INFLUENCE OF INSTITUTIONAL FACTORS ON TREE COVER IN PUBLIC PRIMARY SCHOOLS IN KISUMU COUNTY, KENYA

BY

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DECLARATION

This Thesis report is my original work and has never been presented in this or any other University. All sources of information have been acknowledged explicitly through references.

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DEDICATION

This Thesis report is dedicated to all nations, institutions and individuals who appreciate the worth of the environment and acknowledge that it takes all of us to revive and sustainably manage its precious resources.

ABSTRACT

The entire world benefits from diverse forest biological compositions and services. However, due to natural calamities and human activities, Kenya had only 7.4% forest cover against its 2010 Constitution's minimum of 10%, and Kisumu County had 0.44% forest cover. Besides, reforestation efforts have been jeopardized by increasing land demands; therefore, tree cover has been a great complement to forest cover. Despite having substantial land, the development performance indicators for schools worldwide focused on infrastructural design compared to other land uses. Studies have been done on the influence of green spaces on curriculum and recommendations given for a study on the influence of curriculum on green spaces. Studies have also found that students' classroom learning about ESD is reinforced by the school's formal and informal messages promoted by the school's rules, values, and actions. Thus, the study aimed at determining the influence of institutional factors on tree cover in public primary schools in Kisumu County. Specific objectives were to; determine the influence of school land-use practices on tree population; assess the influence of school curriculum on tree species and establish the relationship between school ground greening the rules and the tree abundance in public primary schools. A descriptive cross-sectional research design was adopted for the study with the individual public primary school as the unit of analysis. Using Mugenda & Mugenda (2003), 20% (124) of the schools were subjected to the study. Every 5^{th} school was drawn from a list of all the public primary schools in the County using a systematic random sampling method. Pilot testing was done in 12 (10% of the sampled number); item analysis reliability and content validity were used to test the instruments used for data collection. Questionnaires were self-administered to school heads and responses were harmonized using focus group discussions with teachers and pupils**.** Further, representatives from the education, forestry, and administrative sectors and parents were interviewed. Observation and desk studies were also used as supplements. Qualitative data were organized into themes and categories then the pattern, trends, and relationships among them were established and presented in the text. Simple descriptive statistics, product-moment correlation and linear regression analysis were conducted to determine the relationships between institutional factors and tree cover in schools, and the were results presented in simple tables and charts. The study established that public primary schools averagely occupy **3.26Ha** with approximately **23.7%** unused spaces. There was a strong positive correlation between school land-use practices and tree population (**r=0.843)**; a weak positive correlation between the three forms of the curriculum studied and tree species (curricular, **r=0.125**, co-curricular, **r=0.393**, extracurricular, **r=0.18**) and a modest positive correlation between school ground greening policies **(r=0.43)** and tree cover in public primary schools. In conclusion, institutional factors positively influenced tree cover in public primary schools. Therefore, the study recommended partial use of the unused spaces to bring up active woodlots or gardens. Teaching and learning to include outdoor lessons with tree planting and management activities; clubs to be intensified and the number of participants in extra-curricular activities be increased. Lastly, schools to emphasize environmental consciousness in their motto/mission/vision statements and have ground greening rules.

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LIST OF ACRONYMS

AAR: Against All Risk

CODESRIA: Council for the Development of Social Science Research in Africa

ESD: Education for Sustainable Development

FAO: Food and Agriculture Organization

FLEG: Forest Law Enforcement and Governance

FT: Forest Transition

GFRA: Global Forest Resource Assessment

IPGRI: International Plant Genetic Resources Institute

ITTO: International Tropical Timber Organization

IUCN: International Union for the Conservation of Nature

KCIDP: Kisumu County Integrated Environmental Plan

KEFRI: Kenya Forestry Research Institute

KFS: Kenya Forest Service

KLEG: Kenya Forest Law Enforcement and Governance

LW: Lower Primary

MENRRDA: Ministry of Environment and Natural Resource and Regional Development Authorities

PPI: Programme for Pastoral Instruction

PPS: Public Primary School

SGGR:	School ground greening rules
SGI:	School Greening Initiative
TCE:	Tree Cover Establishment
UNEP:	United Nation Environmental Programme
UP:	Upper Primary
BoM	Board of Management
KCIDP	Kisumu County Integrated Development Plan
VTC	Vocational training Center
COP	Communication on Progress
FGD	Focused Group Discussions
CV	Coefficience of Variance
UN	United nations

OPERATIONAL DEFINITION OF TERMS

Co-curricular Programmes and learning experiences which complements what is taught and learnt under curricular provisions

Curricular A form of curriculum which has the publicly explicit goals or opportunities provided by the schools, follows the content (from external standards and local goals) and implementation plan for productive teaching and learning as stated in curriculum guides of the schools.

Extra-curricular Activities falling outside the realm of normal curriculum of a primary school but initiated by the teachers or learners to help build on certain traits or values.

Institution: A social structure that constitutes structural framework, mandate, behavioral and the empowering rules and are either public (state-owned) or private. The study will focus on public primary schools in Kisumu County.

Institutional factors: An institution in most cases introduces objects, structures, positions, roles, and functions by way of practical rules, norms goals and preferences. Therefore, for this study institutional factors were routines, practices and rules that shape an institution's culture

Land cover: Conventionally, land cover is defined as the physical material(s) on the surface of the earth. With respect to public primary schools, land cover was the physical materials the surface of a school land.

Land use practice: Conventionally, Land use concerns the products or benefits obtained from use of the land and the land management actions (activities) carried out by humans to produce those products and benefits. In the study, these were the approaches taken, management and modifications done on school land to achieve a purposive land use outcome.

Lower and upper primary: According to KICD, lower primary in Kenya includes grades 1-3 while upper primary are grades 5-8. However, for the study, lower primary included grades 1-4 while upper primary were grades 5-6. The re-grouping was done to best fit the study due to the introduction of Competency Based Curriculum that had reached grade 4 by 2020. Therefore, the two groups were made based on the type of curriculum done.

Public institution: An institution whose main source of funding is the government and have insignificant decision-making influence from the community.

Public Primary school: Elementary learning institutions established, owned, or operated by the Government and tasked with the mandate of preparing pupils to fulfill their potential and be ready for high school, college, workforce, and civic life.

School curriculum: Curriculum refers to the specific blueprint which takes content (from external standards and national goals) shaped into procedural plans on how to conduct effective teaching and learning. The study looked at the three forms of curriculum (curricular, co-curricular and extra-curricular)

content and performance standards for learning to achieve desired results.

School ground greening rules: Individual school level rules and principles guiding tree cover establishment and maintenance within public primary schools' compounds aimed at school ground greening.

School ground greening: Ground greening is the process of transforming living environment into more environmentally friendly version specifically by introducing plants like trees and grass. Schools ground greening therefore meant the creation and maintenance of a section covered by trees within public primary schools' compound.

