another weekend or holiday destination besides the beaches (The Chronicle, 2013b). The available evidence, however, suggests that the average resident might find it difficult to afford entrance to the forest in the future, excluding cash-poor individuals from benefitting from the cultural services Achimota Forest currently provides. The forest's decreasing area seems to offer a convenient explanation as to why FC needs to transform it into an eco-tourism park. The interviewee from GYEM shared this view, opining "it was just an idea to kind of commercialise the place and make money out of the place, urbanise the place and make money out of the place" (Mr Commey, GYEM).

### **7.3 Facilitating Tree Planting**

The five examples of Accra's urban forestry-related events and processes I have discussed above illustrate how these kinds of interventions may reduce people's ability to use trees within a livelihood context. While access to privately owned trees improves an individual's resource base,

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<sup>22</sup> <https://www.fcghana.org/page.php?page=283&section=28&typ=1&subs=286> (Accessed 19.01.2020)

changing laws can reduce the natural capital's usability. Besides, international institutions and processes also affect national developments, such as the Rockefeller Foundation discontinuing its funding to 100 RC in 2019. Accra's membership in this and similar groups, EPA's research interests, DPG's species selection criteria and FC's Eco-Park plans indicate a preference for tree benefits with limited or no direct livelihood function at the micro or local scale. Instead, most government actors focus on the national to global scale, trying to benefit the Ghanaian economy by commercialising urban trees, utilising them to reduce expenditures on road repairs, energy and water infrastructure, and as a component of climate resilience strategies. Many households in densely populated areas rely exclusively on public tree benefits and are therefore especially susceptible to, and limited by, government actors' decisions. In such cases, there is no direct individual, household or compound control over the tree resource, whose availability and accessibility may change unexpectedly. Thus, tree benefits might act as safety nets in times of shocks or stresses but cannot efficiently become a part of long-term sustainable livelihood strategies capable of reducing poverty in a lasting manner.

The existing structures, processes, and interventions prioritise the larger scales and consider further tree functions as an afterthought, if at all. To achieve Accra's greening objectives, city residents' support and compliance will be crucial. However, the current situation offers few incentives for private tree planting and the protection of public trees and green spaces. Urban forestry, multipurpose in nature, can address several issues simultaneously, although planning and management decisions determine species and site choices, and therefore the prioritised scale of activity. While trade-offs will always be necessary, a larger variety of configurations could be included in the decision-making process. This entails accepting that incorporating individual scale benefits might result in less than ideal urban forest structures for globally important ecosystem services, such as climate regulating ones (Heynen, 2003). However, if government agencies were to focus on tree benefits of more direct livelihood relevance, the general public might be more inclined to

prioritise tree protection and care, thereby simultaneously creating positive effects at larger scales through increased tree cover and health.

Assuming relevant departments and agencies agree with my assessment, the challenge becomes how to amend existing structures and processes. I do not want to list specific actions or devise a road map to be followed. Rather, I suggest some general ideas that could initiate conversations with the city's residents who should contribute to the process. To facilitate and support planting on private lands, especially in densely populated and often 'poorer' neighbourhoods, the permit process should be simplified. Pruning constitutes a routine maintenance operation, and while EPA correctly states that it reduces tree benefits in the short to medium term, it does not threaten tree survival and longevity. Furthermore, the permit application system is overly complicated, prohibitively costly, obstructive in nature, potentially time-consuming and with limited prospects of success. Moreover, this 'user-unfriendly' process ignores the complex, varied and dynamic nature of human–tree interactions in Accra's often physically constrained spaces. Reducing people's flexibility in making routine and necessary tree maintenance choices, as the current state management system seeks to do, could undermine their interest in and willingness to invest in tree planting, protection or nurturing in the first place.

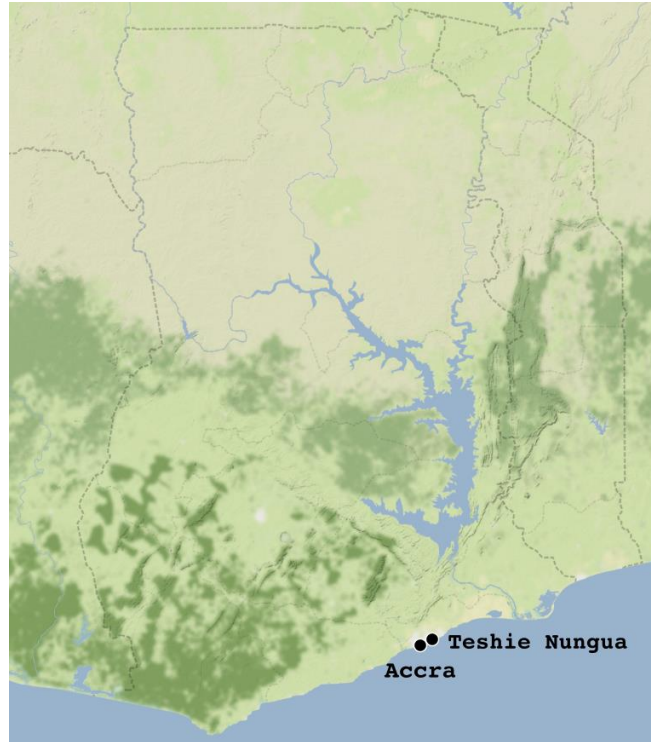
Instead of regulations, incentives may better help to protect and retain urban trees on private lands (Ordóñez-Barona *et al.*, 2021). Utilising the green index EPA wants to produce, the government might consider offering tax or other financial incentives for tree planting on private property in sparsely vegetated urban areas. Where initial tree purchasing costs prevent planting on private land, a tree purchase voucher system could benefit cash-poor individuals (Thompson, 2018). However, the potential efficiency in Accra would have to be analysed as Thompon's case study in Louiseville (US) suggested low initial costs as people used seeds and growing containers they already owned, something I also observed in my case study. Nonetheless, the Louiseville

cost-benefit analysis demonstrated how these vouchers, given to private property owners by the government, benefitted both parties. Such systems could also be financed through private-private partnerships, with large companies not just ‘adopting’ open spaces but also funding seedling production and distribution to private landowners. However, such voucher systems may not just allow the government to control costs but to “regulate tree species to ensure economic and environmental impacts are realized” (Thompson, 2018, p. 9). Thus implementing an incentive approach requires attention to avoid excessive government interference with private property owners’ species choices.

Involving the Youth Employment Agency might offer a feasible way to ensure adequate seedling and sapling maintenance, as trained participants could help people who lack the required tools or the physical ability to regularly water or prune plants. Communicating with the public should be the first step as they might come up with creative ideas, such as the group of citizens who came together in Teshie Nungua, just east of Accra, to build a small children’s park (Fig. 41). Here, the local imam provided water, another resident tools and storage space for materials, and several individuals contributed money via their mobile phones to cover additional project costs for grass or labour for planting.<sup>23</sup> Similar citizen-driven activities involving trees might be an option elsewhere in Accra, given government and private sector support, and subject to *meaningful participatory negotiation* of progressive access rights, imaginative joint management arrangements and secure income or funding streams.

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<sup>23</sup> <https://www.dw.com/en/accra-is-becoming-a-concrete-jungle-so-locals-are-building-their-own-parks/a-49730607> (Accessed: 20.01.2020)



**Figure 41 Location of Teshie Nungua**  
Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL

## 7.4 Chapter Conclusion

Prioritising individual to neighbourhood scales might create an urban forest that does not provide ‘optimal results’ for other scales (Heynen, 2003), such as the global one, preoccupied with the trees’ role in mitigating climate change’s negative effects. In Accra, government departments’ management priorities focus on these larger scales with urban forest strategies devised to maximise benefits like health, energy savings, and produce (climate change) resilient cities. However, the current top-down approach neither created nor maintained a sustainable urban forest that efficiently provides these benefits. A bottom-up approach that centres trees’ livelihood functions for (re)production could, in turn, incentivise people to plant on private lands and maintain and protect both public and private trees. This strategy might provide a more feasible way to increase overall tree cover rather than the government’s current approach, which largely fails to establish the relevance of urban forestry for people’s everyday lives. A detailed understanding of the mul-

tiple and complex ways in which urban forestry is implicated in livelihoods is an important first step. This may lead to re-thinking planning and management and, eventually, developing approaches and strategies which increase the likelihood that city residents can and want to decide **for** tree planting and care.

## 8 CONCLUSION

“I think there are two ways to open the doors to every transformational change: One, presidential leadership and two, public advocacy and action. Presidential leadership we don’t really have so much control over it, but we have control over public advocacy and action, and I think sometimes when the campaign is so strong, and the media actually buys into it, and the media wants to talk about it then it challenges government to also engage.”

**Mr Commey, Ghana Youth Environmental Movement**

In this concluding chapter, I propose five recommendations for urban forestry in Accra. I arrange these suggestions in a stepwise process, which reflects the order in which I think these recommendations should be implemented. The first step is to diversify the knowledge and experience base on which urban forestry-related actors in Accra make their decisions. In the second step, the city should, together with relevant stakeholders, develop an urban forest management plan. Related to this step, there are two further recommendations, which include re-evaluating species selection criteria/species–site matching and a focus on disadvantaged neighbourhoods. The last step I then recommend is to fund the Department of Parks and Gardens. I begin the chapter by summarising the results of the previous ones, discussing the findings in relation to my research questions. I then synthesise my work’s components demonstrating how they relate to each other and what theoretical and practical implications this more holistic view generates. After that, I discuss three ways in which my research adds to political ecology and urban forestry research. Based on my assessment of current urban forestry practices, I then discuss the above-mentioned five recommendations in more detail, which address the city’s two most fundamental urban forestry problems. First, a common narrative that falsely blames marginalised groups for low and/or diminishing tree cover and, second, the likely effects of current and proposed inter-

ventions, which fail to capitalise on urban forestry's multi-purpose nature. Where relevant, I try to estimate my recommendations' level of difficulty in terms of implementing them, the necessary contextual pre-conditions, and their likely effects. I conclude the chapter with a look both backwards and forwards, discussing problems encountered during data collection and the pathways these issues suggest for future research.

## **8.1 Summary and Synthesis**

In this thesis, I have demonstrated how historical events and processes, most notably colonial city planning approaches, created a lasting structure of inequity that persists until today. While other variables, such as tree pests or extreme weather events, also impacted the city's urban forest, they have not as fundamentally changed forest structure as the city's racially motivated morphology. Though Achimota Forest originated as a fuelwood plantation, colonial tree planting focused on producing shade and beautifying selected parts of the town, especially those inhabited by the British. These tree benefits remain important in present-day urban forest planning and management, constituting the Department of Parks and Gardens' main species selection criteria for public trees. My analysis demonstrates how we cannot fully understand contemporary urban forest structure without investigating the legacy effects that have contributed to its formation. Thus, depicting currently existing intra-city disparities and correlations between forest structure variables and neighbourhood characteristics can create simplistic interpretations of cause and effect. Failing to assess the context, which includes investigating urban forest development over time and across space, may falsely promote a view that identifies marginalised groups as responsible for the structural discrimination they experience. Such accounts need to be critically examined to expose the mechanisms and interests that both facilitate and benefit from their existence and deployment.



I have further presented numerous strengths, weaknesses, opportunities, and threats that urban forestry-related stakeholders identified regarding their use and management of the city's trees. I combined these individual accounts and showed how government departments, NGOs, and individuals whose work includes trees and their products currently manage Accra's urban forest. These actors often fail to achieve their respective objectives due to resource shortages, unnecessary and wasteful duplication of effort, and destructive intra-sectoral competition. A detailed urban forest management plan, whose aims would determine agreed-upon activities and a specified course of action, could remedy the second and third problems. Creating such a plan is fraught with potential pitfalls concerning citizen participation and inclusion of diverse knowledges. However, the current undirected situation offers little direction and no coherent response to ongoing processes of green space loss or socio-environmental inequalities within Accra.

The Department of Parks and Gardens restricts its tree planting mostly to sites along major roads in the headquarter's vicinity. A shortage of GPS devices hinders EPA's attempts to geolocate the city's trees, and sub-metropolitan officers have to walk to and through neighbourhoods, reducing the time available for tree-related work. Rather than acknowledging these management shortcomings and how they negatively affect the urban forest, several officials prefer to evoke the narrative of 'the unaware and disinterested poor destroying the environment'. Such explanations require no acknowledgement of fault on the part of the government or its agents. Thus, residents in low canopy cover neighbourhoods are not just blamed for current disparities in tree cover but also for the ongoing loss of green space and the related decrease in benefits like reduced temperatures, air pollution and stormwater run-off absorption.

I then focused on households' experiences, illustrating the multiple (re)productive functions of private and public trees in people's lives and livelihoods. Household members differed with regards to their role in the management and use of privately-owned trees. Some actively planted

and maintained trees, others ‘passively’ enjoyed their benefits or showed little interest in, albeit being aware of, the trees’ multiple purposes. These positions cut across age ranges, gender, and position, but in all four case study households, people managed their trees for various reasons, including direct consumption of fruits and tree-based medicines or use of tree products as part of gifting and exchange systems. Therefore, I suggested that the physical capital ‘tree’ not only affects human capital (diversifying a person’s diet or improving their health) but can also constitute an essential component in creating and maintaining social capital. Furthermore, in ameliorating micro-climates through their shade, trees offer a space in which people can meet and interact. The trees thus further act as vital intermediaries in the process of creating and maintaining social capital. The household questionnaire and case study both clearly demonstrated the public’s awareness of and knowledge about the importance of urban trees, contrary to what a major actor like EPA claimed. As many of the benefits that households manage their trees for are not current state policy priorities, public trees on which tenants in treeless compounds depend often fail to meet the people’s needs and requirements.

Finally, I selected five urban forestry-related interventions to analyse their likely effects on urban trees’ functions within a sustainable livelihood framework. These examples included current and proposed tree inventories, a re-evaluation of city planning schemes, changing tree laws, large-scale tree planting activities, and Achimota’s development into the Accra Eco-Park. I outlined how these interventions might affect Accra’s urban forest and thereby the type, location, quality and quantity of provided tree benefits. While resource shortages hinder EPA’s and DPG’s inventory (plans), a lack of participation, over-complicated processes, and a restricted set of prioritised tree benefits reduce the interventions’ ability to benefit especially marginalised population parts. Generally, I identified little indication that the five examined events and processes could successfully decrease intra-city disparities and might instead widen them even further. Disregarding the individual to local-level tree benefits might disincline the public to participate in tree propagation

and protection and thus decrease overall tree cover and, thereby, national to international-level benefits. I, therefore, suggested considering a bottom-up approach that might produce larger trickle-up effects than the current top-down approach.

Accra's trees are distributed unevenly across the city and continue to decrease in number. Tracing the history of both urban forestry and city planning, I argue that current intra-city green inequalities cannot be understood without referring to the legacy effects of past events and processes. Ignoring these impacts creates conditions favourable for simplistic arguments, which hold marginalised groups responsible, rather than centring discourses that emphasise the fundamental contribution of institutional and structural discrimination. Portraying inhabitants of low canopy cover neighbourhoods as unaware of tree benefits turns them into easy scapegoats for the continued loss of green. A problem, I maintain, more likely due to the absence of a comprehensive urban forest management plan, a lack of resources, and missing coordination between major actors/stakeholders. My qualitative-focused, household-based analysis supports the claim that policy and decision-making state actors largely fail to recognise and acknowledge the trees' multiple (re)productive livelihood functions. Therefore, current and proposed developments fail to more extensively meet people's needs through establishing a multi-purpose urban forest that offers a wide range of benefits simultaneously across geographical space and scales. Instead, the dominant narrative and prevailing management priorities are more likely to widen already existing disparities, disproportionately harming marginalised population groups and further restricting their access to urban trees.

## **8.2 Thesis Contributions**

Quantitative data collection approaches, (post)positive views, and particularly a focus on European and North American cities have long dominated urban forestry and cognate disciplines (Roy *et*

*al.*, 2012; Shackleton, 2012; Ostoić and Konijnendijk, 2015; Shackleton *et al.*, 2021). Urban forestry thus lacks a comprehensive empirical base, given its limited coverage of views and experiences of more than three-quarters of the world's population, which has so far inhibited its ability to produce genuinely inclusive theories and frameworks. My research has not only used a qualitative approach, produced primary data on Accra's forest structure, investigated its development over time and across space, and demonstrated the effects of conflicting management priorities, but it has also added another geographical data point to current urban forestry research coverage.

Due to urban forestry's context- and place-specific nature (Roman *et al.*, 2018), qualitative research approaches offer valuable tools for data collection, which my findings demonstrate, notably in relation to three main points highlighted in what follows. First, the discipline requires a stronger historical focus that moves beyond simply outlining its emergence and growth in countries or regions historically favoured by researchers, to providing detailed and contextualised city-level analyses capable of assisting in establishing the details of often complex temporal and spatial linkages or interactions *in space/place*. Second, a sustainable urban forest, large parts of which grow on privately-owned land, requires attention to people's emotions and affective behaviour, and cannot be created and maintained through use of an entirely cognitive, information-providing approach such as the EPA's focus on education campaigns. Third, individual trees combine to create a city's urban forest in the same way that individual inhabitants collectively constitute a city's population. Thus, to understand the entirety of all views, priorities, and uses relevant to practical urban forest planning and management, and the discipline's theoretical assumptions and frameworks, we need to consider at least four possible combinations of person/society and tree/forest interactions.

My thesis has analysed various legacy effects, such as colonial city planning or tree benefit preferences, on urban forestry in Accra and used these insights to suggest likely future socio-

environmental developments and potential adjustments to improve outcomes. While studies on the politics of natural resource use, management, and extraction typically privilege scale and space, temporal dynamics have received less attention (Fent and Kajola, 2020; Kajola, 2020). However, such dynamics provide essential information for contextualising current urban forest structure, processes and dynamics. My analysis of Accra’s urban forest thus adds to the growing body of political ecology-related research focusing on temporal dynamics of natural resource management (Kojola, 2020). And, selecting the city’s trees, I also extend analyses associated with more commonly studied resources like metals and minerals (Fent, 2020; Kojola, 2020), or water (Braun, 2020), given that urban forest benefits are only partly tangible, whereas global development policies and practice have facilitated the commodification of several of its *intangible* services, and thus incorporated them into a capitalist framework of management, production, and extraction.