Tree cover: These are tree patches outside recorded forest areas less than the minimum mappable area of one hectare. They were the count of trees constituting one or more species clustered, scattered or arranged in a linear sequence within the school compound.

Tree population: This is the number of tall plants with hard trunks, branches and leaves. For the purposes of the study, tree population was the number, species and distribution of trees within a distinct space in public primary school.

Unused spaces Areas within the school compound not covered with any land use.

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CHAPTER ONE

INTRODUCTION

1.1 Background Information

Forests are prestigious and are global as well as national resources (FAO , 2003). The entire world benefits from their diverse biological composition and every nation are served with their greatly diverse services which include food, water and atmospheric purification (Ambus, D'Arcy, & Tyler, 2007). Forest cover is unevenly distributed, there are countries with the greater part of their land forested and those with minimal and insignificant forest cover (World Bank, 2008). Unfortunately, forest cover sizes is constantly shrinking in response to natural patterns and human activities (Food and Agriculture of the United Nation, 2007). Disasters like wildfires, volcanic activities and human activities cause forest areas to decrease with the latter being the most common and rapid cause (German, Karsently, & Tiani, 2010). These only left approximately 31% of the entire earth land surface forested by 2010 based on a World Bank report. Out of which, 93% were occurring naturally and 7% were planted.

In 2008, the World Bank established those anthropogenic activities, including the cutting of woodlands and scattered trees and conversion of forested land to other uses, mainly occur because someone finds it profitable. Jagger Pamela (2003) also concluded that agricultural and settlement expansion which has highly transformed forest habitats across the globe has been to meet the demand of the ever-increasing population. The decline and incline in forest and agricultural land respectively are more evident in low-income countries characterized by high population growth (Food and Agriculture Organization, 2009). Therefore, as established by Emmanuel & Diverson (2010), woodlots and other trees out of the forest are increasingly important sources of woody biomass and are critical soil and water conservation investment as deforestation and land degradation get worse worldwide. Therefore, efficient strategies aimed at increasing tree cover will help correct the imbalance in various land uses (Blaes, et al., 2013). For example, managing an imbalance in the forest and woodland ecosystems is the key strategy for removing atmospheric carbon (iv) oxide (Deakin, Kshatriya, & Sunderland, 2016). However, greater portion of public

interest relating to trees is mostly devoted to closed canopy forests, and trees outside of forests are not adequately documented (Brandt, Tucker, Kariryaa, & al., 2020).

Brandt, et. al., (2020) also revealed that although the overall canopy cover is low in Sub Saharan Africa, the relatively high density of isolated trees is challenging narratives about dry land desertification and suggested for more exploration in trees outside of forests globally. Therefore, the study aims at understanding the influence of school land use practices in bring up single strand trees and woodlots within public primary schools.

AAR group, 2014 sustainable report reveals that substantial land resources existing under local government authorities and public institutions like schools and, if sustainably managed, can support a wide range of forest ecosystems. In the 1970s and 1980s, the United States of America and other countries of the like built huge schools in cities and towns with the expectation of economic merits at the same time offer students a wider and comprehensive curriculum (Sanoff & Walden, 2016). Furthermore, Browing & Rigolon (2019), in a study found out that school administrators as one of the main decision makers, have greater control over school lands. Hence, they have the capacity to make decisions about school ground greening or work with the neighboring communities and implement other greening initiatives. The study also showed that school ground greening needs relatively little capital. Ailin & Nirmala (2017), in a study, also realized that for decades, school learning environment evaluation have focused on the technical performance of these institutions and wished to go further.

However, in as much as scholars and policymakers were increasingly interested in academic performance interventions with law finical requirements, including school green space, less attention was being paid to the design and layout of outdoor space. It was evident from many school design regulations worldwide which focused more on infrastructural design than green spaces within school grounds. Apart from the school design, studies have looked at the performance or effectiveness of school facilities, it is also important to look at school ground greening performance. Therefore, this study adventured not only on identifying various school land uses as per the school designs but also their influence on the population of trees within the school compound.

During 15 years from 1990 to 2006, Africa lost more than 9% of its forest area through wildfires and deforestation (Food and Agriculture of the United Nation, 2007). Emmanuel & Davison (2010) conclude that the net change of forest area in Africa is the highest among the world's regions based on country reports. Therefore, Deakin, Kshatriya & Sunderland (2016), recommends that with increased demand on the world's forest resources, active measures must be taken to ensure that they are used wisely, and coherent and comprehensive forestry practices are in place.

Environmental Education for Sustainable Development (ESD) is the only practical way through which information is passed to pupils (Hanifah, Shaharudin, Mohmadisa, Nasir, & Yazid, 2015). This is because; education is a fundamental building block to improving the social and economic outcomes of millions across the world. Most importantly, information sources and practical activities like ground greening is an efficient strategy to enhance awareness on ESD. Formal and informal sustainable activities are continuously necessary for improving the environmental knowledge of teachers and pupils and foster attitude change and environmental sustainability culture (Kyule, Ochieng', & Nkurumwa, 2015). Besides, **sc**hools are the main institutions with the mandate to educate and create awareness to the young generation who are more receptacles to new ideas (Mitchell & Fisette, 2018)

Anto´nio, Teresa, & Costa (2006), in a publication, gave primary schools fundamental importance in developing behavior and comprehensive views of the surrounding environment. Just as (Bekele, et al., 2015) put it that children's engagement opens the door to the involvement and participation of their parents. Children in primary schools are receptive to the environmental messages, showing that these messages can easily be transmitted to the population. For this reason, fundamental facts of sustainability like tree cover establishment needed to be integrated into mandatory subjects in primary schools, since the younger generation must become more aware of these facts.

Studies have been done to see how the school's physical environment affects curriculum implementation and success ((Dyment, 2005); (J.M., 2009); (Blaes, et al., 2013); (Browning & Rigolon, 2019). Very minimal efforts have been made to understand how curriculum and its implementation relate to the success of school ground greening, which this study ventured in. Furthermore, the green curriculum embedded in other subjects and the two forms of primary curriculum though more theoretical and\or unresponsive in nature in as much as some countries

are trying to ensure that school activities involve more than simply listening or writing. Most importantly, Rao & iwan (2017), while concluding a study, recommended that future research should look more into how curriculum relate to the school physical environment. These observations formed the basis of this study as it sought to understand how curriculum content and teaching method influenced number and species of trees in the public primary schools.

Kenya shares with other East African countries the problem of having small, fragmented areas of forest which are also under pressure from encroachment and exploitation (Food and Agriculture of the United Nation, 2007). The country has been classified among those with the lowest forest cover as closed-canopy forest cover standing at about 2% of the total land area, as 9.3% of the Africa land area and 21.4% of the world forested (FAO, 2015). In 2018, Kenya's forest cover was estimated to be about 7.4% of the total land area, which is a far cry from the recommended global minimum of 10% (Government of Kenya , 2018). In recent years, Kenya's forests have reduced at about 5,000ha yearly, a rate which is alarming (Kenya Forest Services, 2018) which led to annual reduction of water availability by approximately 62 million cubic meters, which when translated to gross economic loss goes over 19 million dollars (Government of Kenya , 2018). The reduction in forest cover also pushes back efforts to achieve Vision 2030 and the Government's Big Four Agenda of food and nutritional security, affordable and decent housing, universal healthcare, and manufacturing, if it is not urgently addressed. This is because forests provide one of the main raw materials for construction, are water catchment areas directly influencing food production and are main carbon sinks reducing health impacts of emission. Therefore, it was high time for achieving a long-lasting forest degradation remedy, which involves overcoming the existing policy and legal impediments and surmounting accumulated problems from long-term institutional deficits. Hence includes formulating distinct policies and regulatory laws on forestry and appropriately disseminating the information entailed in these documents to all stakeholders, especially the public.

Indarto & Mutaqin (2016), concluded that one prominent position of forest transition theory is that it can be associated with other explanatory variables. This is in support of Lambin & Meyfroidt (2010), who established that policymakers could derive some policy alternatives from this theory. Generally, two principal policy directions can be derived for the theory; policies to halt deforestation and policies to accelerate the transition towards increasing forest cover (Indarto &

Mutaqin, 2016). In 2019, the government of Kenya, in collaboration with the Ministry of Environment and Natural Resources gear started a program that is aimed at planting 200,000 trees in selected primary schools.

In 2002, Evergreen found out that in Canada, school ground greening is one of the interventions that are effective in encouraging physical activity levels among children and typically bringing back nature to schools. Nongovernmental and governmental greening projects are one of the drivers for tree planting in schools with greening initiatives like tree plantings and management, kitchen gardens, and woodlots to ensures that the schools partnered with achieves the set objectives (Evergreen , 2002). These projects mainly aim at going beyond classroom curriculum to more practical outdoor learning activities fostering ground greening culture among learners (NEMA , 2012).

However, as stated in the National Land Use Policy (2016), all greening initiatives must follow certain existing forms of policy, either domesticated national policies or those formulated by the individual schools. Unfortunately, in the country and in many institutions, greater research concerns have been given to policies that halt deforestation or manage existing forests and less on those aimed at forest recovery. In as much as reducing deforestation is important, policies should also be able to give directives on how the deforested areas can be reforested and tree cover be established in newly identified areas which this study aimed to fill.

As reported by the FAO Forest Assessment team in 2018 on national forest cover, Nyeri County had the highest forest cover of 38.05%, followed by Elgeyo Markwet County with 37.16% then Nandi County with 33.41%. On the bottom of the list is Siaya County, with 0.41%, Migori County with 0.62% and Kisumu County (which is the study area). Kisumu County is covering 2086km2 land area, that is, 0.36% of the total land area of Kenya, out of which only 0.44% is covered by trees (County Governmnet of Kisumu, 2018). This is way below the constitutional requirement of at least 10% of land cover, making it second last among other counties.

Besides, Kisumu County already has forested areas which are gazetted -Karateng' in Kisumu West sub-county and Koguta forest in Nyakach sub-county. The county also falls in the modified equatorial climate and characterized by two rainy seasons, with an annual average rainfall of

450mm-1800mm. Kisumu sub-counties are characterized by different soil types; black cotton soil, lake sediments commonly sand and clay and red loamy soils. These and other ecological characteristics described in chapter three make Kisumu County one of the counties with greater potential of increasing tree cover. However, even with only 21,521 ha, Mombasa County has a higher forest cover than Kisumu County, which is having 267,696ha. Therefore, working strategies should be drawn and implemented to see Kisumu County improve in tree cover. Therefore, the overall objective of the study was to craft formulars of how public primary school land can be utilized to increase tree cover.

1.2 Problem Statement

Forests play an essential role in sustaining life on earth. Unfortunately, by 2018, Kenya had only 7.4% forest cover of its total land area against the constitutional minimum of 10% and hence was classified among countries with the lowest forest cover. Kisumu County with tree cover establishment potential had only 0.44% forest cover as at 2018. However, reforestation efforts have been jeopardized by other competing land uses. Therefore, tree cover has been a great complement to the county's forest cover. Even so, studies have been done on existing forests and less on of how new potential areas can be used to increase tree cover. Acres of land allocated to public primary schools and their potentiality to establish tree cover in a significant land portion have been overlooked. On many occasions, infrastructure has been a significant indicator of development in schools, irrespective of how green they are. Even with the mandate to educate, foster and bring up more responsive individuals, primary school programs hardly incorporate forestry in all the three forms of their curriculum. Furthermore, several studies have been done on the influence of the school physical environment on curriculum and hardly on how curriculum influence school green spaces. Lastly, although policy is a significant driver to forest transitions, greater research concerns have been on those which halt deforestation or manage existing forests and less on those that accelerate the transition towards increasing forest cover. Therefore, the purpose of this study was to determine the influence of institutional factors on tree cover in public primary schools in Kisumu County, Kenya.

1.3 Research Objectives

The main objective of this study was to determine the influence of institutional factors on tree cover in public primary schools in Kisumu County, Kenya.

1.3.1 Specific Objectives

1. To determine the influence of school land-use practices on the population of trees in public primary schools in Kisumu County.
2. To assess the influence of school curriculum on species of trees in public primary schools in Kisumu County.
3. To establish the relationship between school ground greening rules and tree abundance in public primary schools in Kisumu County.

1.4 Research Questions

1. How do institutional land-use practices influence population of trees in public primary schools in Kisumu County?
2. How does school curriculum influence species of trees in public primary schools in Kisumu County?
3. What is the relationship between school ground greening rules and tree abundance in public primary schools in Kisumu County?

1.5 Study Justification

Forests and trees outside forests support various life systems on earth. Given the tree cover importance, reactionary practices should be put in place to reverse the constant trend of reduction in tree cover. The trend would also enable the achievement of the government's big four plan which is also in line with vision 2030. Kisumu County with history of demarcated forests was one of the counties with the least forest cover, after Siaya and Migori Counties. Referencing to Sanoff & Walden, 2016, schools in Kisumu have relatively large compounds since it hosts the oldest town compared to the other two Counties in which schools were being allocated huge spaces with the

expectation of economic merits and offer students a wider and more comprehensive curriculum. Public primary schools, with greater capacity, are among public institutions with higher potential of planting trees and contribute to the national tree cover percentage. Reason being, school administrators, as the decision makers, have more control over these lands, and can easily influence school ground greening activities or partner with the neighboring communities to implement other ground greening initiatives in the society. Secondly, studies have shown that learners in primary schools are receptacles to new ideas and can easily transmit this information to the whole population. Furthermore, the Kenya 2010 constitution directs all institutions to set aside 10% of their total land area for tree cover establishment. Institutional, physical, social, or environmental factors have potential influence on tree cover in public primary schools. Among these, institutional factors like land use, curriculum and school ground greening rules can be manipulated through linear regression model to increase tree cover in these institutions. Therefore, a better understanding of their dynamics would help in implementing school green space development; ultimately contribute to national tree cover increment and environmental restoration.