In Accra, several state actors participate in developing urban tree-related policies, regulations, and laws, and while these are designed to “predict or prevent a range of potential problems, such as [...] continued effects from climate change” (Fent 2020, p. 882), they essentially reflect normative assumptions about the urban forest’s ideal future. The actors in question thus claim a right to govern this future in the present, to capitalise on their ability to turn their anticipation into action by deploying the power to construct and maintain dominant narratives. My research demonstrates how ‘past’, ‘present’, and ‘future’ do not constitute clearly delimited entities in urban forestry, but exist simultaneously through both tangible, non-human structures like buildings and intangible variables like ‘anticipation’ or emotional memories of a past of greater tree cover to be recovered. My analysis thus starts to question whether any urban forest can be fully understood solely through colonial and capitalist notions of “measurable and linear time” (Fent and Kojola, 2020, p. 821).

The thesis further demonstrates that a sustainable urban forest cannot be planned, created and maintained by the use of a cognitive, data-based and information-providing approach only. The hierarchy of effects model draws attention to the role of affection, as do case study participants comments. John Yetsowodo, for example, derives a considerable amount of income from his trees, yet he stated that he could not describe particular reasons for liking them – he simply does. While researchers have investigated the psychological and mental health effects *of* the urban forest (e.g. Kondo *et al.*, 2018; Lee and Son, 2018; Chen *et al.*, 2021), my research highlights the need to investigate further the role of emotions and feelings *for* urban forestry. Understanding people’s internal and intimate connections with trees, where natural elements are not a means to an end, but ends in themselves which exist outside of benefit-oriented and utilitarian frameworks, is thus fundamental to understanding how urban forests ‘become’. Such research would add to existing approaches that, in employing questionnaires and statistical analyses to elucidate people’s beliefs, attitudes, and preferences for certain ecosystem services and management priorities, measure cognition rather than affection (Perrin and Benassi, 2009).

Individual trees combine to produce a city’s urban forest, and individual humans collectively constitute a city’s population. Research thus needs to investigate (at least) four interaction combinations (forest–society, forest–person, tree–society, tree–person) for a comprehensive understanding of the socio-environmental construct ‘urban forest’. However, much recent work has centred the forest–society link, alongside a framework, in which the city’s trees provide nature-based solutions in the form of green infrastructure to create resilient urban areas. These concepts may further neoliberal agendas (Kotsila *et al.*, 2021), or fail to address issues of power struggles and (in)justice (Cousins, 2021; van der Jagt *et al.*, 2021). They also render invisible the urban forest’s ‘building blocks’, i.e. single trees and how individuals use and manage them, a subject on which there has thus far been little data (Kirkpatrick *et al.*, 2012), especially outside of ‘Northern’ cities. My research adds to the body of literature that addresses these tree–person relationships, and po-

sitions these arboricultural and horticultural attitudes and behaviours as central to city-wide forest planning and management, as private lands contain a significant proportion of any urban forest. I thus suggest that currently dominant concepts, models and guidelines in strategic urban forestry (e.g. Leff, 2016) may need to be revisited in the light of these findings.

### **8.3 Recommendations**

Based on my analysis, I now propose five recommendations aimed at major state actors. These suggestions include diversifying the knowledge base, developing an urban forest management plan, re-evaluating species selection criteria and species–site matching, focusing on disadvantaged neighbourhoods, and funding the Department of Parks and Gardens. None of the recommendations is, on its own, more important than the others, as they combine to address a single issue from several different angles. Their order, though, is essential, which is why I have arranged them in a step-wise process. While an alternative sequence might well increase urban forestry’s organisational efficiency in Accra, it could easily fail to achieve the fundamentally important element of social justice and equity. These recommendations, followed in the proposed step-wise order, have the potential to improve urban forestry activities and outcomes in Accra.

My transformative political ecology view centres justice and equality, thus ‘improving urban forestry activities’ signifies increasing tree cover in Accra in a way that reduces intra-city variation. It further includes taking advantage of urban forestry’s multi-purpose nature, intentionally aiming to produce a wider range of benefits at various scales. Ultimately, I propose moving beyond the current focus on the national and global scale, centring urban forest management on supporting individual and group livelihood opportunities. As part of a poverty reduction and resilience fostering approach, this would link larger-scale concerns with local-level preoccupations. Fundamentally restructuring urban forestry, involving the re-distribution of power, will likely face opposition

by those attempting to maintain their decision-making privileges. However, I suggest re-prioritising scales – away from the current focus on the preferred urban tree benefits within a neo-liberal, global capitalist system – can create a trickle-up system that might be viewed favourably in an outcome-oriented assessment.

### **8.3.1 Recommendation One: Diversify the Knowledge and Experience Base**

One last time, I return to urban forestry's definition, the “art, science, and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic, and aesthetic benefits tree provide society” (Helms 1998, p. 193). This definition identifies benefits as the outcome of the management process. However, the term ‘benefits’ sounds deceptively simple and, when scrutinised, poses more questions than it answers. What concrete benefits are we talking about? Where exactly are they to be produced and in what amounts? How do we decide which ones are needed? Depending on how we answer these questions, a certain urban forest structure emerges as the most promising one to produce the desired benefits in the ideal locations at the right time. However, the many involved stakeholders likely respond differently to these questions, creating a situation in which multiple views conflict. Whose opinions, experiences, and knowledges are prioritised then turns into a matter of being able to make oneself heard.

Urban forestry's multi-purpose nature constitutes its greatest challenge, constantly requiring trade-offs, but is simultaneously its major strength, an opportunity to centre social justice when making those (scalar) trade-offs. Based on my work, I hypothesise that orienting urban forestry towards benefits produced and used at the individual to neighbourhood level can result in a trickle-up effect through an overall increased canopy cover. More city trees then also provide more ecosystem functions and services typically associated with higher scales. Thus, a scalar bottom-up



approach may eventually also outperform the currently dominant top-down one with regards to tree benefits' quality and quantity at national or global scope. The current approach provides insufficient trickle-down effects and disincentivises people from allocating resources to tree care. However, for an effective and responsive bottom-up approach, we must understand how people use trees within a livelihood context to centre their knowledge and experiences when re-designing urban forestry.

Diversifying the knowledge and experience base needs to precede any other step as failing to do so is unlikely to result in an inclusive and comprehensive urban forest management plan. This first step may also be the most challenging one, requiring people and entities in decision-making positions to re-distribute power and acknowledge responsibility for current shortcomings, at least with regards to the potential effects on social justice of the proposed interventions. Additionally, it requires very fundamental and time-consuming structural changes and an openness to further investigate human–tree relationships in the city. A differently tailored approach to urban forestry could help create more resilient livelihoods (with a chain of positive effects on other scales) and benefit the national economy directly, such as the trees' shade protecting roads from premature deterioration. Accra's mayor is keen on urban greening and has started to take action, also involving other state actors like TCPD, intending to increase green spaces in the city. Furthermore, Accra joined networks that promote nature-based solutions to pressing issues like the negative effects of climate change. There is, however, limited indication suggesting an explicit acknowledgement of the dimension of social justice, especially regarding the often overlooked provisional tree benefits and those able to strengthen the human and social capital base.

As quoted at the chapter's beginning, the interviewee from the NGO GYEM suggested that there are two paths to transform any dominant process: (presidential) leadership or public advocacy and action. While mayoral interest in Accra's urban environment is visible, state actors could

seek inspiration in how other cities have cooperated with their inhabitants and support ‘grass-roots initiatives’, public action, and creative approaches, and move from information/consultation to partnership and empowerment. In Lisbon (Portugal), the city provided 2.5 million Euros to implement the winning citizen proposal to develop public green spaces (Ambrose-Oji *et al.*, 2017). In Edinburgh (UK), the city council drew up a statement of support for residents who had started to plant on public places like street corners or grass areas around residential buildings, as they lacked access to private gardens and public green spaces (Ambrose-Oji *et al.*, 2017). The city of Melbourne (Australia), in turn, used online forums, pop-up face-to-face engagement sessions, stakeholder workshops and discussion groups to engage its citizens (Gulsrud *et al.*, 2018). I do not suggest copying these activities but further explore such approaches, including urban forestry’s creative and artistic potential. As the traffic roundabout in Accra’s North Ridge neighbourhood demonstrates, the first steps have already been taken (Figs. 42 to 44).



Figure 42 ‘The Unusual Garden’ – I  
Own picture



Figure 43 'The Unusual Garden' – II  
Own picture



Figure 44 'The Unusual Garden' – III  
Own picture

To diversify the knowledge and experience base, state actors need to consider the natural resource base as the intermediate link that connects their work with the wider society in which and

for which they should operate. EPA has been developing educational materials and aims to run events where they teach citizens about the urban trees' values and environmental protection. Re-designing these activities could create a two-directional flow of information, actively seeking the population's ideas and knowledges. Such communication could occur in an informal manner that can be implemented cheaply and quickly. However, a more formal approach might better reflect this activity's importance, requiring the development of short questionnaires or employing a moderator for a focus group discussion. Utilising already existing structures or those currently being built to consult the city residents should not be confused with a re-distribution of power. I have previously (see Chapter 5) discussed how participation inherently suffers from power imbalances when certain groups create such spaces and then 'invite' others into them. Sub-metropolitan environmental health officers constitute another underused source of information as they interact with the city's inhabitants and could provide insights on human–tree relationships in their neighbourhoods. These sub-metropolitan offices could also serve as meeting points in formal and informal setups.

Involving city inhabitants in top-down urban forest planning approaches requires interest and action on the part of decision-making state actors. Where this interest remains limited, public advocacy and action can increase residents' visibility. While the previously discussed issues with participation and representation also apply in these settings, bottom-up actions may be more likely to include and centre on the idea of social justice. Few NGOs have previously worked in the area of urban forestry in Accra, and their actions have been of varying success. Youth4GreenGhana planted street trees but could not maintain them in the long term. While DPG provided saplings to Y4GG, the lack of more extensive government organisations' support seems like a missed opportunity in terms of creating lasting partnerships for mutual benefit. Additionally, NGOs and other grassroots agencies could consider including urban trees in their agenda. This does not only apply to environment-related groups but could, indeed, be incorporated in social movements

concerned with urban development, health, or livelihood resilience and poverty reduction. I do not consider it necessary for urban trees to be at the centre of these activities, as they may just constitute one component of a more holistic and diversified programme.

### **8.3.2 Recommendation Two: Develop an Urban Forest Management Plan**

Once the knowledge base has been diversified, various stakeholders can collaborate to develop a formal urban forest management plan for Accra. I base this recommendation on my analysis of interviews with state and non-state actors from a variety of backgrounds, which indicated a severe lack of interaction and collaboration. Currently, there is widespread confusion about the distribution of responsibilities, with unnecessary duplication of effort or crucial activities left undone. Additionally, one actor unintentionally undermined and thus rendered ineffective the work of another one, such as road and infrastructure development occurring after roadside tree planting. Developing a management plan requires personnel to partake in repeated inventories of the bio-physical resource base and the financial means to purchase necessary equipment. While resources are scarce or rather distributed towards other government organisations, I suggest taking advantage of existing structures and connections. Inventory personnel could be recruited from YEA's 'Youth in Agriculture and Afforestation' module or institutions of Higher Education, both for developing an initial plan and for ongoing monitoring activities. When government funding is insufficient, fines for illegal tree felling and/or part of the fees for felling permits could be used to develop and follow the forest management plan.

When preparing an urban forest management plan, groups and individuals can draw on several free online resources to help facilitate the process. An affiliate of the California Urban Forests Council<sup>24</sup> developed the Urban Forest Management Plan Toolkit, while the US Forest Service,

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<sup>24</sup> <https://ufmptoolkit.net/> (Accessed 21.08.2020)

American Forests, and the National Association of Regional Councils created the Vibrant Cities Lab Urban Forestry Toolkit<sup>25</sup>. I recommend forming a multidisciplinary team that includes, among others, social scientists, NGO representatives and members of the general public working alongside foresters and natural and environmental scientists. My first recommendation, to diversify the knowledge and experience base, should have already made state actors aware and appreciative of the varied viewpoints of Accra's differentiated population. As the largest and arguably most important group, Accra's private citizens should play a central role in a process that needs to pay attention to this group's heterogeneity to ensure inclusive planning and implementation. While funding the development of a management plan might be challenging, its value cannot be overstated. Urban forestry in Accra could become more efficient, responsive *and* representative when stakeholders work with, rather than separately from or even against, each other. To pursue the goal of social justice, I now discuss in more detail two further recommendations closely linked to this step, which I consider indispensable for creating an inclusive urban forest both in Accra and elsewhere.

### **8.3.3 Recommendation Three: Re-Evaluate Species and Planting Site Selection**

As part of developing an urban forest management plan, EPA and DPG should re-evaluate the rationale behind their current species selection and species–site matching criteria. At the moment, they plant and protect public trees mainly for their aesthetic value and shade. Other benefits, such as fruits, are of no importance also due to fear of windfall fruits littering sidewalks and roads or harvesting activities creating risk to traffic and bystanders. This approach, however, foregoes the opportunity to capitalise on urban trees' multiple functions. While potential traffic disruptions cause valid concern, not all public trees are street trees and instead grow in open areas at safe distances from roads. The NGO Philadelphia Orchard Project, for example, converts underutilised

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<sup>25</sup> <https://www.vibrantcitieslab.com/about/> (Accessed 21.08.2020)

spaces like vacant lots or church and school grounds into community-owned orchards, focusing on low-wealth neighbourhoods in Philadelphia (USA). If food items that grow in high pollution environments pose a health risk when consumed by humans remains unclear as it depends on the precise interaction between location, pollutant/metal and tree species (Li *et al.*, 2006; Oliva *et al.*, 2008; von Hoffen and Säumel, 2014). Rather than excluding this benefit based on general health concerns, I suggest analysing viability in a species and place-specific manner to determine what might be safe to consume under which circumstances in Accra.

Instead of proposing, very specifically, how to create a more multifunctional urban forest, I focus on general ideas to consider when developing a management plan. Implementing any activity, however, will depend on its suitability within the specific context. I suggest that stakeholders examine the two related concepts of ‘urban food forestry’ and ‘edible green infrastructure’. According to Clark and Nicholas (2013, p. 1652), the former is defined as “the intentional and strategic use of woody perennial food-producing species in urban edible landscapes to improve the sustainability and resilience of urban communities”. Their introduction to the topic highlights the advantages of re-evaluating species selection, as well as the requirements for such re-evaluation, including significant cooperation between relevant actors and stakeholders. Edible green infrastructure relates to a broader approach that does not just include trees. It is defined as “a sustainable planned network of edible food components and structures within the urban ecosystem which are managed and designed to provide primarily provisioning [...] ES [ecosystem services]” (Russo *et al.*, 2017, p. 54). Worldwide, several initiatives and cities use urban food trees in their work and plans (Clark and Nicholas, 2013; Kowalski and Conway, 2019). These projects could be studied to evaluate whether and how similar strategies could become part of Accra’s urban forest future.

To diversify Accra's public urban forest, stakeholders should produce a list of climate suitable species, which can then be examined for their potential uses, an approach similar to that in New York (USA) (Hurley and Emery, 2018). As DPG and EPA already consider the species' beautification, shading and human health benefits, I recommend focusing on additional types of benefits such as the trees' provisioning ecosystem services. However, other ideas and needs may emerge when diversifying the knowledge base or planning in a participatory approach. Practically, this step requires diversifying DPG's tree seedling nursery and increasing its capacity. The necessary resources depend on the desired speed, future production volume, and the intensity of diversification but could be matched to available personnel and budget. Additionally, the involved parties need to be aware of available planting locations and their associated growing conditions and potentials. This information should be collected as part of developing the management plan, and required resources will vary based on the chosen approach, e.g. ground-based or desk-based. Public trees would then offer more varied benefits, including those associated with the individual or household scale, available and accessible to non-landowning individuals, i.e. a large proportion of the city's population. This recommendation does not demand immediate large-scale investments in or changes to the forest's structure as it could commence in selected places and be geographically expanded over time.

#### **8.3.4 Recommendation Four: Focus on Disadvantaged Neighbourhoods**

In Chapter 4, I demonstrated how tree cover in Accra varies between neighbourhoods, positively correlating with the areas' socio-economic rating. Thus, the urban forest management plan needs to be spatially explicit at the below-city level, focusing on disadvantaged neighbourhoods. As these areas often feature limited plantable space, tree cover across Accra cannot be levelled out, but the gap reduced. I recommend including both public and private lands in this step, supporting and incentivising landowners to plant trees rather than relying on the laws to enforce these activi-



ties. Government actors could distribute free seedlings to interested residents, providing species that produce desired benefits. To ensure a long growth time, these trees should require limited maintenance, especially in terms of irrigation, and reach a size suitable for the available space. This setting further requires solutions as to how renters can access trees, such as making compound trees available for non-destructive use to all associated households and individuals. Additionally, land owned by neighbours, friends, or family may provide alternative planting locations for non-landowners, such as observed in one of the case study households. When diversifying the knowledge and experience base, participants in community meetings or other settings may brainstorm other creative ideas and suggestions as to how to approach this situation.

Though shifting theoretical focus to disadvantaged neighbourhoods can be instant, the slow growth of trees will create a noticeable effect in the medium to long-term only. In the planning phase, this step requires a willingness to engage with residents in less green neighbourhoods to jointly develop feasible proposals aiming to increase canopy cover. While conducting these meetings and paying related personnel requires financial inputs, these will increase even further during the practical phase when seedlings might need to be distributed, planting support given, and continued maintenance ensured. Overall, I would expect a high need for collaboration between different actors such as the Department of Parks and Gardens, sub-metropolitan offices, individuals trained as part of the Youth Environmental Agency's modules, and the general public. If successful, this step has the potential to provide individual and household-scale tree benefits to a wider population group, thereby positively affecting well-being and livelihood security, while also increasing citywide canopy cover and possibly the quantity of those benefits that require larger stands and better-connected tree patches.