Therefore, this study was aimed at crafting a formula for increasing tree cover in public primary schools with the goal of increasing the country's forest cover towards the aimed 10% (equations 1 to 6 in chapter 4). The study would help in evaluating the integration of environmental issues in development in public primary schools and findings be used by institutions' management bodies in decision making. The findings of this research could also be used to enhance environmental governance, especially in land use and forestry at the local and national level.

1.6 Delimitation of the Study

Among other public institutions, the study was delimited to public primary schools in Kisumu County. Secondly, the study was delimited to institutional factors influencing tree cover in public primary schools rather than physical, social, or environmental factors. School land use practices, school curriculum and school ground greening rules were the only institutional factors studied to establish their relationship to number, species, and distribution of trees in public primary schools.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is designed to provide an overview of sources explored while researching the study topic and it helps to demonstrate how a selected topic fits within a larger field of study. It will provide both the summary of key sources and their synthesis within specific conceptual categories. After introducing the concept of institutional factors, the thematic areas discussed are school land use practices and tree population; school curriculum and species of trees and school ground greening rules and tree abundance in public primary schools. The chapter will also present the theoretical and conceptual framework of the study.

2.2 The concept of institutional factors

Institutions can be understood as rules of the game in a society or, more formally, the humanly devised constraints that shape human interactions. In other words, stable patterns define, govern, and constrain action (Wang, Chi, Kaijian, & Eugene, 2016). An institution, which is the framework of action, frequently introduces objects, structures positions and roles attaches to them as well as determining their functions by way of practical rules, norms goals and preferences (Slate, Craig, Karen, Jeanie, & Tracy, 2008). Schools are examples of social institutions that offer schooling- a more organized form of education (Hanifah, Shaharudin, Mohmadisa, Nasir, & Yazid, 2015). In institutions, not only the structural framework of the definition is constructive but, to the same extent, at least, also the institutional factors like behavioral and the empowering rules, the goals and governing ideas which also contribute to their constitution (Wang, Chi, Kaijian, & Eugene, 2016).

Primary schools are elementary learning institutions tasked with the mandate of preparing students to fulfill their potential, lead satisfying and productive lives, and be ready for college, workforce, and civic life (Browning & Rigolon, 2019). To achieve their mandate, public primary schools use resources and certain standards as per the curriculum and policy. Curriculum refers to the specific blueprint (Dündar & Merç, 2017). It takes content (from external standards and local goals) and shapes it into an implementation plan for productive teaching and learning, thus making it go

beyond coverage list (the ,input) but also the implementation roadmap of how to achieve the desired results (Lampa, Anca, & Todorescu, 2013). As stated in Alismail & McGuire, (2015) study report, the curricular which had the publicly explicit goals or opportunities provided by the schools and are stated in curriculum guides of the schools. The others will be the Co-curricular which are programmes and learning experiences which complements what is taught and learnt and extracurricular which are activities falling outside the realm of normal curriculum of a primary school (Dündar & Merç, 2017). The study of the curriculum involved getting certain measurements, number of subjects and lessons, implementation method (theoretical or practical), type and frequency of specific curriculum activities and number of participants. Lastly, were school rules which is normally framed within national or regional policies and an institutional mandate or mission (Slate, Craig, Karen, Jeanie, & Tracy, 2008). However, the policies that govern an institution's relationships with its main components are usually established by the institution itself, which is in conventional education (Aty, 2018). The study looked at both written and unwritten forms; primary (formed by the school) and secondary (domesticated national policy) types of policy and established their relation to tree cover. Apart from the form and type, the study went further to establish how these policies were implemented by different stakeholders.

2.3 School land use practices and tree population in public primary school

School land use practices are the approaches taken, management and modifications done on school land to achieve a purposive land use outcome as desired by the individual school management team or the larger education ministry. Emmanuel & Dickson (2010) established that any sustainable land use practice planning would need to begin with a clear understanding of land resource use practices. As established by Sanoff & Walden (2016), schools should be located on sites large enough to permit the use of the outdoor space for teaching and learning as well as play and sports. The findings support the earlier recommendation in Sustainability – COP Report (2014), on growing trees on school grounds enhances the establishment of attractive schools, increases the tree cover as well as enhances better understanding of the positive aspects of tree growth.

As confirmed by AAR 2015 sustainability report, public schools typically occupy a large land area. According to the current international standards for schools, the minimum space area for primary schools should be 2750 square meters translating to 0.7 acres (Department of Education and Skills, 2010). According to Education Act (2012), it is a requirement that Pre-School, depending on the

availability of land, has a minimum of 0.125 of an acres; Primary/Secondary/Colleges in urban areas to have at least 0.5 of an acre; schools in rural high density to have at least 1 acre while those in rural low Density to have a minimum of 4 acres. Similarly, as stated earlier, the United States and other countries have been building huge schools intending to offer students an all-round and productive curriculum (Sanoff & Walden, 2016). Therefore, Evergreen (2002) concluded that public schools have great opportunities to reduce their ecological footprints at the same time contribute significantly to overall community sustainability. In Kenya, in response to chapter 5 of the 2010 constitution, National Land Use Policy was drafted in 2016. The Policy addresses issues of optimal utilization of land and related resources by providing principles and guidelines for promoting environmental conservation and preservation and land use planning to enhance sustainable development, among other principles (National Land Use Policy, 2016).

Bolscho & Hauenschild (2006), in a study, concluded that outdoor practical activities have made students more creative than indoor lessons or traditional playgrounds. Furthermore, Teachers, in most cases are more influenced and encouraged by the physical school environments just as Malcolm said, the building and school environment make the teaching method (Department of Education and Skills, 2007). Chawla, Keena, Pevec, & Stanley (2014), in a study also found out that today, school activities nowadays go beyond listening or writing as many teachers have shifted to having classes in many different kinds and qualities of space to increase efficiency and break monotony. Therefore, schools where learners are involved in active practical lessons outside the classroom blocks in green and attractive exterior is the ideal learning institution for children.

Secondly, Sanoff & Walden (2016) established that educational reform, however, has primarily focused on what should be taught and procedures to be followed, calling for constant improvement on the curricular content and teaching strategies. However, the physical environment where education occurs has received very little attention despite its benefits to the school and the overall community. This is despite the fact that it has been proven that school exterior is an ideal vehicle for effective learning and socialization across board as it provides real time practical learning platforms and great scenery needed for learners to relax during breaks (Merike, Emer, & Cliona, 2010). Moreover, Gibb (2016), in a publication, clarifies that school systems found out that a school's parents will choose for children is also dependent on the physical appearance. Besides,

school systems had discovered that schools with “sick” internal physical environments are shunned by prospective teachers and parents alike.