### **8.3.5 Recommendation Five: Fund the Department of Parks and Gardens**

Lastly, I recommend funding the Department of Parks and Gardens. DPG has been underfunded for years, recognised not only by the department itself but also by other government departments and agencies, NGOs, the media, and the public. While DPG attempts to raise money and other resources from foreign embassies or through public-private partnerships, department employees continue to lack the means to work efficiently. Recent tree planting activities have increased their responsibilities (see Chapter 7), and developing and later implementing an urban forest management plan would do so even further. I recommend considering allowing DPG to retain a proportion of the revenue they generate and to direct a part of the permit application fees and fines towards them. This, however, requires recognising the department's role not just in city greening specifically but also in sustainable and comprehensive city planning and development. While neglected in the recent past, DPG might find an ally in Accra's mayor who has shown interest and concern regarding the city's plants. Though the government apparently recognised the link between city greening and planning, theoretically fusing DPG and TCPD at the local level, visible effects are still lacking, suggesting a continued low rank on the government's agenda. Without this last step, even the most comprehensive management plan will fail to succeed, as funding DPG is a basic requirement to create lasting structures of sustainably planning, monitoring, and evaluating Accra's urban forest.

## **8.4 Looking Backward and Looking Forward**

In the methodology chapter (see Chapter 3), I discussed my work's limitations related to language, researcher behaviour in environment and sustainability-related studies, and the ethics of my chosen approach. In this section, I focus on methods-related issues and the data collection experience, discussing the mixed methods design and some of its individual components. Based on the problems and limitations I identify, I then suggest three related topics for future research,

relating to household survey design, household and individual level interactions with trees, and to the integration between urban forest research and practice.

#### **8.4.1 Hindsight**

The mixed methods approach I chose was suitable and indeed necessary to comprehensively analyse urban forestry in Accra and respond to my research questions. I want to reiterate, however, some of the challenges Teye (2012) identified in his mixed methods study of the formulation and implementation of forest policy in Ghana. Teye described the research process as time-consuming and requiring both high amounts of labour and money, which resonates strongly with my experience. To keep project demands manageable, I had to restrict the resources spent on my study's individual components. As statistical requirements prescribed the scope of canopy cover analysis, tree inventory, and household survey, I had to adjust the remaining time for archival research, interviews, and the case study accordingly. I, therefore, suggest examining how requirements related to quantitative data affect the quality and quantity of qualitative data in mixed methods research. Being new to mixed methods research, I also followed an often-walked path and combined common research methods. In hindsight, I wish I had chosen a more unusual approach and mixed methods more creatively.

In future projects, I would want to focus more on qualitative approaches. In hindsight, especially the information from the survey does not seem to fully justify the resources I spent on it. Administering the questionnaire demanded excessive amounts of time, personnel, and money, something I had seriously underestimated. In a similar project, I would make major adjustments to a survey, if including one at all, focussing on a few, fast to ask and easy to answer, closed-ended questions with limited open-ended follow-up questions. This approach should significantly reduce the time necessary to administer the questionnaire, as well as the demand on respondent

time, attention and goodwill. I feel that the current survey's length exceeded the concentration and interest span of several participants, possibly reducing the quality of the obtained information. I would then invest freed up resources into a more extensive case study component, which would provide detailed context to closed-ended questionnaire responses.

#### **8.4.2 Foresight**

Where a sizeable proportion of the study population is illiterate and/or unreachable by mail or online, researchers often have to administer their questionnaires. Such surveys can then become unfeasible or negatively balanced in terms of required inputs compared with obtainable outputs. I, thus, suggest creatively rethinking survey methodology and testing new approaches for their appropriateness in a setting such as my study. In Burundi, Lee *et al.* (2016) utilised colour coding and images in a researcher-assisted, self-completion questionnaire with a preliterate population on a sensitive and potentially stigmatising topic. While I provided pictures to rank and rate pre-selected urban tree benefits, I would like to investigate if using more visual images in similar questionnaires with non-literate respondents could decrease resource needs. In North America, an increasingly common approach to reduce costs and non-response rates involves mixing modes of survey data collection. Researchers offer respondents the opportunity to choose between a telephone, web or postal survey and a directly administered questionnaire in the form of a face-to-face interview (de Leeuw *et al.*, 2008; Tijdens and Steinmetz, 2016). However, the feasibility of such an approach has not been investigated in the context of mostly non-literate multi-lingual study populations with limited internet access and no fully developed formal road naming and address system.

I started to investigate urban trees' functions within the context of household production and reproduction but within the limited scope of four cases in one city. For a more detailed under-

standing of individual-level human–tree interactions, this type of research has to be expanded, both geographically and in volume. Where cities and countries are compared, the effects of the environmental and socio-political contexts would need to assume great prominence. Comparative research could enhance our understanding and appreciation of how political, environmental, social, technological, or legal variables shape people’s relationships with urban trees. Larger case study designs could support theory building, thereby adding to the discipline of urban forestry in which quantitative and positivist approaches continue to dominate. The four household cases produced a wealth of information, significantly more than I had anticipated and despite the relatively limited time I spent with each. While I observed and interacted with the case study households, using a more ethnographic ‘participant observation’ approach might noticeably extend the limits of our current knowledge in this area. Becoming more actively involved could also be extended to other actor types, such as government bodies or NGOs. While EPA offered me the opportunity to observe and participate in their tree-tagging activities, time constraints and prior appointments prevented this experience.

Finally, we need to devote more time and effort to integrating urban forest theory and practice. I established common reasons for people in Accra not to plant trees, which explain their reluctance to invest in slow-growing and immovable plants. I also collected a list of reasons why people do plant trees, outlining their many (re)productive functions. These constitute central aspects of urban forestry research worldwide, but applying this information in a way that has practical, problem-solving value seems to remain limited. Not only does urban forestry research often fail to make practical impacts, but it also appears oddly detached from the *practical experiences* of individuals and groups. Many of these groups share their experiences on the internet or social media platforms, and a simple web search produces various initiatives similar to the Philadelphia Orchard Project (see Section 6.2.2.1). Their experiences, however, seem noticeably underutilised in

urban forestry *as a research discipline*. While I attempted to identify such groups in Accra prior to and during data collection, I was unable to locate a relevant initiative.

## **8.5 Chapter Conclusion**

In this chapter, I summarised the preceding chapters and how they responded to my research questions. I then offered five recommendations, which not only would increase Accra's urban forestry efficiency but support the development of a more sustainable and socially just approach. These recommendations, however, constitute no blueprint but should be adjusted according to stakeholders' inputs. Reflecting on some issues I noticed during data collection, I also suggested related areas for future research. Urban forestry's value is inherently linked to its perceived capacity for contributing to policy implementation and the applied planning, establishment and management of a city's forest. Thus, we need to branch out within the research discipline itself but also to disciplines like urban ecology, urban planning or anthropology. At its most elementary level, doing urban forestry, i.e. planning and managing city trees, is a matter of trade-offs. As these trade-offs have real-world implications, the importance of asking ourselves who decides and who does not, which experiences and knowledges count and which do not, should occupy a more fundamental position, both in theory and implementation.

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## APPENDICES

### 1 Participant Information Sheets

#### 1.1 Participant Information Sheet for Survey Respondents

My name is Lyn Hosek and as part of my PhD degree in African Studies at the University of Birmingham (UK), I am carrying out research on trees and their uses in the city of Accra. I would like to collect information about these trees to know what officials and ordinary people think about planting, using and protecting them. I also want to know whether people like you who live in Accra own trees, what you use them for or get from them and what you think about the value of trees (for eg, do you like having them around? Do you think they are useful things? Would you like to see/have more around? Who is responsible for them?).

As part of my research I am conducting a household survey to ask questions about these things and I am inviting you and the other people in your household to participate. Your household was randomly selected as a possible respondent. The survey consists of two parts: The first part contains questions about the members of your household and I am expecting this part to take approximately 5 to 10 minutes. The second part contains questions about urban trees and their services and products. I am expecting this part to take about 30 minutes. I would like to ask these questions to as many members of your household as possible, in the form of a group meeting.

You and the other people in your household do not have to take part in this survey. Your participation is completely voluntary. If you agree to participate, I will ask each person taking part to sign a consent form to say that they are willing to take part. You can withdraw from the study at any point if you change your mind during the research, and for up to four weeks after I finish talking to people in the household. You will not have to give any reason for changing your mind. If you decide not to continue with the survey, I will not use any information you provide in my work. In this case, all your information will be destroyed.

This project has received ethics approval from the University of Birmingham's Humanities and Social Sciences Ethics Committee. I do not expect participation in the survey to have any positive or negative effects on you.

Because I will be spending plenty of time with you and other members of the household if you agree to take part in my research, you cannot be anonymous as people will know I have been talking to you about my work. However, nobody outside the household, family or compound will know what you say to me or a research assistant as this information will be treated as confidential. Your personal information will be stored safely, locked or password-protected. It will only be accessible to the researcher and other authorised researchers for verification purposes. Other people helping with this research will not have access to the original data (apart from a research assistant where they have asked the questions) and will not be able to trace any information back to you. The information will be treated in accordance with the Data Protection Act 1998. It will be stored for ten years and then deleted/destroyed after.

I will use the results of the survey in my thesis and any publications and/or workshop or conference presentations that might arise from it. I will not use your name or address when I use the information you provide. If you wish, you can receive feedback about the results of the study. You can specify what kind of feedback you would like to receive, and how, on the consent form.

Please feel free to ask for further clarification should anything be unclear. If you agree to participate in the survey, please read the consent form and sign it.

## **1.2 Participant Information Sheet for Minors – Household Survey**

Hello, my name is Lyn and I am studying at a university in England. I am trying to find out things about the trees growing in Accra. I want to know what trees are growing here and where they are growing. I also want to know what people use trees for, what they get from the trees and what they think about trees (for eg, do people like having trees around? do they think trees are useful things? would they like to see/have more trees around?).

For my work I am talking to families and other people who live together in the same household to find out what they think about the trees in Accra, whether they use them, and what for, who looks after them and how, and what they think should happen to the trees in future. I would like to talk to you and other members of your family and household for around half an hour. Your parents/guardian say they are happy for you to talk to me if you want to.

You don't have to talk to me if you don't want to. If you agree to talk to me you can change your mind at any time and not answer any more questions or answer only some of my questions. If you decide you don't want to be part of my work anymore, you can say so at any time, even up to four weeks after we have finished talking. You will not need to tell me why you have changed your mind. If you decide you no longer want to be part of my work after you have given me information, I will not use what you have told me in my work.

I will treat everything you tell to me as secret or confidential. That means that I will not use your name or the place where you live when I write about you in my work or when I talk about what you tell me to my lecturers and colleagues at university, or to other people at small meetings and/or big conferences where we talk about people and trees in Accra and other places.

If you want me to, I can send you more information about my work when it is finished. For eg, I can send you copies of things I write.

If there is anything you have not understood, please ask me to explain it better. If you want to talk to me I need you to write your name on the form below or tell me that you have understood what I would like you to do and that you want to be part of my work.

## **1.3 Participant Information Sheet for Stakeholder Interviews**

My name is Lyn Hosek and as part of my PhD degree in African Studies at the University of Birmingham (UK), I am carrying out research on the trees in the city of Accra. The objective of the project is to collect information about these trees and to investigate planning and management strategies and goals regarding their propagation, use and protection. It further aims to explore what the inhabitants of Accra think about the role of urban trees in and for their lives and how they make use of these trees and their services and products.

As part of the research, I am conducting interviews and I am inviting you to participate, as you were identified as a possible respondent due to being privately/professionally involved in this ar-

ea. I am expecting the interview to take approximately 60 minutes. If you agree, the interview will be audio-taped or video-taped and I might take photos during the interview.

You do not have to take part in this interview. Your participation is completely voluntary. If you agree to participate, I will ask you to sign a consent form. You can withdraw from the study at any point during participation and up to four weeks after without giving reasons. In this case, all your data will be destroyed.

This project has received ethics approval from the University of Birmingham's Humanities and Social Sciences Ethics Committee. I do not expect the interview to have any positive or negative effects on you.

Your data will be treated as confidential, but I cannot guarantee that you will not be identifiable, as contextual information that I need to provide, e.g. the type of work you do, might make it possible for some people to find out who you are.

Consequently, you cannot be anonymous but your data will be treated as confidential. Your personal information will be stored safely, locked or password-protected. It will only be accessible by the researcher and other authorised researchers for verification purposes. Other people helping with this research will not have access to the original data, only modified versions that do not link your responses to your personal information. Your personal information will be treated in accordance with the Data Protection Act 1998. It will be stored for ten years and deleted/destroyed after that.

If you wish to participate please indicate your willingness on the consent form, which also allows you to say if you would like your contribution to be linked to your name. I will present the results of the interview in my thesis and any publications and/or presentations that might arise from the research.

If you wish, you can receive feedback about the results of the study. You can specify what kind of written or other feedback you would like to receive, and how, on the consent form.

Please feel free to ask for further clarification should anything be unclear. If you agree to participate in the interview, please read the consent form and sign it.

#### **1.4 Participant Information Sheet for Household Case Study**

My name is Lyn Hosek and as part of my PhD degree in African Studies at the University of Birmingham (UK), I am carrying out research on the trees in the city of Accra. The main reason behind the project is to find out where and what kind of trees are found in Accra; what purpose they serve; and what their future might be. I also want to know what government and other officials and ordinary people in Accra think about planting, using and protecting these trees, and who owns, controls, manages and uses the trees. The objective of the project is to collect information about these trees and to investigate planning and management strategies and goals. It further aims to explore what the inhabitants of Accra think about the role of urban trees in and for their lives and how they make use of urban trees and their services and products I also want to know whether people like you who live in Accra own trees, what you use them for or get from them and what you think about the value of trees (for eg, do you like having them around? Do you



think they are useful things? Would you like to see/have more around? Who is responsible for them?).

As part of the research I am doing household case studies and I am inviting your household to participate in this case study. Your household was identified as a possible participant due to the answers that you provided in the questionnaire survey you previously participated in. Over the course of about two to three weeks I would like to spend a total of around fifty hours with the members of your household. During this time I would like to engage in conversations with you and conduct interviews which, if you agree, might be audio-taped or video-taped. If you agree, I might also take some photos. I would also like to observe tree-related activities of household members about what exactly they do, and how and why. The research might also include rating answers or producing a timeline of your activities throughout the year.

As before, your household does not have to take part in the case study research. Your participation is still completely voluntary. If you agree to participate, I will again ask all the members of your household to sign a consent form. You can withdraw from the study at any point and for up to four weeks after I finish my research with you and the rest of the household without giving reasons. If you decide not to continue taking part in the research for whatever reason, I will not use any of the information you provide for this part of the study in my work. The information will be destroyed in that case.

This project has received ethics approval from the University of Birmingham's Humanities and Social Sciences Ethics Committee.

I need you to be aware of the following issue: The data I hope to collect on your household will be quite substantial, detailed and private in nature. Your data will be treated as confidential, but I cannot guarantee that you will not be identifiable, as contextual information that I need to provide, e.g. the setup of your household or the type of work you do, might make it possible for some people to find out who you are. Additionally, the time commitment is quite significant. Therefore, please take your time when deciding if your household wants to participate and feel free to ask any questions that you have. Due to the nature of the case study, you can only participate if all household members wish to do so.

Due to the nature of the project, you cannot be anonymous but your data will be treated as confidential. Your personal information will be stored safely, locked or password-protected. It will only be accessible by the researcher and other authorised researchers for verification purposes. Other people helping with this research will not have access to the original data, but just to modified versions that do not link your responses to your personal information. Your personal information will be treated in accordance with the Data Protection Act 1998. It will be stored for ten years and deleted/destroyed after.

I will use the results of the case study in my thesis and any publications and/or workshop or conference presentations that might arise from it. I will not use your name or address when I use the information you provide. However, if you and the other household members are happy for me to, I can/will identify you by name in my work. If you wish, you can receive feedback about the results of the study. You can specify what kind of feedback you would like to receive, and how, on the consent form.

Please feel free to ask for further clarifications should anything still be unclear. If all household members agree to participate in the case study, please read the consent form and sign it.

## **1.5 Participant Information Sheet for Minors – Case Study**

Hello, my name is Lyn and I am studying at a university in England. I am trying to find out things about the trees growing in Accra. I want to know what trees are growing here and where they are growing. I also want to know what people use trees for, what they get from the trees and what they think about trees (for eg, do people like having trees around? do they think trees are useful things? would they like to see/have more trees around?).

For my work, I am talking to families to find out what they know and think about the trees in Accra, whether and how they use them, and what they think should happen to them in future. I want to talk to you and your family because you have talked to me before and I have some more questions. I want to spend around a total time of 50 hours with your family over about two to three weeks doing different things like asking questions and watching what you are doing with trees and what you can get from them, etc. If you are ok with it, I might audio-record or video-record some of our talks and take some pictures. Your parents/guardians say it is ok for you to talk to me if you want to.

You don't have to talk to me if you don't want to. If you agree to talk to me you can change your mind at any time and not answer any more questions or answer only some of my questions. If you decide you don't want to be part of my work anymore, you can say so at any time, even up to four weeks after we have finished talking. You will not need to tell me why you have changed your mind. If you decide you no longer want to be part of my work after you have given me information, I will not use what you have told me in my work.

I will treat everything you tell to me as secret or confidential. That means that I will not use your name or the place where you live when I write about you in my work or when I talk about what you tell me to my lecturers and colleagues at university, or to other people at small meetings and/or big conferences where we talk about people and trees in Accra and other places. However, if you and the other people in your house or family are happy for me to, I will mention you by name in my work.

If you want me to, I can send you more information about my work when it is finished. For eg, I can send you copies of things I write, photographs, voice recordings, etc.

If there is anything you have not understood, please ask me to explain it better. If you want to talk to me, I need you to write your name on the form below or tell me that you have understood what I would like you to do and that you want to be part of my work.