Evergreen (2002) established that public primary schools have different ways of making or contributing to environmental greening. For example, currently there is increased need for agroforestry, however, most small-scale farmers are not able to get the right quantity of trees seedlings they want with the designed quality because of varied accessibility reasons (Food and Agriculture of the United Nation, 2007). Therefore, as suggested by Mbora, Lillesø, & Ramni (2008) on-farm and community tree nurseries either owned or managed by schools or other community service institutions could be one of the ways to achieve intergenerational demand for trees planting materials. This would provide a reliable economic activity, increase availability of affordable seedlings and promote tree nursery development within the localities. Most importantly the seedlings provided will be able to meet the local community needs in terms of the tree species and time of delivery.

In addition, bringing up trees is one of the hands-on experiences which introduces effective is also Environmental Education in schools’ timetables. (Temu, et al., 2008). As established by Miriam, Ochieng, & Agnes (2015), tree nursery managemnt and seedling tranplanting activities help learners acquire the technical knowhow they can apply in their homes to promote agroforestry even out of school. This will also enable learners appreciate the benefits of agroforestry including land and microclimate transformation and source of food, cooking energy and raw material.

It is therefore important to note that the sustainable way to ensure balance in built environment and ground greening is to support schools with advisory ideas on tree species diversity. The woodlots would help in achieving self-sufficiency in cooking energy supply, improve on nutrition for those including fruit trees and improve the aesthetic value of the schools and environmental quality. In 2013, His Excellency the President of Kenya Hon. Uhuru Kenyatta launched the Green Schools and Commercial Tree Growing Programme intending to use the school communities to expand the nation's tree cover and inculcate tree planting among the youth (Ministry of Environment, Natural Resources, 2017). According to Bekel et al. (2015), making the school compounds green and clean through effective tree planting and can take place without impacting on the class schedule.

Unfortunately, Darmody, Smyth, Doherty (2010), affirmed that current school design guidelines have specifications for playgrounds and structural buildings but mute general outdoor spaces. The study shows that school designs in many countries, including Kenya (as evident from primary school design guidelines), seem to concentrate on the structural designs of these facilities. One of the major recommendations given in Merike et al., (2010) study report is that guidelines should be developed to incorporate school garden and other green habitats as many respondents strongly complained about the absence of mature trees in the school compounds, among other things. Therefore, this research sought to understand how school land use practices influences tree population by assessing school design and layout of outdoor space, incorporating a variety of school gardens and other green habitats.

2.4 School curriculum and species of trees in public primary schools

Since the 1990s, whole-school approaches been one of the highly promising strategies to achieving sustainable development (Slate, Craig, Karen, Jeanie, & Tracy, 2008). In a whole-school approach, classroom lessons on Environmentally Sustainable Development (ESD) is reinforced by the informal activities promoted by the individual school's values, mission and vision moving it from simple awareness creation to productive action (Kenya Country Report, 2012). Since then, ESD has been defined as an innovation in educational reform that has evolved from the commonly known Environmental Education (EE) movement to practical actions. It is hoped that the new generation will appreciate the need to preserve environmental resources for the present and future generations (Doost, Sanusi, Fariddudin, Jegatesan, 2011). Researchers like Hopkins & McKeown (2002), Scoullos & Argyro, (2004), Lampa, Greculescu & Todorescu (2013); made strong suggestions that emerging environmental problems should easily be resolve through either formal or informal education. This is because education is important in transforming the community towards sustainable development (Alismail & McGuire, 2015).

In 1956, the Africa Committee for Forest Education (ACFE) was formed and mandated by FAO to advise forestry education and human resource development at all levels (Ministry of Education, 2017). Similarly, Kenya forest policy (2014) gave the government the mandate to create awareness on forest policy and legislation amongst stakeholders by supporting, promoting and strengthening the capacity for formal forest sector education programmes at different skill levels.

Antonio et al. (2006), in a publication, acknowledge the advantages of developing correct behavior to students, however, emphasizes the fact that it is much more important to make them understand the ideas supporting the subjects they learn. However, Agea et al., (2009), in a study established that primary schools and many secondary schools do not offer forestry as a subject, and even where it is offered, it is too theoretical that it cannot make a difference in practice. As previously discovered by Janet (2005), certain subject areas or grade levels lent themselves more easily to using the green school grounds as an outdoor classroom and lack of obvious curricular links is a key barrier that limits outdoor learning. Therefore, despite the materialization of the new education curriculum that covers environment, biodiversity, and integrated resource management, much should be done to cover forest sustainability, productivity and conservation effectively. Hence, the need to refocus forestry training to make it more responsive to ever-changing societal demands worldwide.

Agea et al., (2009), attested that in addition to the formal education, in forest policy practice, informal instruments are usually employed both to achieve public awareness as well as power and behavior development. Similarly, Puttick & Hughes (2018), in a study found out that practical tree planting and management helps young people to generate a sense of self-transcendent purposefulness and to foster feelings of nurture and care for the natural world. Temu, Chamshama, Kung'u, Kaboggoza, Chikamai & Kawira (2008), in a study, also concluded that commitment of the participating students to protect the nursery and planted tree shows a better understanding of the introduced environmental program on environmental hazards.

Since learning is defined as a relatively long-lasting changes in behavior that result from experience (Sanoff & Walden, 2016), there is an increasing need for the process to be more responsive in nature involving both indoor and outdoor. Moreover, Bolscho & Hauens (2004) established that environmental Education in schools takes place at different levels and includes the course contents, development of schemes of work or plans and initiatives for extension of environmental education such as science congress, awards, clubs, school greening programs and support of environmental centers.

When planned school ground greening is achieved, learners get more play opportunities (Dyment, 2005) enhanced learning opportunities, increased engagement with the natural environment and

improved academic achievement (Blaes, et al., 2013). Furthermore, the Green School facilities can also be considered as an extension of a Green Curriculum (Iwan & Rao, 2017)

However, while doing a study on the influence of EE on conservation, Gachuru (2010), concluded that the implementation of EE in schools is still suffering from inadequacies in the implementation process such as poor teacher preparation, ineffective teaching methods, lack of teaching aids and crowded classrooms. Similarly, Ailin & Nirmala (2017), interview data also revealed that the stakeholders preferred children taught under green curriculum, more than schools constructing green buildings. Therefore, more effort, resources, and financial investment should be put into the development of a 'green curriculum' within the context of ESD goals.

2.5 School ground greening rules and tree abundance in public primary schools

Policy has been misunderstood to be an issue which only concerns the government without the knowledge that aligned shareholders have a legitimate interest in both the policy objectives and enforcement plan (Fraiser, 2002). Furthermore, Bolscho & Hauenschild (2006) established that not only the structural framework of the definition set is constructive for the institution but, to the same extent, at least, also the behavioral and the empowering rules, the goals and governing ideas also contribute to the constitution. Studies (Gibb, 2016); (Mitchell & Fisette, 2018), have also found out that, students' indoor learning about ESD is reinforced by the informal messages promoted by the school's values and actions. In this way, whole-school approaches move ESD from awareness to action.

In 2002, Evergreen produced a school ground greening policy and planning guidebook for Canadian schools which: recommended ground greening policies and land use practices; ESD rationale and aimed at assisting school management develop legislations to ensure greening projects are properly planned, implemented, and maintained. Furthermore, Slate et al., (2008), established that schools instill certain desirable behavior, which is in line with the set administrative rules or norms. In Kenya, for example, one of the guidelines in the school safety manual 2008 is that trees in the school should be labeled, indicating their uses and those that may be poisonous.

Hanifa et al. (2015) point out that one of the steps in developing a greening and sustainability culture in schools is by including these themes in the vision, mission, and values of the institutions

to constantly improve understanding the aspect of and individual role in sustainable development. Many school districts and individual schools create unique mission statements to guide policies and procedures and to create opportunities for all students (Gibb, 2016). Therefore, school success requires a written mission statement that all professional staff incorporates into their daily curricular activities. School administrations should, therefore, use themes that insinuate environmental caring and those that encourage the development of responsive behaviors in school mission or vision statements.

Slate et al. (2008) state that teachers should play a significant role in enabling success of school ground greening. According to Zinck & Carola (2013), the attempts to provide an understanding of the environment are closely related to the teaching methods and students' learning. Ideally, teaching will use the National Standards or a state-level equivalent to guide their planning, but they might vary in their preferences for focus on different learning outcomes (Mitchell & Fisette, 2018). Teachers teach so that the students can learn, and they often teach in different ways. The various approaches to teaching, the variety of curriculum models and instructional methods, the many different assessment strategies, and tools – are all intended to lead to student learning (Ministry of Environment, Natural Resources and Regional Development , 2017). Unfortunately, in most studies, students acknowledge that the rigors teaching to finish the syllabus is a major constraint in which teachers in schools were only focusing on finishing the content in the syllabus and textbooks due to time constraints. This is the factor that leads to the neglecting of greening the school as less time is allocated for school greening activities, as was evident in the Green Schools and Commercial Tree Growing Programme auditoria report (Ministry of Environment, Natural Resources and Regional Development , 2017). Therefore, as Oduol et al. (2006) concluded, the developing a school culture on greening goes beyond the school vision statements and values, to implementation of strategic plans, policies and programmes (Gibb, 2016). Therefore, understanding how these components relate and influence greening culture in primary schools is important for the success of such initiatives.

2.6 Theoretical framework

This study was based on the possibility of forest cover dynamics being captured in a time dimension, theorized as the ***forest transition theory*** (FT), which was introduced by Mather in 1992. Indarto & Mutaqin (2016) mentions that originally, Mather developed this idea based on a basic

sequence of natural resource destruction and conservation or the depletion-melioration model. As elaborated by Indarto & Mutaqin (2016), this model argues that, at an early stage, natural resource destruction is inevitable to meet human needs. Later, rising demand and price of natural resources then incentivize people to conserve and to restore their natural resources. Kenya's tree cover situation fits in the FT pathway and is at the point of extremely low forest cover (stage two).

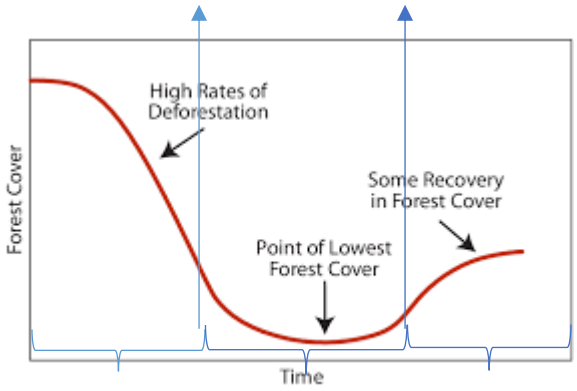


Figure 0.1 forest transition theory (Source: Mather (1992)

The U-shaped curve model consists of two trends or periods: forest decline due to conversion of forested lands to agriculture, settlement and other land uses. The other is forest recovery resulting from reforestation and afforestation. Mather explains that after soil fertility decline, people will relocate to new areas and the left areas used for reforestation. However, this study assumed that the population pressure in Kenya allows for insignificant chances for relocation, and new lands identification for tree cover establishment is most appropriate. Therefore, the use of public primary school land for tree cover establishment comes in at stage two. Their contribution is aimed at lifting the country to stage three, where there is a recovery in forest cover using tree cover as supplement.

However, as revealed by different FT examinations, the recovery stage always drags (Wolfers, Delacote, & Serge, 2015); (Indarto & Mutaqin, 2016). Indarto & Mutaqin (2016), explains that this is because people keep utilizing logged-over forest marginal land for other land uses. The study goes further to argue that policy plays a vital role in the forest cover transition. Giving an example of Mississippi in the same manner, institutional factors like school land-use practices, curriculum

and school ground greening rules could have been the reason which drags the recovery process by influencing the tree cover establishment in public primary schools.

2.7 Conceptual Framework

The conceptual framework offered the link and assumed a relationship between the independent and dependent variables. It assumed that institutional factors (school land use practices, school curriculum and school ground greening rules) have an influence on abundance, species, and distribution of trees in public primary schools. The conceptual framework also introduced intervening variables (National education, land use and education policies), which play an important role in influencing the link between the independent and the dependent variable.