## 2 Consent Forms

### 2.1 Consent Form for Survey Respondents

This information is being collected as part of a research project concerned with urban trees in the city of Accra, their management and their role in the lives of city inhabitants. The research is carried out by a PhD researcher from the Department of African Studies and Anthropology at the University of Birmingham (UK). The information that you supply and that will be collected as part of this research will be entered into a filing system or database. Your personal information will be stored locked/password protected and will only be accessed by authorised personnel involved in the project and other researchers for verification purposes. The information you provide will be retained by the University of Birmingham and will only be used for the purpose of research and statistical and audit purposes. By supplying this information, you are consenting to the University storing your information for the purposes stated above. The information will be processed by the University of Birmingham in accordance with the provisions of the Data Protection Act 1998.

|                                                                                                                                                                                                                                                                                          | YES | NO |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| I confirm that I have read and understood the participant information sheet. I had the chance to ask questions, which were answered satisfactorily.                                                                                                                                      |     |    |
| I understand that my participation is voluntary and that I am free to withdraw at any point during participation and up to four weeks afterwards without giving reasons. If I withdraw, my data will be removed from the study and will be destroyed.                                    |     |    |
| I wish to receive written feedback once the research has been completed (please specify which type of written feedback you would like).<br><input type="checkbox"/> Summary/E-mail <input type="checkbox"/> Summary/Post <input type="checkbox"/> Complete work/E-mail<br><b>E-mail:</b> |     |    |
| I understand that my personal data will be processed for the purposes detailed above, in accordance with the Data Protection Act 1998.                                                                                                                                                   |     |    |
| I give permission for _____<br>(name of minor) to participate.                                                                                                                                                                                                                           |     |    |
| Based upon the above, I agree to take part in this survey.                                                                                                                                                                                                                               |     |    |
| Consent was given orally.                                                                                                                                                                                                                                                                |     |    |

-----  
Name Participant

-----  
Date

-----  
Signature Participant

-----  
Name Researcher/Data collector

-----  
Date

-----  
Signature Researcher/Data collector<sup>26</sup>

<sup>26</sup> Each consent form also included the contact details of my supervisor and me

## 2.2 Consent Form for Minors – Household Survey

|                                                                                                                                                                                                                                                                                                                          | YES | NO |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| I understand what your work is about and what I have to do. I have asked for explanations of things I didn't understand and have no more questions.                                                                                                                                                                      |     |    |
| I understand that I don't have to be part of the work. I can stop at any time up to four weeks after answering questions. I understand that I won't have to explain why if I decide not to continue as part of your work. If I don't want to be part of the work anymore, what I have said will not be used in the work. |     |    |
| I want to find out more about the work when it is done.<br><input type="checkbox"/> Summary/E-mail <input type="checkbox"/> Summary/Post <input type="checkbox"/> Complete work/E-mail<br>E-Mail:                                                                                                                        |     |    |
| I want to be part of the work.                                                                                                                                                                                                                                                                                           |     |    |
| Consent was given orally.                                                                                                                                                                                                                                                                                                |     |    |

-----  
 Name Participant

-----  
 Date

-----  
 Signature Participant

-----  
 Name Researcher/Data collector

-----  
 Date

-----  
 Signature Researcher/Data collector

### 2.3 Consent Form for Stakeholder Interviews

This information is being collected as part of a research project concerned with urban trees in the city of Accra, their management and their role in the lives of city inhabitants. The research is carried out by a PhD researcher from the Department of African Studies and Anthropology at the University of Birmingham (UK). The information that you supply and that will be collected as part of this research will be entered into a filing system or database. Your personal information will be stored locked/password protected and will only be accessed by authorised personnel involved in the project and other researchers for verification purposes. The information will be retained by the University of Birmingham and will only be used for the purpose of research and statistical and audit purposes. By supplying this information, you are consenting to the University storing your information for the purposes stated above. The information will be processed by the University of Birmingham in accordance with the provisions of the Data Protection Act 1998. No identifiable personal data will be published unless requested or approved by the participant.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | YES | NO |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| I confirm that I have read and understood the participant information sheet. I had the chance to ask questions, which were answered satisfactorily.                                                                                                                                                                                                                                                                                                                 |     |    |
| I understand that my participation is voluntary and that I am free to withdraw at any point during participation and up to four weeks after without giving reasons. If I withdraw, my data will be removed from the study and will be destroyed.                                                                                                                                                                                                                    |     |    |
| I wish my name/identity to be kept confidential                                                                                                                                                                                                                                                                                                                                                                                                                     |     |    |
| I agree to the interview being audio-taped                                                                                                                                                                                                                                                                                                                                                                                                                          |     |    |
| I agree to the interview being video-taped                                                                                                                                                                                                                                                                                                                                                                                                                          |     |    |
| I agree to being photographed                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |    |
| I wish to receive written feedback once the research has been completed (please specify which type of written feedback you would like).<br><input type="checkbox"/> Summary/E-Mail <input type="checkbox"/> Summary/Post <input type="checkbox"/> Complete work/E-Mail<br><input type="checkbox"/> Photos/E-Mail <input type="checkbox"/> Photos/Post <input type="checkbox"/> Audio-recording/E-Mail<br><input type="checkbox"/> Video-recording/E-Mail<br>E-Mail: |     |    |
| I understand that my personal data will be processed for the purposes detailed above, in accordance with the Data Protection Act 1998.                                                                                                                                                                                                                                                                                                                              |     |    |
| I give permission for _____<br>(name of minor) to participate.                                                                                                                                                                                                                                                                                                                                                                                                      |     |    |
| Based on the above, I agree to take part in this interview.                                                                                                                                                                                                                                                                                                                                                                                                         |     |    |
| Consent was given orally.                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |    |

-----  
Name Participant

-----  
Date

-----  
Signature Participant

-----  
Name Researcher

-----  
Date

-----  
Signature Researcher

## 2.4 Consent Form for Household Case Study

This information is being collected as part of a research project concerned with urban trees in the city of Accra, their management and their role in the lives of city inhabitants. The research is carried out by a PhD researcher from the Department of African Studies and Anthropology at the University of Birmingham (UK). The information that you supply and that will be collected as part of this research will be entered into a filing system or database. Your personal information will be stored locked/password protected and will only be accessed by authorised personnel involved in the project and other researchers for verification purposes. The information will be retained by the University of Birmingham and will only be used for the purpose of research and statistical and audit purposes. By supplying this information, you are consenting to the University storing your information for the purposes stated above. The information will be processed by the University of Birmingham in accordance with the provisions of the Data Protection Act 1998. No identifiable personal data will be published unless otherwise wished by the participant.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | YES | NO |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| I confirm that I have read and understood the participant information sheet. I had the chance to ask questions, which were answered satisfactorily.                                                                                                                                                                                                                                                                                                                 |     |    |
| I understand that my participation is voluntary and that I am free to withdraw at any time during participation and up to four weeks after without giving reasons. If I withdraw, my data will be removed from the study and will be destroyed.                                                                                                                                                                                                                     |     |    |
| I wish my name to be kept confidential                                                                                                                                                                                                                                                                                                                                                                                                                              |     |    |
| I agree to being audio-taped                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |    |
| I agree to being video-taped                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |    |
| I agree to being photographed                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |    |
| I wish to receive written feedback once the research has been completed (please specify which type of written feedback you would like).<br><input type="checkbox"/> Summary/E-Mail <input type="checkbox"/> Summary/Post <input type="checkbox"/> Complete work/E-Mail<br><input type="checkbox"/> Photos/E-Mail <input type="checkbox"/> Photos/Post <input type="checkbox"/> Video-recording/E-Mail<br><input type="checkbox"/> Audio-recording/E-Mail<br>E-Mail: |     |    |
| I understand that my personal data will be processed for the purposes detailed above, in accordance with the Data Protection Act 1998.                                                                                                                                                                                                                                                                                                                              |     |    |
| I give permission for _____<br>(name of minor) to participate.                                                                                                                                                                                                                                                                                                                                                                                                      |     |    |
| Based upon the above, I agree to take part in this household case study.                                                                                                                                                                                                                                                                                                                                                                                            |     |    |
| Consent was obtained orally.                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |    |

-----  
Name Participant

-----  
Date

-----  
Signature Participant

-----  
Name Researcher

-----  
Date

-----  
Signature Researcher

## 2.5 Consent Form for Minors – Case Study

|                                                                                                                                                                                                                                                                                                                                                                                     | YES | NO |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| I understand what your work is about and what I have to do. I have asked for explanations of things I didn't understand and have no more questions.                                                                                                                                                                                                                                 |     |    |
| I understand that I don't have to be part of the work. I can stop at any time up to four weeks after answering questions. I understand that I won't have to explain why if I decide not to continue as part of your work. If I don't want to be part of the work anymore, what I have said will not be used in the work.                                                            |     |    |
| I want my name to be a secret                                                                                                                                                                                                                                                                                                                                                       |     |    |
| I agree to being audio-recorded                                                                                                                                                                                                                                                                                                                                                     |     |    |
| I agree to being video-recorded                                                                                                                                                                                                                                                                                                                                                     |     |    |
| I agree to being photographed                                                                                                                                                                                                                                                                                                                                                       |     |    |
| I want to find out more about the work when it is done.<br><input type="checkbox"/> Summary/E-Mail <input type="checkbox"/> Summary/Post <input type="checkbox"/> Complete work/E-Mail<br><input type="checkbox"/> Photos/E-Mail <input type="checkbox"/> Photos/Post <input type="checkbox"/> Audio-recording/E-Mail<br><input type="checkbox"/> Video-recording/E-Mail<br>E-Mail: |     |    |
| I want to be part of the work                                                                                                                                                                                                                                                                                                                                                       |     |    |
| Consent was given orally                                                                                                                                                                                                                                                                                                                                                            |     |    |

|                           |               |                                |
|---------------------------|---------------|--------------------------------|
| -----<br>Name Participant | -----<br>Date | -----<br>Signature Participant |
| -----<br>Name Researcher  | -----<br>Date | -----<br>Signature Researcher  |

### 3 Neighbourhood Poverty Ratings

| Non-Poverty         | Low Poverty           | Moderate Poverty         | High Poverty      | Very High Poverty |
|---------------------|-----------------------|--------------------------|-------------------|-------------------|
| Airport Residential | Dansoman              | Accra Central            | Abeka             | Ussher Town       |
| Dzorwulu            | Mataheko              | Adabraka                 | Abofu             | Nima              |
| North Dzorwulu      | Lartebiokorshie       | Airport West Residential | Abossey Okai      |                   |
| Abelenkpe           | Labone                | Alajo                    | Akweteyman        |                   |
| Roman Ridge         | East Legon            | Alogboshie               | Chorkor           |                   |
| North Ridge         | Achimota College      | Avenor                   | Gbegbeyise        |                   |
| West Ridge          | Ringway Estate        | Awudome                  | Kanda             |                   |
|                     | South Industrial      | Bubuashie                | Korle Gonno       |                   |
|                     | Asylum Down           | Cantonments              | Kotobabi          |                   |
|                     | North Industrial Area | Dakuman                  | Kpehe             |                   |
|                     | Kokomlele             | East Legon Extension     | Kwashiemman       |                   |
|                     | North Kaneshie        | James Town               | Mamobi            |                   |
|                     | Tesano                | Kaneshie                 | Mamponse          |                   |
|                     | Old Tesano            | Kissiemman               | Mamprobi          |                   |
|                     |                       | Korle Bu                 | New Town          |                   |
|                     |                       | Korle Dudor              | North Odorkor     |                   |
|                     |                       | La                       | Osu               |                   |
|                     |                       | La Dadekotopon           | Russia            |                   |
|                     |                       | Legon                    | Sabon Zongo       |                   |
|                     |                       | Ministerial Area         | Sempe             |                   |
|                     |                       | Mpoase                   | South La          |                   |
|                     |                       | New Fadama               | South Odorkor     |                   |
|                     |                       | North Alajo              | Sukura            |                   |
|                     |                       | South Legon              | Zoti              |                   |
|                     |                       | Tudu                     | Nyanba Estate     |                   |
|                     |                       |                          | Old Mamprobi      |                   |
|                     |                       |                          | West Abossey Okai |                   |
|                     |                       |                          | Lapaz             |                   |



## 4 Tree Inventory Form

Check when plot is completed

### Plot Information

|          |          |                 |       |       |
|----------|----------|-----------------|-------|-------|
| Plot ID: | Stratum: | GPS Coordinates | Date: | Crew: |
|          |          | Lat.            |       |       |
|          |          | Long.           |       |       |

|                              |                     |
|------------------------------|---------------------|
| Percent of Plot measured (%) | Plot Tree Cover (%) |
|                              |                     |

Did this Plot have any Trees? (Y/N): \_\_\_\_\_

### Actual Land Use

|                  |                  |
|------------------|------------------|
| Actual Land Use: | Percent of plot: |
| Actual Land Use: | Percent of plot: |
| Actual Land Use: | Percent of plot: |
| Actual Land Use: | Percent of plot: |
| Actual Land Use: | Percent of plot: |
| Actual Land Use: | Percent of plot: |

### Ground cover (% of plot covered by)

| Bldg. | Cement | Tar | Rock | Soil | Duff/<br>Mulch | Herb/<br>Ivy | Main.<br>Grass | Unmain.<br>Grass | Water |
|-------|--------|-----|------|------|----------------|--------------|----------------|------------------|-------|
|       |        |     |      |      |                |              |                |                  |       |

**Additional Comments (e.g. about access to plot or plot itself):**

| SURVEY DATE: |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
|--------------|--------------|----------|--------|-------|-------|-------|-------|-------|-------|------------|-----------------|-------------------|-------------------|
| PLOT ID      |              |          |        | DBH   |       |       |       |       |       |            |                 |                   |                   |
| TREE ID      | TREE SPECIES | LAND USE | HT DBH | DBH 1 | DBH 2 | DBH 3 | DBH 4 | DBH 5 | DBH 6 | CROWN COND | TOT TREE HEIGHT | LIVE CROWN HEIGHT | CROWN BASE HEIGHT |
| 1            |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
| 2            |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
| 3            |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
| 4            |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
| 5            |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
| 6            |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
| 7            |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
| 8            |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
| 9            |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |
| 10           |              |          |        |       |       |       |       |       |       |            |                 |                   |                   |

| TREE ID | CROWN WIDTH |       | CROWN % MISS | CLE | STREET TREE | PUBLIC TREE | TREE GPS    |              | MANAGEMENT  |                 |               | COMMENTS |
|---------|-------------|-------|--------------|-----|-------------|-------------|-------------|--------------|-------------|-----------------|---------------|----------|
|         | N - S       | E - W |              |     |             |             | LAT COORD Y | LONG COORD X | MAINT RECOM | SIDE WALK CONFL | UTILITY CONFL |          |
| 1       |             |       |              |     |             |             |             |              |             |                 |               |          |
| 2       |             |       |              |     |             |             |             |              |             |                 |               |          |
| 3       |             |       |              |     |             |             |             |              |             |                 |               |          |
| 4       |             |       |              |     |             |             |             |              |             |                 |               |          |
| 5       |             |       |              |     |             |             |             |              |             |                 |               |          |
| 6       |             |       |              |     |             |             |             |              |             |                 |               |          |
| 7       |             |       |              |     |             |             |             |              |             |                 |               |          |
| 8       |             |       |              |     |             |             |             |              |             |                 |               |          |
| 9       |             |       |              |     |             |             |             |              |             |                 |               |          |
| 10      |             |       |              |     |             |             |             |              |             |                 |               |          |

## 5 Household Questionnaire

### Section A - Basics

|                                           |              |       |           |                                 |
|-------------------------------------------|--------------|-------|-----------|---------------------------------|
| Household ID and description of location: | Interviewer: | Date: | Language: | Comments (e.g. on replacement): |
|-------------------------------------------|--------------|-------|-----------|---------------------------------|

| 1. ID Household member | 2. Household position (in relation to head)<br>1 – Head<br>2 – Spouse<br>3 – Child<br>4 – Grandchild<br>5 – Parent<br>6 – Parent-in-law<br>7 – Child-in-law<br>8 – Other relative<br>9 – Non-relative<br>10 – Househelp<br>11 – Other (specify) | 3. Sex | 4. How old is this person? | 5. What is this person's nationality?<br>1 – Ghanaian<br>2 – ECOWAS<br>3 – Other African<br>4 – American<br>5 – Asian<br>6 – European<br>7 - Oceanian | 6. To which ethnic group does this person belong?<br>1 – Akan<br>2 – Ga-Dangme<br>3 – Ewe<br>4 – Guan<br>5 – Gurma<br>6 – Mole-Dagbani<br>7 – Grusi<br>8 – Mande<br>9 – Other (specify)<br>10 – Don't know | 7. What are this person's religious beliefs?<br>1 – No religion<br>2 – Catholic<br>3 – Protestant<br>4 – Pentecostal/Charismatic<br>5 – Other Christian<br>6 – Muslim<br>7 – Traditionalist<br>8 – Other (specify)<br>9 – Don't know | 8. How long has this person lived in Accra?<br><i>Based on answer and age:<br/>Has this person always lived in Accra?</i><br>1 – Yes<br>2 – No<br><br>If no:<br><i>a. Where did this person live before?</i> | 9. What is this person's highest finished educational qualification?<br>1 – None<br>2 – Kindergarten<br>3 – Primary<br>4 – JHS/JSS<br>5 – SHS/SSS<br>6 – Technical/Vocational<br>7 – Undergraduate (Bachelor)<br>8 – Undergraduate (HND)<br>9 – Postgraduate<br>10 – Don't know |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |                                                                                                                                                                                                                                                 |        |                            |                                                                                                                                                       |                                                                                                                                                                                                            |                                                                                                                                                                                                                                      |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                 |
|                        |                                                                                                                                                                                                                                                 |        |                            |                                                                                                                                                       |                                                                                                                                                                                                            |                                                                                                                                                                                                                                      |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                 |
|                        |                                                                                                                                                                                                                                                 |        |                            |                                                                                                                                                       |                                                                                                                                                                                                            |                                                                                                                                                                                                                                      |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                 |