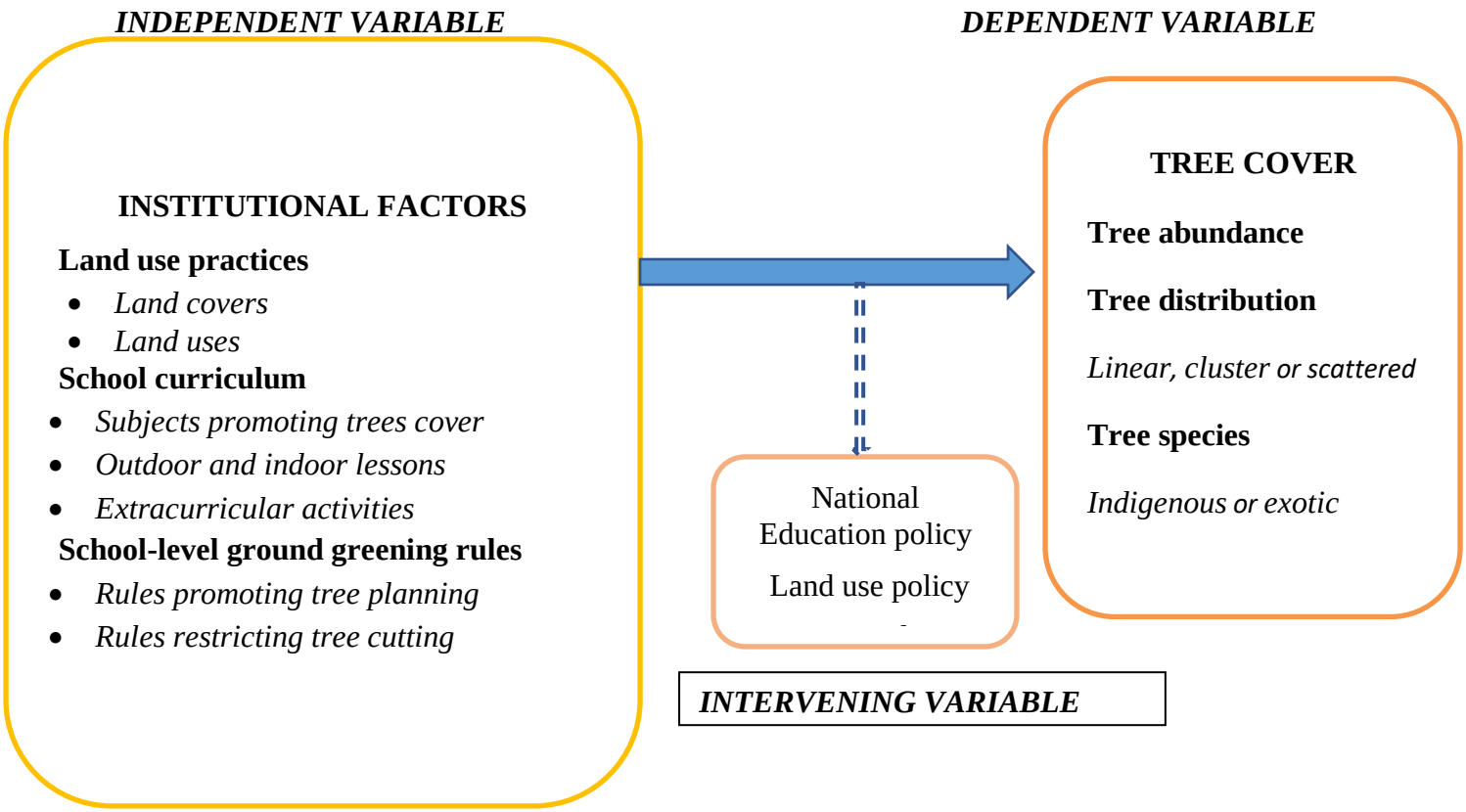


Figure 0.2: Conceptual Framework

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter explicitly describes the study area concerning location and size, physical and climatic conditions. It goes farther and gives the research framework that will be employed to achieve the set research goals. It comprehensively addresses the research designs target population, sample size and sampling procedure, data collection instruments, data analysis and data presentation methods.

3.2 The Study Area

The study was carried out in Kisumu County in the Nyanza region of Kenya. Delineated as number 47, Kisumu is one of the 47 counties created under the Constitution of Kenya 2010. At the beginning of 2018, the county had an estimated population of 1,224,531 persons. According to KCIDP 2018-2022, primary school pupils who are in the 6-13 years' age group constitute 21.5% of the county's population. The county has a diverse background comprising of urban and rural set-ups.

According to KCIDP 2018-2022, Kisumu County lies between longitudes 33020'E and 350 20'E and latitude 00 20' South and 00 50' South. The County is neigbours Homa Bay County to the South, Nandi County to the Northeast, Kericho County to the East, Vihiga County to the Northwest, Siaya County to the West. Kisumu County is surrounded by the second-largest freshwater lake in the World, Lake Victoria. The County covers approximately 567 km2 on water and 2086km2 land area, representing 0.36% of the total land area of Kenya's 580,367km2.

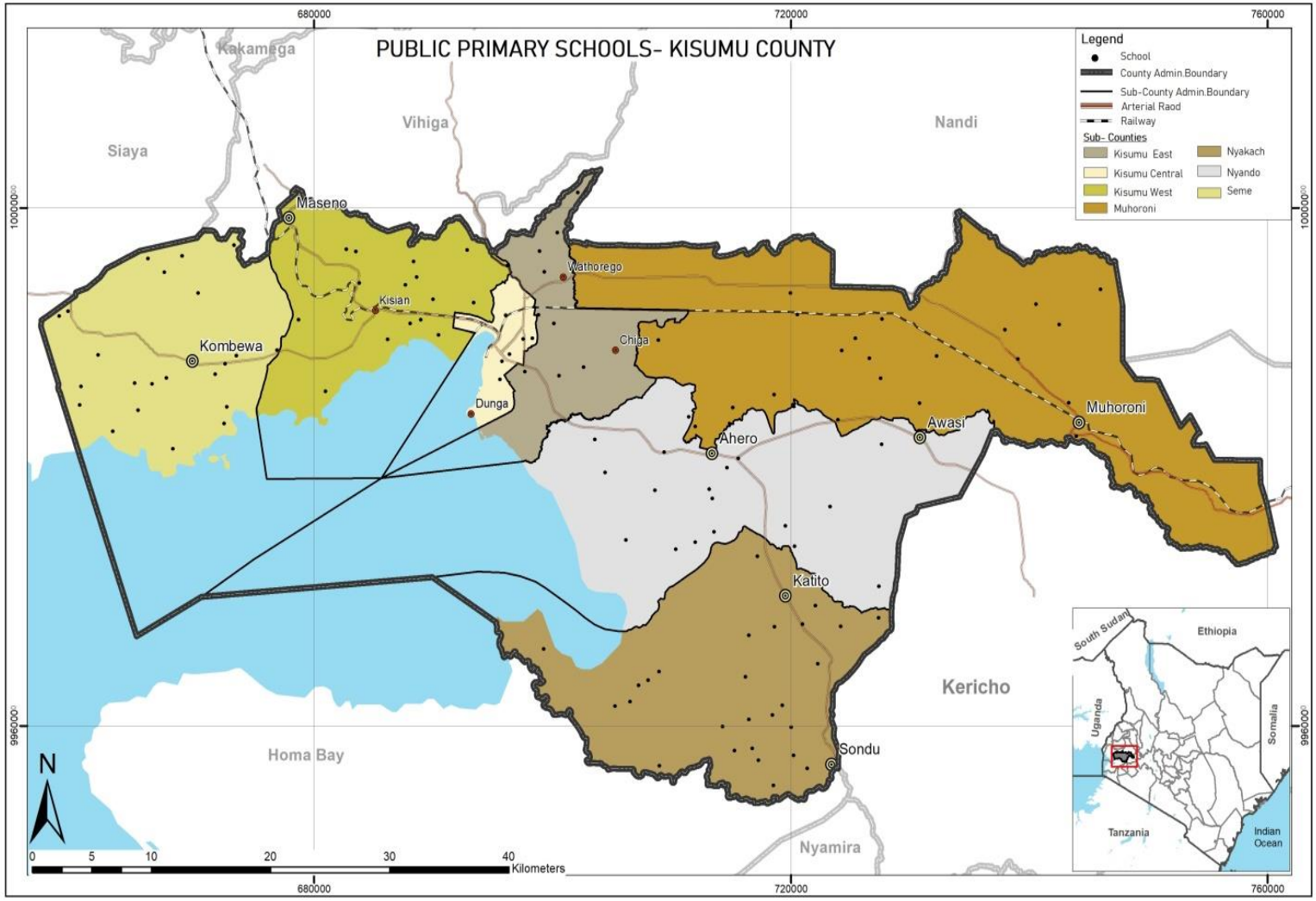


Figure 0.1: map of Kenya showing the location of Kisumu County and a magnified map of Kisumu County showing the distribution of primary schools. (Source: Landsat redrawn by author)