## Section B – Progress out of Poverty

| Indicator                                                             | Value                                                                                                       | Points | Score |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------|-------|
| 1. How many members does the household have?                          | A. Eight or more                                                                                            | 0      |       |
|                                                                       | B. Seven                                                                                                    | 4      |       |
|                                                                       | C. Six                                                                                                      | 9      |       |
|                                                                       | D. Five                                                                                                     | 13     |       |
|                                                                       | E. Four                                                                                                     | 14     |       |
|                                                                       | F. Three                                                                                                    | 21     |       |
|                                                                       | G. Two                                                                                                      | 24     |       |
|                                                                       | H. One                                                                                                      | 29     |       |
| 2. Are all household members ages 5 to 17 currently in school?        | A. No                                                                                                       | 0      |       |
|                                                                       | B. Yes                                                                                                      | 2      |       |
|                                                                       | C. No one ages 5 to 17                                                                                      | 3      |       |
| 3. Can the male head/ spouse read a phrase/ sentence in English?      | A. No                                                                                                       | 0      |       |
|                                                                       | B. No male head/spouse                                                                                      | 2      |       |
|                                                                       | C. Yes                                                                                                      | 5      |       |
| 4. What is the main construction material used for the outer wall?    | A. Mud bricks/earth, wood, bamboo, metal sheet/slate/asbestos, palm leaves/ thatch (grass/raffia), or other | 0      |       |
|                                                                       | B. Cement/concrete blocks, landcrete, stone, or burnt bricks                                                | 5      |       |
| 5. What type of toilet facility is usually used by the household?     | A. No toilet facility (bush, beach), or other                                                               | 0      |       |
|                                                                       | B. Pit latrine, bucket/pan                                                                                  | 4      |       |
|                                                                       | C. Public toilet (e.g. W.C., KVIP, pit pan)                                                                 | 4      |       |
|                                                                       | D. KVIP, or W.C.                                                                                            | 6      |       |
| 6. What is the main fuel used by the household for cooking?           | A. None, no cooking                                                                                         | 0      |       |
|                                                                       | B. Wood, crop residue, sawdust, animal waste, or other                                                      | 6      |       |
|                                                                       | C. Charcoal, or kerosene                                                                                    | 13     |       |
|                                                                       | D. Gas, or electricity                                                                                      | 22     |       |
| 7. Does any household member own a working box iron or electric iron? | A. No                                                                                                       | 0      |       |
|                                                                       | B. Yes                                                                                                      | 4      |       |
| 8. Does any household member own a working television, video player,  | A. No                                                                                                       | 0      |       |
|                                                                       | B. Only television                                                                                          | 2      |       |

|                                                                           |                                                                                       |    |  |
|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----|--|
| VCD/DVD/MP3/MP4 player/iPod, or satellite dish?                           | C. Video player, VCD/ DVD/MP3/MP4 player/iPod, or satellite dish (regardless of T.V.) | 8  |  |
| 9. How many working mobile phones are owned by members of the household?  | A. None                                                                               | 0  |  |
|                                                                           | B. One                                                                                | 4  |  |
|                                                                           | C. Two                                                                                | 8  |  |
|                                                                           | D. Three or more                                                                      | 10 |  |
| 10. Does any household member own a working bicycle, motor cycle, or car? | A. None                                                                               | 0  |  |
|                                                                           | B. Only bicycle                                                                       | 3  |  |
|                                                                           | C. Motor cycle or car (regardless of bicycle)                                         | 8  |  |

### Section C – General Questions Public Trees

When answering the following questions, please consider only **public** trees, such as those along roads or in parks, that are growing within the city of Accra

#### 1. BENEFITS

a. Can you please tell me all the benefits and purposes that you think these trees have? Both for the city and its residents generally and for you and your household specifically.

|   |   |   |   |
|---|---|---|---|
| A | E | I | M |
| B | F | J | N |
| C | G | K | O |
| D | H | L | P |

I would now like you to rank some benefits of public trees. First, according to how important you think they are for the well-being of Accra’s residents generally. Then according to how important they are for the well-being of your household or some of its members specifically.

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b. Ranking for Accra's residents generally

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

c. Based on this ranking, can you please divide the list into three groups: Benefits that you consider to be of (1) high importance, (2) medium importance, and (3) low importance for the well-being of the city's residents. You do not need to use all three groups and you can divide the lists however you want.

d. Ranking for household and members specifically

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

e. Based on this ranking, can you please also divide the lists into three groups: Benefits that you consider to be of (1) high importance, (2) medium importance, and (3) low importance for the well-being of your household or some of its members specifically. You do not need to use all three groups, and you can divide the lists however you want.

f. Are there any public trees in **your area** of housing that have caught your attention or are especially important for you?

Yes  No  Don't know

i. If 'yes': Can you please tell me what kind of trees and why?

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g. Are there any public trees **elsewhere** in the city that have caught your attention or are especially important for you?

Yes  No  Don't know

i. If 'yes': Can you please tell me what kind of trees and why?

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## 2. MANAGEMENT

a. Would you like to have more public trees in Accra? Yes  No  Don't know

i. Can you please explain why/why not?

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ii. If 'yes': Are there any specific trees you would like to see planted?      Yes       No       Don't know

A. If 'yes': Which and why?

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iii. If 'yes': Are there any specific places where you would like them to be planted?      Yes       No       Don't know

A. If 'yes': Where and why?

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b. Do you think that the public trees are generally in a good condition?      Yes       No       Don't know

i. If 'no': Can you please explain what makes you think so?

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c. Do you think that the city is generally taking good care of the public trees?      Yes       No       Don't know

i. If 'no': Can you please explain what makes you think so?

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### 3. WISHES, THREATS and PROBLEMS

a. Do you see any threats or problems affecting the public trees?      Yes       No       Don't know

i. If 'yes': Can you please tell me what threats or problems you see?

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b. If you could, would you change anything about the public trees?      Yes       No       Don't know

i. If 'yes': Can you please tell me what you would change and why?

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### 4. ADDITIONAL INFORMATION

a. Is there anything else you would like to say about public trees in Accra?



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**Section D – General Questions Public Trees**

1. Does your household own land in Accra that has trees on it?      Yes       No       Don't know
- a. If 'no': Would you like to own land with trees in Accra?      Yes       No       Maybe       Don't know
- i. Can you please explain why/why not/why maybe?
- 

- b. If 'yes': Are any of these trees owned by all household members together?      Yes       No       Don't know
- c. If 'yes': Does any household member own other land elsewhere in the city with trees on it?      Yes       No       Don't know

*IF YES, FILL IN TABLE*

|                                                                     |  |  |
|---------------------------------------------------------------------|--|--|
| A. Who are the owners? (ID/relationship to owner)                   |  |  |
| B. How many trees do you own today?                                 |  |  |
| C. Has this number changed over the past?<br>C1. If 'yes': How?     |  |  |
| D. Can you name specific types of trees that you own?               |  |  |
| E. Are there any reasons for owning the specific trees that you do? |  |  |

|                                                                                                                                                                                                                                                                                                                        |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <p>F. Has the type of trees you own changed over the past<br/> <i>F1. If 'yes': How?</i></p>                                                                                                                                                                                                                           |  |  |
| <p>G. Is anyone looking after the trees?<br/> <i>G1. If yes:</i> Can you please tell me more about this? I would e.g. like to know who is responsible for this, what they are doing and why, when they are taking care of the trees and how often.<br/> <i>G2. If no:</i> Why is nobody 'looking after' the trees?</p> |  |  |
| <p>H. Anything you would like to add about the management and care of your trees?</p>                                                                                                                                                                                                                                  |  |  |

2. Is there anything else you would like to say about privately owned trees in Accra, either owned by the household, someone from the household or someone else?

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**Section E – Tree Products Household Use**

Now I have some questions about the sale of products coming from public and private trees in Accra. Please consider original tree parts such as fruits, leaves or wood as well as products that have been made from these such as juices, medicine or household items

1. In the past 12 months, has any member of your household sold [tree part(s)] or a product derived from them? (*fill in first table:* Yes – 1, No – 2, Don't know – 3)

If 'yes': Can you please tell me what kind of trees the [tree product(s)] was/were from? (*fill in 2<sup>nd</sup> table below*) (*if unknown just tree part*)

| a. Fruits or nuts | b. Seeds | c. Flowering parts | d. Leaves | e. Wood or woody parts | f. Bark | g. Roots | h. Tree liquids (saps, resins, latex) |
|-------------------|----------|--------------------|-----------|------------------------|---------|----------|---------------------------------------|
|                   |          |                    |           |                        |         |          |                                       |

| Tree part | Tree type (if unknown: write unknown) | 2. How frequently have you sold [tree part(s)] of [tree type] in the past 12 months?<br><br>Daily – 1<br>Weekly – 2<br>Monthly – 3<br>Less than monthly – 4 | 3. Did a member of the household get some of these from a tree within the city?<br>Yes – 1<br>No – 2<br>Don't know – 3<br><br><i>If 'yes':</i> Did any of these come from a:<br>public tree – 1<br>household owned tree – 2<br>another private tree – 3 | 4. Were any of these processed before you sold them?<br><br>Yes – 1<br>No – 2<br>Don't know – 3<br><br><i>If 'yes':</i> By:<br>a household member – 1<br>someone else – 2 |
|-----------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |

## Section F – Tree Product Selling

Now I have some questions about the sale of products coming from public and private trees in Accra. Please consider original tree parts such as fruits, leaves or wood as well as products that have been made from these such as juices, medicine or household items

1. In the past 12 months, has any member of your household sold [tree part(s)] or a product derived from them? (*fill in first table: Yes – 1, No – 2, Don't know – 3*)

If 'yes': Can you please tell me what kind of trees the [tree product(s)] was/were from? (*fill in 2<sup>nd</sup> table below*) (*if unknown just tree part*)

| a. Fruits or nuts | b. Seeds | c. Flowering parts | d. Leaves | e. Wood or woody parts | f. Bark | g. Roots | h. Tree liquids (saps, resins, latex) |
|-------------------|----------|--------------------|-----------|------------------------|---------|----------|---------------------------------------|
|                   |          |                    |           |                        |         |          |                                       |

| Tree part | Tree type (if unknown: write unknown) | 2. How frequently have you sold [tree part(s)] of [tree type] in the past 12 months?<br><br>Daily – 1<br>Weekly – 2<br>Monthly – 3<br>Less than monthly – 4 | 3. Did a member of the household get some of these from a tree within the city?<br>Yes – 1<br>No – 2<br>Don't know – 3<br><br><i>If 'yes':</i> Did any of these come from a:<br>public tree – 1<br>household owned tree – 2<br>another private tree – 3 | 4. Were any of these processed before you sold them?<br><br>Yes – 1<br>No – 2<br>Don't know – 3<br><br><i>If 'yes':</i> By:<br>a household member – 1<br>someone else – 2 |
|-----------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |
|           |                                       |                                                                                                                                                             |                                                                                                                                                                                                                                                         |                                                                                                                                                                           |

## 6 List of Newspaper Articles

| No. | Title                                                              | Date       | Author                    | Newspaper     |
|-----|--------------------------------------------------------------------|------------|---------------------------|---------------|
| 1   | KMA to transform Garden City                                       | 10.04.2014 | No name (NN)              | Daily Graphic |
| 2   | KMA Launches 'Greening Kumasi' Project                             | 15.05.2014 | Freiku, S. R.             | The Chronicle |
| 3   | KMA to plant one million trees in metropolis                       | 15.05.2014 | NN                        | Daily Graphic |
| 4   | Kumasi to become Garden City once again                            | 22.05.2014 | NN                        | Daily Graphic |
| 5   | 'Me And My Tree' Competition Takes Off In Kumasi                   | 28.05.2014 | Owusu-Akyaw, R.           | The Chronicle |
| 6   | KMA begins planting one million trees                              | 08.08.2014 | Baidoo, F. A.             | Daily Graphic |
| 7   | Restoring greenery of a pounded city – Will KMA succeed this time? | 17.07.2017 | NN                        | Daily Graphic |
| 8   | KMA Plants 70,000 Trees                                            | 19.07.2017 | Awuah Jnr., J.            | Daily Guide   |
| 9   | Kumasi observes National Sanitation Day                            | 08.08.2017 | Baah, E.                  | Daily Graphic |
| 10  | KMA launches 'keep Kumasi clean and green'                         | 06.10.2017 | NN                        | Daily Graphic |
| 11  | Green Kumasi project progresses – 7000 seedlings planted           | 16.08.2017 | NN                        | Daily Graphic |
| 12  | KMA disburses GH¢381,167 to 367 PLWDs                              | 19.12.2016 | NN                        | The Chronicle |
| 13  | KMA celebrates one year of Rattray Park                            | 13.07.2016 | NN                        | Daily Graphic |
| 14  | Mahama, Otumfuo to commission recreational park in Kumasi          | 17.06.2015 | NN                        | Daily Graphic |
| 15  | Kumasi Rattray park closed down for non-payment of tax             | 23.09.2016 | NN                        | Daily Graphic |
| 16  | Kumasi: The Garden City without gardens?                           | 31.07.2013 | Asare, G. E.              | Daily Graphic |
| 17  | The beautiful green danger in Takoradi                             | 02.12.2014 | NN                        | Daily Graphic |
| 18  | Prez Mahama inaugurates renovated Tamale Market                    | 16.11.2015 | Duodu, S. and Gyes, Z. K. | Daily Graphic |
| 19  | Tamale Assembly to green Metropolis                                | 16.11.2015 | NN                        | Daily Graphic |
| 20  | Why we need open spaces in human settlements                       | 23.05.2016 | Intsiful, G. W. K.        | Daily Graphic |
| 21  | Minister Outdoors Committee To Plan Eco-Park                       | 24.05.2013 | Adam, F.                  | The Chronicle |
| 22  | Spiritual enclave to be created in                                 | 02.10.2013 | Enin, E.                  | Daily Graphic |

|    |                                                                                              |            |                           |                |
|----|----------------------------------------------------------------------------------------------|------------|---------------------------|----------------|
|    | Achimota Forest                                                                              |            |                           |                |
| 23 | Stop planned destruction of Achimota Forest – Nduom tells President Mahama                   | 11.11.2013 | Nduom, P. K.              | Daily Graphic  |
| 24 | Mr. President, Stop The Destruction Of Achimota Forest!                                      | 11.11.2013 | Nduom, P. K.              | The Chronicle  |
| 25 | An open letter to Prez Mahama: Stop the destruction of Achimota Forest                       | 15.11.2013 | Nduom, P. K.              | Daily Graphic  |
| 26 | Rescuing Achimota Forest Reserve                                                             | 18.11.2013 | NN                        | Daily Graphic  |
| 27 | Achimota Forest ecotourism project set to begin                                              | 03.01.2014 | NN                        | Daily Graphic  |
| 28 | Chief Seizes Achimota Forest...School Under Threat, As Lands Commission Fails To Defend Suit | 06.06.2014 | Akli, E.                  | The Chronicle  |
| 29 | Battle of Achimota...Legal Bullets Ricochet Across Terrain                                   | 09.06.2014 | Akli, E.                  | The Chronicle  |
| 30 | Endangered Species Near Extinction...As Depletion Of Achimota Forest Continues               | 11.06.2014 | Nonor, D.                 | The Chronicle  |
| 31 | Chief Seizes Achimota Forest...As Forestry Commission Fails To Defend Suit                   | 26.06.2014 | Adjei, N. O.              | The Chronicle  |
| 32 | Fc Seeks Partnership For Achimota eco-Park                                                   | 21.07.2014 | NN                        | Ghanaian Times |
| 33 | Achimota Forest to be turned into recreational park                                          | 07.08.2014 | NN                        | Daily Graphic  |
| 34 | Accra Eco-Park Project Gets Suitors                                                          | 07.08.2014 | Nonor, D.                 | The Chronicle  |
| 35 | Forestry Commission, Police And Achimota Forest                                              | 26.11.2014 | NN                        | The Chronicle  |
| 36 | MPs, Police In Hot Exchange Over FC Lands                                                    | 26.11.2014 | Attenkah, R. and Adam, F. | The Chronicle  |
| 37 | Forestry Commission, police in tango over Achimota Forest                                    | 26.11.2014 | NN                        | Daily Graphic  |
| 38 | Protecting Achimota Forest...Parliamentary Select C'ttee, team of policemen clash            | 27.11.2014 | NN                        | Daily Graphic  |
| 39 | Forestry Commission, devt partner sign agreement to make Achimota Forest ecopark             | 20.02.2016 | NN                        | Daily Graphic  |
| 40 | Nduom opposes sale of Achimota Forest                                                        | 25.02.2016 | NN                        | Daily Graphic  |
| 41 | Four sue gov't over sale of Achimota                                                         | 27.04.2016 | NN                        | Daily Graphic  |

|    |                                                                               |            |            |                |
|----|-------------------------------------------------------------------------------|------------|------------|----------------|
|    | Forest                                                                        |            |            |                |
| 42 | Sale of Achimota forest – four go to court                                    | 17.05.2016 | NN         | Daily Graphic  |
| 43 | Achimota Forest: Major Ecotourism destination                                 | 17.05.2016 | NN         | Daily Graphic  |
| 44 | Disaster looms if Achimota Forest Eco-tourism Project goes ahead – NDPC boss  | 16.06.2016 | NN         | Daily Graphic  |
| 45 | Must we cut our nose to spite our face?                                       | 17.06.2016 | NN         | Daily Graphic  |
| 46 | \$1.2 billion Accra Eco-Park Project takes off                                | 20.08.2016 | NN         | Daily Graphic  |
| 47 | Development of Accra Eco Park now on Course                                   | 22.08.2016 | NN         | Daily Graphic  |
| 48 | Achimota Forest Not For Sale - Mahama                                         | 22.08.2016 | Larbi, C.  | Daily Guide    |
| 49 | Achimota Forest shouldn't be turned into Eco Park – Prof. Frimpong-Boateng    | 13.03.2017 | NN         | Ghanaian Times |
| 50 | Forestry Commission exceeds budget by 56 per cent                             | 22.12.2013 | NN         | Daily Graphic  |
| 51 | “Garden & Flower Show” To Boost Arts & Crafts                                 | 16.08.2013 | Twum, C.   | The Chronicle  |
| 52 | Flower and Garden Show begins today                                           | 29.08.2013 | NN         | Daily Graphic  |
| 53 | Use gardens, flowers as avenue for job creation – Second Lady                 | 31.08.2013 | NN         | Daily Graphic  |
| 54 | Stratcomm-Africa Brings Gardening To Life                                     | 02.09.2013 | Bessey, B. | The Chronicle  |
| 55 | 2 <sup>nd</sup> Garden and Flower Show opens in Accra                         | 27.06.2014 | NN         | Daily Graphic  |
| 56 | Ghana Garden And Flower Show Underway In Accra                                | 02.09.2014 | NN         | Ghanaian Times |
| 57 | Garden show takes off in Accra                                                | 05.09.2014 | NN         | Daily Graphic  |
| 58 | Breathing New Life into Old Fragments of Wood                                 | 02.09.2015 | Boadi, E.  | The Chronicle  |
| 59 | Ghana Garden and Flower Awards and Clubs launched                             | 17.09.2015 | NN         | Daily Graphic  |
| 60 | Garden And Flower Show Ends                                                   | 22.09.2015 | NN         | The Chronicle  |
| 61 | Fourth Ghana Garden and Flower Show to promote ecotourism launched            | 27.07.2016 | NN         | Daily Graphic  |
| 62 | The 4 <sup>th</sup> Ghana Garden and Flower Show: Flowers are worth more than | 08.09.2016 | NN         | Daily Graphic  |

|    |                                                                                            |            |                   |                |
|----|--------------------------------------------------------------------------------------------|------------|-------------------|----------------|
|    | aesthetics                                                                                 |            |                   |                |
| 63 | Garden and Flower show opens in Accra                                                      | 12.09.2016 | NN                | Daily Graphic  |
| 64 | Stacomm crowns 4 <sup>th</sup> Garden Show with awards                                     | 19.09.2016 | NN                | The Chronicle  |
| 65 | Enforce regulations on tree cutting                                                        | 10.01.2015 | NN                | Daily Graphic  |
| 66 | Media Tasked To Partner EPA To Save Environment                                            | 16.06.2014 | Anane, E. B.      | The Chronicle  |
| 67 | EPA Marks World Environment Day                                                            | 06.06.2014 | Adam, F.          | The Chronicle  |
| 68 | EPA creates environmental awareness                                                        | 12.10.2016 | Amege, D. K.      | Ghanaian Times |
| 69 | EPA urges Ghanaians to plant trees                                                         | 08.06.2014 | NN                | Daily Graphic  |
| 70 | EPA launches Green City Project                                                            | 13.06.2014 | NN                | Daily Graphic  |
| 71 | EPA Service Personnel Plant Trees Along Awoshie-Pokuase Road                               | 18.05.2016 | NN                | The Chronicle  |
| 72 | EPA service personnel partners foundation to plant trees                                   | 18.06.2015 | NN                | Daily Graphic  |
| 73 | ABL, EPA Plant Trees To Save The Environment                                               | 07.06.2016 | Bessey, B.        | The Chronicle  |
| 74 | GNASBA marks 23 <sup>rd</sup> anniversary with tree planting                               | 12.12.2016 | NN                | Daily Graphic  |
| 75 | Philio Delio Foods to undertake tree planting in 6 northern schools                        | 22.07.2015 | Issah, Z.         | Daily Graphic  |
| 76 | Accra Premier Lions Club to climax centenary anniversary – 29 Countries expected to attend | 02.05.2017 | NN                | Daily Graphic  |
| 77 | ABL marks World Environmental Day                                                          | 06.06.2016 | NN                | Daily Graphic  |
| 78 | Help grow more trees in rainy season – Baffour Oppong                                      | 20.04.2015 | NN                | Ghanaian Times |
| 79 | Forestry ladies plant trees at Manya Jorpanya                                              | 28.09.2016 | NN                | Ghanaian Times |
| 80 | Horticulture can contribute to growth – Access Bank                                        | 04.09.2013 | Ablordeppey, S.   | Daily Graphic  |
| 81 | Ghana tackles climate change at the beaches                                                | 23.07.2012 | Nonor, D.         | The Chronicle  |
| 82 | Parks and Gardens to feature in making Accra a Millennium City                             | 01.10.2010 | NN                | The Chronicle  |
| 83 | Aburi Botanical Gardens: Botanically beautiful, structurally ugly                          | 19.05.2014 | Bentil, N.        | Daily Graphic  |
| 84 | Parks and gardens dept. cries for assistance                                               | 16.06.2015 | Abdul-Rahaman, S. | Ghanaian Times |



|     |                                                                        |            |                   |               |
|-----|------------------------------------------------------------------------|------------|-------------------|---------------|
| 85  | Beyond the euphoria of the new era                                     | 06.01.2017 | Yeboah-Afari, A.  | Daily Graphic |
| 86  | Pockets of Indiscipline                                                | 29.04.2017 | NN                | Daily Guide   |
| 87  | From my Rooftop: What next after the familiarisation tours?            | 23.04.2013 | Akordor, K.       | Daily Graphic |
| 88  | Where have all the flowers gone?                                       | 12.08.2016 | Yeboah-Afari, A.  | Daily Graphic |
| 89  | A Greener, Healthier, More Beautiful Ghana                             | 03.08.2016 | Ogyiri, A. K.     | The Chronicle |
| 90  | AMA rolls out plans to make Accra cleanest city                        | 10.05.2017 | NN                | Daily Graphic |
| 91  | Accra must sparkle and bloom!                                          | 12.05.2017 | Yeboah-Afari, A.  | Daily Graphic |
| 92  | Saving the vegetative cover of an urbanising Accra                     | 02.05.2017 | NN                | Daily Graphic |
| 93  | AMA Cleans Accra                                                       | 10.05.2017 | Tarlue, M.        | Daily Guide   |
| 94  | Gender, Tourism Ministries to facelift Efua Sutherland Children's Park | 22.06.2016 | NN                | Daily Graphic |
| 95  | Line of trees cut to give way to Giffard Road expansion works          | 19.09.2013 | Bokpe, S. J.      | Daily Graphic |
| 96  | Vandalism of trees in Accra: Becoming a norm                           | 22.12.2015 | NN                | Daily Graphic |
| 97  | Dr. James Orleans-Lindsay's green dream                                | 28.08.2015 | NN                | Daily Graphic |
| 98  | YEA employs more youth; Targets 100,000 by close of year               | 02.11.2016 | Ennin, E.         | Daily Graphic |
| 99  | YEA To Recruit 100,000 Youth                                           | 11.11.2016 | Bruce-Quansah, E. | Daily Guide   |
| 100 | YEA launches Youth in Greening Ghana Module                            | 30.11.2016 | NN                | Daily Graphic |
| 101 | Time to halt destruction of our environment                            | 08.03.2016 | NN                | Daily Graphic |
| 102 | Bats: Ghana's best-kept wildlife secret                                | 11.04.2013 | Agyei-Ohemeng, J. | Daily Graphic |
| 103 | Green Ghana project launched                                           | 13.07.2015 | NN                | Daily Graphic |
| 104 | Respect Sanitation Workers... Zoomlion MD Pleads To The Public         | 24.02.2014 | NN                | The Chronicle |
| 105 | Youth urged to support efforts to attain SDGs                          | 06.07.2016 | NN                | Daily Graphic |
| 106 | UG to introduce sustainability and envi-                               | 31.03.2017 | NN                | Daily Graphic |

|     |                                                |            |                    |                |
|-----|------------------------------------------------|------------|--------------------|----------------|
|     | ronmental sanitation MA programmes             |            |                    |                |
| 107 | 'Who we are is what we leave behind'           | 16.06.2016 | NN                 | Daily Graphic  |
| 108 | MMDAs to develop parks, gardens                | 16.09.2015 | Boateng, E. A.     | Ghanaian Times |
| 109 | Ghana fast losing its forest                   | 28.05.2014 | NN                 | Daily Graphic  |
| 110 | Where Are All The Flowers?                     | 01.10.2016 | NN                 | Daily Guide    |
| 111 | Essence of gardens to human development        | 17.08.2015 | Boadi, E.          | Ghanaian Times |
| 112 | Climate Change And Our Survival                | 15.05.2015 | NN                 | Ghanaian Times |
| 113 | Untitled                                       | 01.09.2016 | Owusu-Amoah, L. K. | Ghanaian Times |
| 114 | NADMO, assembly assist Koforidua flood victims | 14.09.2016 | Kodjo, D.          | Ghanaian Times |

## 7 Guide for Semi-Structured Stakeholder Interviews

1. Questions about the respondent's work/job/position/role/relation to urban trees, forests and/or forestry and, if applicable, general information about the employer/organisation the respondent is working for

| 'Area'            | Possible questions                                                                                                                                                                                                                                                      | Possible follow-ups                                                                      |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Respondent's work | <ul style="list-style-type: none"> <li>- Can you tell me about your professional responsibilities/your job?</li> <li>- Can you tell me about your (professional) background/your job 'history'?</li> <li>- Can you tell me about your organisation/employer?</li> </ul> | <ul style="list-style-type: none"> <li>- Relationship with other stakeholders</li> </ul> |

2. Questions relating more directly to the urban trees, the urban forest and urban forestry

| 'Area'                                         | Possible questions                                                                                                                                                                                                                                                                                                                                                                             | Possible follow-ups                                                                                                                                                                                                                                                                                 |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Planning and Management Objectives             | <ul style="list-style-type: none"> <li>- Can you tell me about your current and (possible) future objectives in relation to urban forestry/the urban forest?</li> <li>- Have these objectives changed in the past?</li> <li>- In your opinion, what factors/events/ processes have influenced/are influencing the process of planning and managing the urban trees/forest in Accra?</li> </ul> | <ul style="list-style-type: none"> <li>- How to achieve objectives</li> <li>- Time frame</li> <li>- Monitoring</li> <li>- Why named factors/events/processes</li> <li>- How have they influenced planning and management</li> </ul>                                                                 |
| Trees                                          | <ul style="list-style-type: none"> <li>- Can you tell me about the trees (species) you are planting/researching/using/ maintaining/selling?</li> <li>- Can you tell me about the planting and maintenance process/operations ('work' directly done on/with the trees)?</li> </ul>                                                                                                              | <ul style="list-style-type: none"> <li>- Where are the trees from</li> <li>- Why certain species</li> <li>- Why certain operations</li> <li>- Planting sites</li> </ul>                                                                                                                             |
| Problems/ Threats and Opportunities/ Strengths | <ul style="list-style-type: none"> <li>- Can you tell me about any problems with/threats to the urban trees/forest you see?</li> <li>- In your opinion, what do you consider to be the main benefits/services coming from the trees/forest?</li> <li>- If you could simply change one thing, what would it be (simply = not considering e.g. financial, legal, political aspects)?</li> </ul>  | <ul style="list-style-type: none"> <li>- Why/how are they problems/threats/ opportunities/strengths</li> <li>- How do they impact job/work</li> <li>- Relationship with e.g. laws/policies (forestry-related and general city planning)</li> <li>- Specific (geographical) focus area(s)</li> </ul> |

3. Questions relating directly to tangible tree products (to be asked if ‘area’ was not brought up by respondent before).

| ‘Area’                 | Possible questions                                                                                                                                                                                                                                                                                                                                  | Possible follow-ups                                                                                                                                                                                                                          |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tangible Tree Products | <ul style="list-style-type: none"> <li>- do you/ your organisation consider tangible products in planning and management/research</li> <li>- what is your view/ your organisation’s view on tangible tree products?</li> <li>- what kind of tangible tree products (from urban trees) do you sell/buy/trade or are part of your work/job</li> </ul> | <ul style="list-style-type: none"> <li>- why/why not?</li> <li>- what kind of information can you give me about specific tree products (e.g. amounts sold, percentage from urban trees, changes in volumes traded, quality, etc.)</li> </ul> |

## 8 List of Trees in Schumacher's Book

Tree species in Schumacher (1827): *Beskrivelse af Guineiske planter: som ere fundne af Danske botanikere, især af etatsraad Thonning*

To confirm and/or update species names provided in the book, I used 'Plants of the World Online' from the Royal Botanic Gardens, Kew<sup>27</sup>; JSTOR Global Plants database<sup>28</sup> as well as 'The Plant List', a collaboration between the Royal Botanic Gardens, Kew; Missouri Botanical Garden and a number of further contributors<sup>29</sup>. Where there are doubts, the current species name provided is marked with a question mark. I included all species which might, even if rarely, present in a tree habit and also included palms. The species are listed in the order as they appear in the book and Figure 45 (below table) depicts the locations of some of the mentioned places.

Translations are my own. I did not translate all Danish comments but focused on location descriptions and general information, while I excluded comments on plant descriptions/comparisons and detailed descriptions of use.

| Species name (as in book)  | Species name (current accepted)                       | Page | Comments in book (translated)                                                          |
|----------------------------|-------------------------------------------------------|------|----------------------------------------------------------------------------------------|
| <i>Codarium nitidum</i>    | <i>Dialium guineense</i> Willd.                       | 18   | Grows in Accra. Flowers in September and May.                                          |
| <i>Ficus umbellata</i>     | <i>Ficus umbellata</i> Vahl                           | 25   | For its fast growth and shade often planted along main roads and in the African towns. |
| <i>Ficus lutea</i>         | <i>Ficus lutea</i> Vahl                               | 25   | Cultivated.                                                                            |
| <i>Ficus ovata</i>         | <i>Ficus laurifolia</i> Lam.                          | 26   | Along roads between Christiansborg and Frederiksberg [Frederiksberg]                   |
| <i>Ficus calyptрата</i>    | <i>Ficus calyptрата</i> Vahl                          | 27   | Here and there. Fruits are eaten by the Natives.                                       |
| <i>Ficus microcarpa</i>    | <i>Ficus thonningii</i> Blume (?)                     | 28   | /                                                                                      |
| <i>Nauclea africana</i>    | <i>Mitragyna inermis</i> (Willd.) Kuntze              | 104  | Common in the plains.                                                                  |
| <i>Cephalina esculenta</i> | <i>Sarcocephalus latifolius</i> (Sm.) E.A.Bruce       | 105  | Here and there under bushes. Flowers in May and June.                                  |
| <i>Ucriana racemosa</i>    | <i>Oxyanthus racemosus</i> (Schumacher & Thonn.) Keay | 107  | Rare; some places in Aquapim, e.g. Begusso [Berekuse]                                  |
| <i>Psychotria triflora</i> | <i>CremaSpora triflora</i> (Thonn.) K.Schum.          | 108  | Grows near Asiama [Afiaman]                                                            |

<sup>27</sup> <http://plantsoftheworldonline.org/> (Accessed: 15.06.2021)

<sup>28</sup> <https://plants.jstor.org/> (Accessed: 15.06.2021)

<sup>29</sup> <http://www.theplantlist.org/> (Accessed: 15.06.2021)

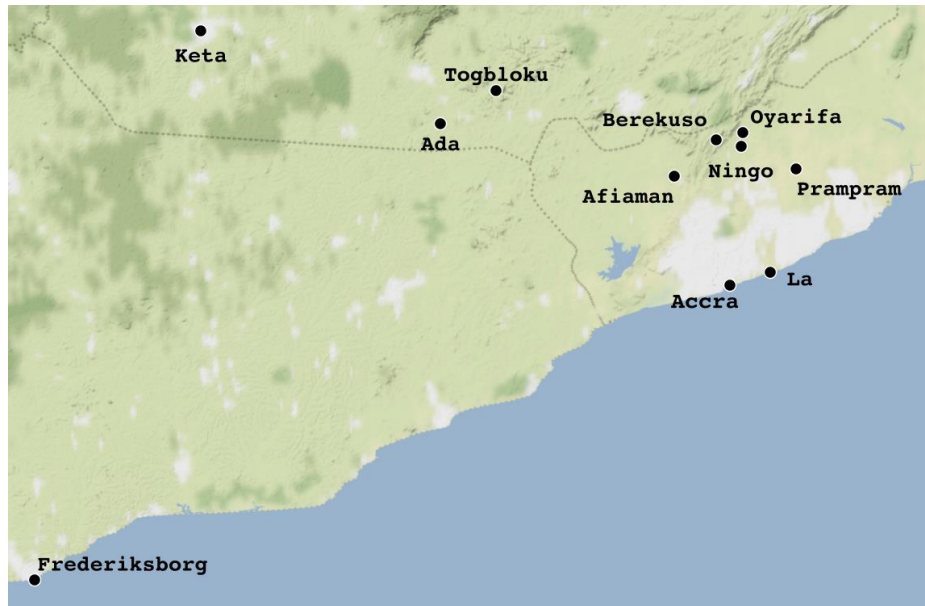
|                               |                                                                                                        |     |                                                                                                                                                 |
|-------------------------------|--------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Phallaria spinosa</i>      | <i>Vangueriella spinosa</i> (Schumach. & Thonn.) Verdc.                                                | 113 | Not common.                                                                                                                                     |
| <i>Conocarpus pubescens</i>   | <i>Conocarpus erectus</i> L. (?)                                                                       | 115 | Common near the beach and salty lagoons.                                                                                                        |
| <i>Cordia guineensis</i>      | <i>Cordia guineensis</i> Thonn.                                                                        | 128 | Common in the landscapes near the beach; flowers in the rainy season.                                                                           |
| <i>Ebretia cymosa</i>         | <i>Ebretia cymosa</i> Thonn.                                                                           | 129 | Common; flowers in May. The longest branches are used for anchor chains.                                                                        |
| <i>Bumelia dulcifica</i>      | <i>Synsepalum dulcificum</i> (Schumach. & Thonn.) Daniell                                              | 130 | Not common in Aquapim.                                                                                                                          |
| <i>Celastrus laucifolius</i>  | <i>Maytenus undata</i> (Thunb.) Blakelock                                                              | 132 | Rare, around Adah [Ada]                                                                                                                         |
| <i>Carissa dulcis</i>         | <i>Carissa spinarum</i> L.                                                                             | 146 | Fairly common.                                                                                                                                  |
| <i>Gardenia ternifolia</i>    | <i>Gardenia ternifolia</i> Schumach. & Thonn.                                                          | 147 | In Accra and Adampi [?]; not common.                                                                                                            |
| <i>Gardenia medicinalis</i>   | <i>Gardenia thunbergia</i> Thunb.                                                                      | 148 | In the forests of Fida. According to Isert, the Natives use it for several illnesses.                                                           |
| <i>Asclepias procera</i>      | <i>Calotropis procera</i> (Aiton) Dryand.                                                              | 154 | Grows in the sandy areas of La and Prampram. Flowers in March and April.                                                                        |
| <i>Celtis guineensis</i>      | <i>Trema orientalis</i> (L.) Blume                                                                     | 160 | Here and there between other bushes.                                                                                                            |
| <i>Achras sericea</i>         | <i>Chrysophyllum albidum</i> G.Don                                                                     | 179 | /                                                                                                                                               |
| <i>Ornitrophe tristachyos</i> | <i>Allophylus africanus</i> P.Beauv.                                                                   | 188 | Between other bushes on previously cultivated places and near Aquapim.                                                                          |
| <i>Noltia tricolor</i>        | <i>Diospyros tricolor</i> (Schumach. & Thonn.) Hiern                                                   | 189 | Common near the coast.                                                                                                                          |
| <i>Cupania edulis</i>         | <i>Blighia sapida</i> K.D.Koenig                                                                       | 190 | Grows on the fields north of Christiansborg and Fredensborg [Ningo]. Flowers in November and fruits in January.                                 |
| <i>Amyris anisata</i>         | <i>Clausena anisata</i> (Willd.) Hook.f. ex Benth. or <i>Clausena heptaphylla</i> (Roxb.) Wight & Arn. | 191 | Grows here and there, rather common.                                                                                                            |
| <i>Ximenia americana</i>      | <i>Ximenia americana</i> L.                                                                            | 193 | Not common, a mile north of Christiansborg. Flowers in June.                                                                                    |
| <i>Dodonaea repanda</i>       | <i>Dodonaea viscosa</i> (L.) Jacq.                                                                     | 194 | Common on the shores of the Volta.                                                                                                              |
| <i>Sophora nitens</i>         | <i>Sophora tomentosa</i> subsp. <i>littoralis</i> (Schrad.) Yakovlev                                   | 201 | Here and there between the bushes on the estuary of the Volta, also in Poisi [?]. It grows in loose sandy soils and flowers in October and May. |

|                                  |                                                       |     |                                                                                                           |
|----------------------------------|-------------------------------------------------------|-----|-----------------------------------------------------------------------------------------------------------|
| <i>Podalyria hema-toxylon</i>    | <i>Baphia nitida</i> Lodd.                            | 202 | Most common in the valleys of Aquapim, even though it is also not common there.                           |
| <i>Bauhinia thonningii</i>       | <i>Bauhinia thonningii</i> Schum.                     | 203 | In Aquapim.                                                                                               |
| <i>Caesalpinia pulcherrima</i>   | <i>Caesalpinia pulcherrima</i> (L.) Sw.               | 209 | Flowers the whole year. Cultivated in the Danish establishments for its beautiful flowers.                |
| <i>Adenanthera tetraptera</i>    | <i>Tetrapleura tetraptera</i> (Schum. & Thonn.) Taub. | 213 | Grows in the fertile regions of Aquapim, flowers in May.                                                  |
| <i>Melia angustifolia</i>        | <i>Melia azedarach</i> L.                             | 214 | Cultivated.                                                                                               |
| <i>Gomphia flava</i>             | <i>Gomphia flava</i> Schumach. & Thonn.               | 216 | Grows on the fertile mountain fields and flowers in different seasons.                                    |
| <i>Limonia monadelphba</i>       | <i>Trichilia monadelphba</i> (Thonn.) J.J.de Wilde    | 217 | Grows in Aquapim.                                                                                         |
| <i>Erythroxylo-emarginatus</i>   | <i>Erythroxylo-emarginatus</i> Thonn.                 | 224 | /                                                                                                         |
| <i>Spondias aurantiaca</i>       | <i>Spondias mombin</i> L.                             | 225 | Here and there on fields, not so common.                                                                  |
| <i>Psidium longifolium</i>       | <i>Psidium guajava</i> L. (?)                         | 229 | /                                                                                                         |
| <i>Eugenia coronata</i>          | <i>Eugenia coronata</i> Vahl ex DC.                   | 230 | Common at the shores.                                                                                     |
| <i>Lundia monacantha</i>         | <i>Oncoba monacantha</i> Steud. (?)                   | 231 | Rare.                                                                                                     |
| <i>Chrysobalanus orbicularis</i> | <i>Chrysobalanus icaco</i> L.                         | 232 | /                                                                                                         |
| <i>Capparis tomentosa</i>        | <i>Capparis tomentosa</i> Lam.                        | 234 | Rare, found at Ningo.                                                                                     |
| <i>Capparis erythrocarpos</i>    | <i>Capparis erythrocarpos</i> Isert                   | 235 | Here and there at the shores.                                                                             |
| <i>Crataeva guineensis</i>       | <i>Crataeva adansonii</i> DC.                         | 240 | Along the Volta, flowers in May.                                                                          |
| <i>Sterculia verticillata</i>    | <i>Cola verticillata</i> (Thonn.) Stapf ex A.Chev.    | 240 | Here and there in Aquapim. The fruit is eaten by the Natives; it has a bitter taste and dyes crimson red. |
| <i>Deinbollia pinnata</i>        | <i>Deinbollia pinnata</i> (Poir.) Schumach. & Thonn.  | 242 | Here and there.                                                                                           |
| <i>Bülowia illustris</i>         | <i>Smeathmannia pubescens</i> R. Br. (?)              | 246 | /                                                                                                         |
| <i>Euphorbia drupifera</i>       | <i>Euphorbia drupifera</i> Thonn.                     | 250 | /                                                                                                         |
| <i>Uvaria cylindrica</i>         | <i>Uvaria chamae</i> P.Beauv.                         | 256 | Here and there.                                                                                           |
| <i>Annona arenaria</i>           | <i>Annona senegalensis</i> Pers.                      | 257 | Grows at Quita [Keta], often between other bushes in loose sandy                                          |

|                               |                                                                            |     |                                                                                                                                                                                                                                                                                  |
|-------------------------------|----------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               |                                                                            |     | ground. Flowers in September, October, November and fruits in December, January and February.                                                                                                                                                                                    |
| <i>Annona glauca</i>          | <i>Annona glauca</i> Schumach. & Thonn.                                    | 259 | Near Ursua [?]; flowers in May.                                                                                                                                                                                                                                                  |
| <i>Bignonia tulipifera</i>    | <i>Spathodea campanulata</i> P.Beauv.                                      | 273 | In the mountains of Aquapim and in Frederiksstad. Flowers in different seasons.                                                                                                                                                                                                  |
| <i>Bignonia glandulosa</i>    | <i>Newbouldia laevis</i> (P.Beauv.) Seem.                                  | 274 | Cultivated here and there.                                                                                                                                                                                                                                                       |
| <i>Premna quadrifolia</i>     | <i>Premna quadrifolia</i> Schumach. & Thonn.                               | 275 | Once found in Frederiksberg [Frederiksborg]. Flowers in January.                                                                                                                                                                                                                 |
| <i>Vitex ferruginea</i>       | <i>Vitex ferruginea</i> Schumach. & Thonn.                                 | 288 | In Aquapim.                                                                                                                                                                                                                                                                      |
| <i>Vitex cuneata</i>          | <i>Vitex doniana</i> Sweet                                                 | 289 | Everywhere.                                                                                                                                                                                                                                                                      |
| <i>Avicennia africana</i>     | <i>Avicennia germinans</i> (L.) L.                                         | 290 | Grows at the small salty reefs close to the beach but rarely above 6-8 <i>alen</i> height. At the Volta river and close by areas where the shore side wind is not as strong, it grows as big as the largest oak. Flowers primarily in the rainy seasons but also at other times. |
| <i>Adansonia digitata</i>     | <i>Adansonia digitata</i> L.                                               | 300 | At Quita [Keta], Tubreku [Togbloku], Aquapim.                                                                                                                                                                                                                                    |
| <i>Bombax pentandrum</i>      | <i>Ceiba pentandra</i> (L.) Gaertn.                                        | 301 | /                                                                                                                                                                                                                                                                                |
| <i>Hibiscus tilliceus</i>     | <i>Hibiscus tilliaceus</i> L.                                              | 313 | Common at the shores of the Volta.                                                                                                                                                                                                                                               |
| <i>Mimosa glaberrima</i>      | <i>Albizia glaberrima</i> (Schum. & Thonn.) Benth.                         | 321 | Here and there between Asiaman [Afiaman] and Jadofa [Oyarifa]. Flowers in April. The wood is used as firewood.                                                                                                                                                                   |
| <i>Mimosa adianthifolia</i>   | <i>Albizia adianthifolia</i> (Schum.) W.Wight                              | 322 | Grows in Bligusso [Berekuso] and flowers in April.                                                                                                                                                                                                                               |
| <i>Mimosa guineensis</i>      | <i>Zapoteca portoricensis</i> (Jacq.) H.M.Hern.                            | 323 | Grows in the shrubbery and near Aquapim.                                                                                                                                                                                                                                         |
| <i>Mimosa procumbens</i>      | <i>Mimosa pigra</i> L.                                                     | 324 | Some bushes of this plant were found near Christiansborg.                                                                                                                                                                                                                        |
| <i>Mimosa adstringens</i>     | <i>Acacia nilotica</i> subsp. <i>adstringens</i> (Schum. & Thonn.) Roberty | 327 | In Ningo.                                                                                                                                                                                                                                                                        |
| <i>Pterocarpus esculentus</i> | <i>Pterocarpus santalinoides</i> DC.                                       | 330 | Grows widespread at the shores of the Volta.                                                                                                                                                                                                                                     |
| <i>Sommerfeldtia obovata</i>  | <i>Machaerium lunatum</i> (L.f.) Ducke                                     | 331 | Everywhere at the shores of the Volta.                                                                                                                                                                                                                                           |
| <i>Ecastaphyllum brownnei</i> | <i>Dalbergia ecastaphyllum</i> (L.) Taub.                                  | 332 | Everywhere at the shores of the Volta.                                                                                                                                                                                                                                           |



|                                |                                                                |     |                                                                            |
|--------------------------------|----------------------------------------------------------------|-----|----------------------------------------------------------------------------|
| <i>Erythrina latifolia</i>     | <i>Erythrina senegalensis</i> DC.                              | 333 | Rarely found wild but cultivated by the Natives.                           |
| <i>Robinia thoningii</i>       | <i>Millettia thoningii</i> (Schumach. & Thonn.) Baker          | 349 | Grows here and there on the field, most commonly, however, near the Volta. |
| <i>Robinia multiflora</i>      | <i>Millettia irvinei</i> Hutch. & Dalziel                      | 350 | Not very common. Grows in June.                                            |
| <i>Robinia argenteiflora</i>   | <i>Lonchocarpus sericeus</i> (Poir.) Kunth ex                  | 352 | In Ada.                                                                    |
| <i>Citrus paniculata</i>       | <i>Afraegle paniculata</i> (Schumach. & Thonn.) Engl.          | 378 | /                                                                          |
| <i>Chrysocoma amara</i>        | <i>Vernonia colorata</i> subsp. <i>Colorata</i> (Willd.) Drake | 383 | /                                                                          |
| <i>Acalypha dentata</i>        | <i>Mallotus oppositifolius</i> (Geiseler) Müll.Arg.            | 410 | Here and there.                                                            |
| <i>Jatropha curcas</i>         | <i>Jatropha curcas</i> L.                                      | 412 | Here and there.                                                            |
| <i>Janipha manihot</i>         | <i>Manihot esculenta</i> Crantz                                | 414 | Cultivated.                                                                |
| <i>Phyllanthus angulatus</i>   | <i>Flueggea virosa</i> (Roxb. ex Willd.) Royle                 | 415 | Common in the plains close to the sea.                                     |
| <i>Zanthoxylum polygamum</i>   | <i>Zanthoxylum zanthoxyloides</i> (Lam.) Zepern. & Timler (?)  | 433 | Common.                                                                    |
| <i>Phoenix spinosa</i>         | <i>Phoenix reclinata</i> Jacq.                                 | 437 | At the Volta, in the Aquapim mountains and in some other places.           |
| <i>Elais guineensis</i>        | <i>Elaeis guineensis</i> Jacq.                                 | 439 | Grows wild and cultivated.                                                 |
| <i>Borassus flabelliformis</i> | <i>Borassus flabellifer</i> L.                                 | 443 | Here and there.                                                            |
| <i>Hyphaene guineensis</i>     | <i>Hyphaene guineensis</i> Schumach. & Thonn.                  | 445 | /                                                                          |
| <i>Ferreola guineensis</i>     | <i>Diospyros vera</i> (Lour.) A.Chev.                          | 448 | In Quita [Keta].                                                           |
| <i>Schousboea cordifolia</i>   | <i>Alchornea cordifolia</i> (Schumach. & Thonn.) Müll.Arg.     | 449 | Here and there.                                                            |
| <i>Flacourtia edulis</i>       | <i>Flacourtia flavescens</i> Willd.                            | 450 | Here and there.                                                            |



**Figure 45** Location of places mentioned in Schumacher (1827)  
Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL

## 9 Neighbourhood Land Cover Values with Standard Errors

| Area                | Canopy (%) | Canopy SE | Plantable (%) | Plantable SE | Non-plantable (%) | Non-plantable SE |
|---------------------|------------|-----------|---------------|--------------|-------------------|------------------|
| Accra               | 14.0       | 1.55      | 40.40         | 2.19         | 45.60             | 2.23             |
| Abeka               | 5.00       | 0.97      | 24.20         | 1.92         | 70.80             | 2.03             |
| Abelenkpe           | 13.40      | 1.52      | 36.80         | 2.16         | 49.80             | 2.24             |
| Abofu               | 16.60      | 1.66      | 34.00         | 2.12         | 49.40             | 2.24             |
| Abossey Okai        | 3.80       | 0.86      | 22.20         | 1.86         | 74.00             | 1.96             |
| Accra Central       | 6.60       | 1.11      | 31.40         | 2.08         | 62.00             | 2.17             |
| Achimota College    | 53.60      | 2.23      | 32.60         | 2.10         | 13.80             | 1.54             |
| Adabraka            | 9.20       | 1.29      | 32.60         | 2.10         | 58.20             | 2.21             |
| Airport Residential | 30.40      | 2.06      | 36.00         | 2.15         | 33.60             | 2.11             |
| Airport West Res.   | 22.40      | 1.86      | 39.40         | 2.19         | 38.20             | 2.17             |
| Akweteyman          | 11.80      | 1.44      | 31.60         | 2.08         | 56.60             | 2.22             |
| Alajo               | 6.20       | 1.08      | 33.40         | 2.11         | 60.40             | 2.19             |
| Alogboshie          | 7.80       | 1.20      | 44.60         | 2.22         | 47.60             | 2.23             |
| Asylum Down         | 12.60      | 1.48      | 24.40         | 1.92         | 63.00             | 2.16             |
| Avenor              | 3.60       | 0.83      | 34.80         | 2.13         | 61.60             | 2.18             |
| Awudome             | 26.20      | 1.97      | 37.00         | 2.16         | 36.80             | 2.16             |
| Bubuashie           | 12.60      | 1.48      | 36.60         | 2.15         | 50.80             | 2.24             |
| Cantonments         | 27.60      | 2.00      | 38.80         | 2.18         | 33.60             | 2.11             |
| Chorkor             | 0.20       | 0.20      | 18.60         | 1.74         | 81.20             | 1.75             |
| Dansoman            | 17.00      | 1.68      | 29.80         | 2.05         | 53.20             | 2.23             |
| Darkuman            | 7.40       | 1.17      | 26.60         | 1.98         | 66.00             | 2.12             |
| Dzorwulu            | 15.00      | 1.60      | 41.40         | 2.20         | 43.60             | 2.22             |
| East Legon          | 14.40      | 1.57      | 40.80         | 2.20         | 44.80             | 2.22             |
| East Legon Ext.     | 20.00      | 1.79      | 49.80         | 2.24         | 30.20             | 2.05             |
| Gbegbeyise          | 2.00       | 0.68      | 29.20         | 2.03         | 68.80             | 2.07             |
| James Town          | 1.20       | 0.49      | 41.20         | 2.20         | 37.60             | 2.21             |
| Kanda               | 21.40      | 1.83      | 41.40         | 2.20         | 37.20             | 2.16             |
| Kaneshie            | 5.00       | 0.97      | 33.20         | 2.11         | 61.80             | 2.17             |
| Kisseman            | 16.20      | 1.65      | 37.20         | 2.16         | 46.60             | 2.23             |
| Kokomlemle          | 3.80       | 0.86      | 27.80         | 2.00         | 68.40             | 2.08             |
| Korle Bu            | 22.40      | 1.86      | 53.60         | 2.23         | 24.00             | 1.91             |
| Korle Dudor         | 2.80       | 0.74      | 26.00         | 1.96         | 71.20             | 2.03             |
| Korle Gonno         | 5.20       | 0.99      | 37.00         | 2.16         | 57.80             | 2.21             |
| Kotobabi            | 4.00       | 0.88      | 31.00         | 2.07         | 65.00             | 2.13             |
| Kpehe               | 4.00       | 0.88      | 30.80         | 2.06         | 65.20             | 2.13             |
| Kwashiman           | 5.60       | 1.03      | 35.20         | 2.14         | 59.20             | 2.20             |

|                   |       |      |       |      |       |      |
|-------------------|-------|------|-------|------|-------|------|
| La                | 8.80  | 1.27 | 31.60 | 2.08 | 59.60 | 2.19 |
| La Dadekotopon    | 10.40 | 1.37 | 67.20 | 2.10 | 22.40 | 1.86 |
| Labone            | 19.40 | 1.77 | 39.60 | 2.19 | 41.00 | 2.20 |
| Lapaz             | 5.80  | 1.05 | 35.00 | 2.13 | 59.20 | 2.20 |
| Lartebiokorshie   | 13.00 | 1.50 | 33.20 | 2.11 | 53.80 | 2.23 |
| Legon             | 33.60 | 2.11 | 50.80 | 2.24 | 15.60 | 1.62 |
| Mamobi            | 4.40  | 0.92 | 18.60 | 1.74 | 77.00 | 1.88 |
| Mamponse          | 5.40  | 1.01 | 32.20 | 2.09 | 62.40 | 2.17 |
| Mamprobi          | 8.60  | 1.25 | 30.40 | 2.06 | 61.00 | 2.18 |
| Mateheko          | 7.60  | 1.19 | 28.80 | 2.03 | 63.60 | 2.15 |
| Ministerial Area  | 15.20 | 1.61 | 49.00 | 2.24 | 35.80 | 2.14 |
| Mpoase            | 3.40  | 0.81 | 33.80 | 2.12 | 62.80 | 2.16 |
| New Fadama        | 8.40  | 1.24 | 33.80 | 2.12 | 57.80 | 2.21 |
| New Town          | 3.60  | 0.83 | 31.40 | 2.08 | 65.00 | 2.13 |
| Nima              | 4.40  | 0.92 | 17.60 | 1.70 | 78.00 | 1.85 |
| North Alajo       | 5.80  | 1.05 | 38.40 | 2.18 | 55.80 | 2.22 |
| North Dzorwulu    | 21.00 | 1.82 | 40.80 | 2.20 | 38.20 | 2.17 |
| North Industrial  | 7.80  | 1.20 | 31.60 | 2.08 | 60.60 | 2.19 |
| North Kaneshie    | 15.60 | 1.62 | 35.20 | 2.14 | 49.20 | 2.24 |
| North Odorkor     | 12.40 | 1.47 | 37.60 | 2.17 | 50.00 | 2.24 |
| North Ridge       | 28.40 | 2.02 | 35.40 | 2.14 | 36.20 | 2.15 |
| Nyaniba Estate    | 12.60 | 1.48 | 32.00 | 2.09 | 55.40 | 2.22 |
| Old Mamprobi      | 10.60 | 1.38 | 34.20 | 2.12 | 55.20 | 2.22 |
| Old Tesano        | 11.00 | 1.40 | 36.40 | 2.15 | 52.60 | 2.23 |
| Osu               | 10.20 | 1.35 | 36.80 | 2.16 | 53.00 | 2.23 |
| Ringway Estate    | 30.20 | 2.05 | 33.20 | 2.11 | 36.60 | 2.15 |
| Roman Ridge       | 24.80 | 1.93 | 46.40 | 2.23 | 28.80 | 2.03 |
| Russia            | 6.00  | 1.06 | 28.40 | 2.02 | 65.60 | 2.12 |
| Sabon Zongo       | 5.20  | 0.99 | 28.00 | 2.01 | 66.80 | 2.11 |
| Sempe             | 9.80  | 1.33 | 29.00 | 2.03 | 61.20 | 2.18 |
| South Industrial  | 5.60  | 1.03 | 36.40 | 2.15 | 58.00 | 2.21 |
| South Labadi      | 6.20  | 1.08 | 51.80 | 2.23 | 42.00 | 2.21 |
| South Legon       | 22.00 | 1.85 | 57.60 | 2.21 | 20.40 | 1.80 |
| South Odorkor     | 10.80 | 1.39 | 39.20 | 2.18 | 50.00 | 2.24 |
| Sukura            | 8.60  | 1.25 | 37.80 | 2.17 | 53.60 | 2.23 |
| Tesano            | 21.80 | 1.85 | 44.60 | 2.22 | 33.60 | 2.11 |
| Tudu              | 6.00  | 1.06 | 31.80 | 2.08 | 62.20 | 2.17 |
| Ussher Town       | 2.60  | 0.71 | 10.40 | 1.37 | 87.00 | 1.50 |
| West Abossey Okai | 9.40  | 1.31 | 37.60 | 2.17 | 53.00 | 2.23 |
| West Ridge        | 28.60 | 2.02 | 40.20 | 2.19 | 31.20 | 2.07 |
| Zoti              | 17.40 | 1.70 | 43.40 | 2.22 | 39.20 | 2.18 |

## 10 Terms for Interactions between Stakeholders

| Interactions                                        |                                                                              |
|-----------------------------------------------------|------------------------------------------------------------------------------|
| to (not) comply with something                      | to (not) be involved                                                         |
| to (not) have to comply with something              | to (not) involve someone                                                     |
| to (not) take part in something                     | to (not) need to involve someone                                             |
| to (not) be part of something                       | to (not) need to get involved                                                |
| to (not) be supposed to be part of something        | to (not) warn someone                                                        |
| to (not) work in partnership with someone           | to (not) make someone aware of something                                     |
| to (not) partner with someone                       | to (not) interact with someone                                               |
| to (not) compete with someone                       | to (not) be there for someone                                                |
| to (not) impose something on someone (e.g. charges) | to (not) do work for someone                                                 |
| to (not) encourage someone to do something          | to (not) meet                                                                |
| to (not) talk to someone about something            | to (not) be able to meet                                                     |
| to (not) connect with someone                       | to (not) direct/refer someone to someone/somewhere else                      |
| to (not) get interested                             | to (not) motivate someone to do something                                    |
| to (not) be interested                              | to (not) take (legal) actions against someone/something                      |
| to (not) make someone interested                    | to (not) approve something for someone else                                  |
| to (not) feel well-informed by someone              | to (not) present something to someone                                        |
| to (not) be well-informed                           | to (not) give/bring something to someone (e.g. copies, opportunities, ideas) |
| to (not) make information available                 | to (not) ask someone to do/give something                                    |
| to (not) inform someone                             | to (not) need approval from someone                                          |
| to (not) be informed                                | to (not) be present/active                                                   |
| to (not) supply something to someone                | to (not) consider who is present/active                                      |
| to (not) acquire something from someone             | to (not) sensitize someone about/for something                               |
| to (not) have support from someone/anyone           | to (not) make an effort to sensitize someone about/for something             |
| to (not) support someone/something                  | to (not) stand up against something/someone                                  |
| to (not) be able to get support                     | to (not) demonstrate something to someone                                    |
| to (not) have to seek support to do something       | to (not) drive someone away/out                                              |
| to (not) force someone to do something              | to (not) insist that someone does something                                  |
| to (not) attack someone                             | to (not) ensure that someone does something                                  |
| to (not) be able to regulate                        | to (not) try that someone does something                                     |
| to (not) regulate something                         | to (not) expect someone to do something                                      |
| to (not) collaborate with someone                   | to (not) make someone do something (e.g. compensate, pledge, plant)          |
| to (not) cooperate with someone                     | to (not) do something about something                                        |
| to (not) consult someone                            | to (not) promote something                                                   |

|                                                                            |                                                                |
|----------------------------------------------------------------------------|----------------------------------------------------------------|
| to (not) report to someone                                                 | to (not) be sponsored by someone                               |
| to (not) report someone                                                    | to (not) get to know things                                    |
| to (not) be able to control someone                                        | to (not) share your<br>experience/knowledge/plans with someone |
| to (not) control someone                                                   | to (not) take over something                                   |
| to (not) agree with someone/something                                      | to (not) resist to listening to someone else                   |
| to (not) assist someone                                                    | to (not) see value in someone else's work                      |
| to (not) work together                                                     | to (not) relocate someone to another<br>stakeholder's office   |
| to (not) come together to do something                                     | to (not) buy into someone else's plans/ideas                   |
| to (not) coordinate something                                              | to (not) channel your ideas into someone else's<br>work        |
| to (not) give advice to someone                                            | to (not) put pressure onto someone                             |
| to (not) trust someone                                                     | to (not) being pushed by someone                               |
| to (not) contract someone                                                  | to (not) organise something                                    |
| to (not) accept something                                                  | to (not) explain something to someone                          |
| to (not) supervise someone/something                                       | to (not) challenge someone to do something                     |
| to (not) guide someone                                                     | to (not) be encouraged by someone's<br>behaviour/actions       |
| to (not) stop someone                                                      | to (not) give conditions on how to do<br>something             |
| to (not) be able to stop someone/something                                 | to (not) merge with someone                                    |
| to (not) invite someone to do something                                    | to (not) correct the attitude of someone                       |
| to (not) task someone to do something                                      | to (not) conduct a verification                                |
| to (not) work closely with someone                                         | to (not) do something behind someone's back                    |
| to (not) work closer with someone                                          | to (not) assure someone to get something                       |
| to (not) finance someone/something                                         | to (not) be limited by someone else                            |
| to (not) take any side                                                     | to (not) have your work undone                                 |
| to (not) receive something/anything (e.g.<br>feedback, training, supplies) | to (not) require someone to do/have<br>something               |
| to (not) get attention                                                     | to (not) join someone/something                                |
| to (not) draw someone's attention to<br>something                          | to (not) obtain knowledge from<br>someone/somewhere            |
| to (not) interfere                                                         | to (not) let someone know something                            |
| to (not) help someone do something                                         | to (not) allow someone to do something                         |
| to (not) see how to help someone                                           | to (not) be allowed to do something                            |
| to (not) restrict someone to do something                                  | to (not) do your own thing                                     |
| to (not) educate someone                                                   | to (not) tell someone to do something                          |
| to (not) need to educate someone                                           | to (not) tell someone something                                |
| to (not) train someone to do something                                     | to (not) take care that someone does<br>something              |
| to (not) organise something for someone<br>(e.g. training)                 | to (not) engage                                                |

## 11 Information on All Household Trees

| HH | Trees (T) and Saplings (S) | Species                                               | Comments                                                                                                                                |
|----|----------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1  | T1                         | Mango                                                 | About 80 years old <sup>30</sup> , branches pruned to about 1,80 m height, DBH 60 cm, 6-7 m high, crown spread 12 m, holds washing line |
| 1  | T2                         | Avocado                                               | Planted about 12 years ago, does not give fruits, 9-10m high, 2 stems, DBH 8 cm and 9.5 cm, crown spread 6 m,                           |
| 1  | T3                         | <i>Newbouldia laevis</i>                              | Planted about 10 years ago, 9-10 m high, DBH 13 cm                                                                                      |
| 1  | T4                         | <i>Newbouldia laevis</i>                              | Planted about 10 years ago, 9-10 m high, DBH 24 cm                                                                                      |
| 1  | T5                         | <i>Newbouldia laevis</i>                              | Planted about 10 years ago, 9-10 m high, DBH 8 cm                                                                                       |
| 1  | T6                         | <i>Newbouldia laevis</i>                              | Planted about 2 years ago, 7 m high, 2 stems with 8 cm and 10 cm DBH, crown spread 3 m                                                  |
| 1  | T7                         | <i>Newbouldia laevis</i>                              | Planted about 2 years ago, 7 m high, DBH 13 cm, crown spread 3 m                                                                        |
| 1  | T8                         | Umbrella tree ( <i>Terminalia catappa</i> )           | Planted in 1979, DBH 35 cm, 12 m high, crown spread 11 m                                                                                |
| 1  | 1S-7S                      | Mango, 4x Soursop, <i>Dialium guineense</i> , Unknown | Planted less than a year ago, 0.8-1.2 m high                                                                                            |
| 2  | T1                         | Coconut                                               | 12 m high, DBH 40 cm, crown spread 4.5 m, holds washing lines                                                                           |
| 2  | T2                         | Coconut                                               | 7 m high, DBH 20 cm, crown spread 4 m, holds washing lines                                                                              |
| 2  | T3                         | Coconut                                               | 14 m high, DBH 30 cm, crown spread 5 m                                                                                                  |
| 2  | T4                         | Coconut                                               | 7.5 m high, DBH 22 cm, crown spread 5 m, shaded by T3 and T5 and T30                                                                    |
| 2  | T5                         | Coconut                                               | 14 m high, DBH 25 cm, crown spread 4.5 m                                                                                                |
| 2  | T6                         | Coconut                                               | 7.5 m high, DBH 20 cm, crown spread 4 m                                                                                                 |
| 2  | T7                         | Coconut                                               | DBH 20 cm, crown spread 5.5 m, coconut harvester cut some coconuts off this palm and pruned some fronds                                 |
| 2  | T8                         | Coconut                                               | 6 m high, DBH 20 cm, crown spread 4 m, largely shadowed by surrounding palms                                                            |
| 2  | T9                         | Coconut                                               | 13 m high, DBH 30 cm, crown spread 5 m                                                                                                  |
| 2  | T10                        | Coconut                                               | 13 m high, DBH 30 cm, crown spread 5 m                                                                                                  |
| 2  | T11                        | Coconut                                               | 13 m high, DBH 20 cm, crown spread 4 m, one side of stem black, possibly burnt as located next to the HH's garbage burning place        |

<sup>30</sup> Approximate age at time of data collection in 2017.

|   |         |                          |                                                                                                                                                                                   |
|---|---------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 | T12     | Coconut                  | 5.5 m high, DBH 15 cm, crown spread 4 m                                                                                                                                           |
| 2 | T13     | Coconut                  | 5 m high, DBH 20 cm, crown spread 5 m                                                                                                                                             |
| 2 | T14     | Coconut                  | 12 m high, DBH 25 cm, crown spread 5 m                                                                                                                                            |
| 2 | T15     | Coconut                  | 12 m high, DBH 30 cm, crown spread 4 m                                                                                                                                            |
| 2 | T16     | Coconut                  | 12 m high, DBH 20 cm, crown spread 5 m                                                                                                                                            |
| 2 | T17     | Coconut                  | 12 m high, DBH 20 cm, crown spread 4.5 m                                                                                                                                          |
| 2 | T18     | Coconut                  | 13 m high, DBH 20 cm, crown spread 4 m                                                                                                                                            |
| 2 | T19     | Coconut                  | 12 m high, DBH 20 cm, crown spread 5 m                                                                                                                                            |
| 2 | T20     | Coconut                  | 13 m high, DBH 25 cm, crown spread 4.5 m                                                                                                                                          |
| 2 | T21     | Coconut                  | 13 m high, DBH 25 cm, crown spread 4.5 m                                                                                                                                          |
| 2 | T22     | Coconut                  | 13 m high, DBH 25 cm, crown spread 4.5 m                                                                                                                                          |
| 2 | T23     | Coconut                  | 13 m high, DBH 25 cm, crown spread 4.5 m                                                                                                                                          |
| 2 | T24     | Coconut                  | 6 m high, DBH 20 cm, crown spread 2 m                                                                                                                                             |
| 2 | T25     | Oil Palm                 | 5 m high                                                                                                                                                                          |
| 2 | T26     | Oil Palm                 | 2.5 m high, crown spread 3 m                                                                                                                                                      |
| 2 | T27     | Oil Palm                 | 10 m high, DBH 40 cm, crown spread 5.5 m                                                                                                                                          |
| 2 | T28     | Papaya                   | 6 m high, 12 cm DBH                                                                                                                                                               |
| 2 | T29     | Neem                     | 4 m high, only one quarter of crown with leaves, stem almost black in some places, located close to garbage burning place, crown spread 3 m in one direction and 1 m in the other |
| 2 | T30     | <i>Newbouldia laevis</i> | 9 m high, 2 stems with 18 cm and 15 cm DBH, crown spread 3 m                                                                                                                      |
| 2 | T31     | <i>Newbouldia laevis</i> | 5 m high, DBH 10 cm                                                                                                                                                               |
| 2 | T32-T41 | <i>Newbouldia laevis</i> | Between 2 and 7 m high, between 5 and 10 cm DBH                                                                                                                                   |
| 2 | T42     | <i>Newbouldia laevis</i> | 7 m high, DBH 10 cm, crown spread 2 m                                                                                                                                             |
| 2 | T43     | <i>Newbouldia laevis</i> | 7 m high, DBH 25 cm, crown spread 2 m                                                                                                                                             |
| 2 | T44     | <i>Hippocratea</i> sp.   | 5 m high, DBH 15 cm, crown spread 2 m                                                                                                                                             |
| 2 | T45     | <i>Hippocratea</i> sp.   | 4 m high, DBH 10 cm, crown spread 1.5 m                                                                                                                                           |
| 2 | T46     | <i>Ficus capensis</i>    | 7.5 m high, 2 stems with DBH 20 cm and 15 cm, crown spread 7 m                                                                                                                    |
| 2 | S1-S10  | Coconut                  | Between 60 cm and 2 m high, for sale, several with broken and dried leaves, completely shaded by other plants                                                                     |
| 3 | T1      | Avocado                  | 7 m high, DBH 30 cm, crown spread 8-9 m                                                                                                                                           |
| 3 | T2      | Moringa                  | Cut off at 1.5 m height, resprouting, DBH 10 cm                                                                                                                                   |
| 3 | T3      | Moringa                  | Cut off at 1.5 m height, resprouting, DBH 10 cm                                                                                                                                   |
| 4 | T1      | Coconut                  | 15 m high, DBH 40 cm, crown spread 6 m                                                                                                                                            |
| 4 | T2      | Coconut                  | 14 m high, DBH 40 cm, crown spread 4 m                                                                                                                                            |
| 4 | T3      | Oil palm                 | 12 m high, DBH 40 cm, crown spread 7 m                                                                                                                                            |
| 4 | T4      | Coconut                  | 13 m high, DBH 20 cm, crown spread 2.5 m, no coconuts                                                                                                                             |
| 4 | T5      | Oil palm                 | 12.5 m high, crown spread 8 m                                                                                                                                                     |



|   |        |                        |                                                                                                                                                                                                                  |
|---|--------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | T6-T13 | Moringa                | Between 2 and 3.5 m high, between 3 and 10 cm DBH, between 1 and 3 m crown spread, apart from T6 and T13 overshadowed by T5, T6 and T13 noticeably bigger than T7 to T12                                         |
| 4 | T14    | Coconut                | 14 m high, DBH 35 cm, crown spread 4 m                                                                                                                                                                           |
| 4 | T15    | Coconut                | 15 m high, DBH 30 cm, crown spread 4 m                                                                                                                                                                           |
| 4 | T16    | Coconut                | 13 m high, DBH 30 cm, bottom part of stem black, possibly from burning as located close to the HH's garbage burning area, fronds appear short and 'broken', fronds are yellow and asymmetrical, crown spread 3 m |
| 4 | T17    | Coconut                | 14 m high, DBH 25 cm, crown spread 4 m                                                                                                                                                                           |
| 4 | T18    | <i>Annona squamosa</i> | About 5 m high, 2 stems with DBH 15 cm and 18 cm, crown spread 5-6 m                                                                                                                                             |
| 4 | T19    | Mango                  | Dying/almost dead, 11 m high, DBH 70 cm, crown spread 12 m (almost no leaves left)                                                                                                                               |
| 4 | T20    | Coconut                | 10 m high, DBH 20 cm, crown spread 4 m                                                                                                                                                                           |
| 4 | S1     | Lemon                  | 60 cm high, 'fenced' with some stones                                                                                                                                                                            |
| 4 | S2     | Lemon                  | 25 cm high, 'fenced' with some stones                                                                                                                                                                            |
| 4 | S3     | Lemon                  | 15 cm high, 'fenced' with some stones                                                                                                                                                                            |