3.2.1 Climatic Conditions

The climate of the County is generally warm, with minimal monthly variation in temperatures between 23°C and 33°C throughout the year. The rainfall is determined by a modified equatorial climate characterized by long rains (March to May) and short rains (September to November). The average annual rainfall varies from 1000-1800mm during the long rains and 450-600mm during the short rains. The altitude in the County varies from 1,144 meters above the sea level on the plains to 1,525 meters above sea level in the Maseno and Lower Nyakach areas. This greatly influences temperatures and rainfall in the County (County Governmnet of Kisumu, 2018)

3.2.2 Ecological Conditions

Kano Plains is predominantly black cotton soil, which is poorly drained and unstable though suitable for rice, horticulture, and sugarcane production. Seme and the lower parts of Nyakach Sub-counties are dominated by lake sediments, commonly sand and clay soils. At the same time, Kisumu West Sub- County and upper-Nyakach are predominantly red-loamy soils suitable for agricultural production. The lake shores are generally swampy and offer fertile ground for horticulture and fish breeding (County Governmnet of Kisumu, 2018)

3.2.3 Forestry

0.44% tree cover exists in Kisumu County with Karateng' forest covering an area of 41.600 hectares being the only gazetted forest as classified by KFS in 2018 under legal notice 175/2017. Apart from Karateng' forest, there exist the Koguta forest in Nyakach Subcounty covering 25 hectares. Farm forestry and commercial forestry are lowly adopted in Kisumu County.

Kisumu County has both the KFS Nyanza Region Conservancy and County Ecosystem Conservator located with Kisumu Town. Apart from the KFS offices, Lake Victoria Basin Eco-Region Research Programme (LVBERP) mandated to undertake forestry research mainly within the Lake Victoria Basin (Kisumu, Kakamega, Bungoma, Busia, Siaya, Vihiga, Homabay, Nyamira, Kisii and Migori counties), is in Kisumu County.

3.2.4 Educational institutions

Table 0.1: Distribution of public primary schools in Kisumu County

Sub-County	Number of Public Primary Schools
Kisumu central	30
Kisumu east	46
Kisumu west	80
Muhoroni	110
Nyakach	144
Nyando	99
Seme	106
TOTAL	**615**

Source: KCIDP 2018-2022; County Director of Education GoK and CGK (VTC and ECDEs)

The above number of public primary schools was against 222 and 19 public secondary schools and Vocational Training Institutes (VTI), respectively.

3.3. Research Design

Descriptive survey research design was used for this study. In a snapshot and without manipulation, observed and measured phenomena on institutional factors and tree cover in public primary schools together with knowledge from experience were used rather than from theory or belief during data collection.

3.4 Study population

As evident from section **3.2.4**, Kisumu County had 855 public learning institutions, including primary, secondary and vocational training institutes, of which 71.8% were public primary schools. Apart from the 615 public primary schools, there were 153 private primary schools in the county. However, private primary schools in the county tended to have relatively small spaces as compared to their public counterparts. Therefore, the target population for this study constituted all 615-public primary schools in Kisumu County.

3.5 Sample Size and Sampling Procedure

Sapling size refers to the number of items to be selected from the universe for examination while sampling procedure refers to the techniques used to select samples from a population ((Mugenda & Mugenda, 2003). The sampling size and sampling procedure this study adopted are outlined in the subsequent sub-sections

3.5.1 Sample size

As Mugenda & Mugenda (2003) established, for a population less than 10,000, a sample size of 10%-30% is representative. Therefore, 20% of the 615 which translated to 124 schools' public primary schools in Kisumu County were the units of analysis as individual school's heads formed the units of observation for this study.

3.5.2 Sampling Procedure

Since each unit (individual public primary school) had equal chances of being selected, probability sampling design was used for this study. Systematic random sampling was applied to draw respondents. An interval of **N/n** was used to select representatives from the sample frame, where **N** was the total population while **n** was the sample size. Since **N**=615 and **n**=124, every 5^{th} public primary school was drawn.

3.6 Instruments for Data Collection

Questionnaires, observation checklist, interview guide and focus group discussion guide were used to investigate the institutional factors influence on the tree cover in public primary schools in Kisumu County. Questionnaires best suited for the study as it enhanced the anonymity of the respondent allowing comparability.

The questionnaire with 100% return rate was self-administered to school heads. It was divided into four main sections; general information, school land-use practices and tree population; curriculum and tree species and SGGR and tree cover in public primary schools. The first section sought to the general information about the school. Questions on the gender of the respondent (though this did not have influence on the study), location of the school and category of the school were asked. The second section had questions aimed at obtaining information on the school land size and land

cover, school land-use practices and their contribution to tree population in public primary schools. School curriculum and tree species section sought to get information on: tree cover content in both lower and upper primary school curriculum; tree cover teaching-learning method; co-curricular activities and Extra-curricular and their corresponding tree species in public primary school. The last section, which was on SGGR and tree cover, had questions on forms, components, and contribution of SGGR, resource allocation policy and tree cutting and replacement in public primary school.

Responses obtained through questionnaires administration were harmonized using focus group discussions from 10% of the sampled schools per sub-county. The FGDs were made up of three groups, teachers, pupils from lower primary (classes 2-4) and pupils from upper primary (classes 6-8). Total population sampling was used to get all teachers present during the discussion to participate in the discussion. However, a sample of 10% per class was randomly picked in each case to form the last two groups. During FGD, the questionnaire sections were used to guide the discussions.

Further, key informant interviews were used to get professional points of view where representatives from the education sector, forestry sector, administrative sector (area chiefs) and PTA (Parents Teacher Association) were interviewed. In each of the seven sub-counties, Sub-County director of education and one forester was interviewed. Also, 10% of all the locations in each of the seven sub-counties were sampled and their representative chiefs interviewed. Lastly, from the sampled 124 public primary schools, 10% was randomly selected and their PTA representative interviewed. Finally, observation was used as a supplement for information on tree abundance, species and distribution as obtained during the questionnaire administration.

3.7 Procedures for data collection

Before commencement on data collection could start, all the 124 questionnaires were printed and confirmed for correctness. Appointments with the key informants were obtained before the actual day of the visit. During the data collection process, the researcher explained to the respondents what the study was about and sought their informed consent through the consent letter attached in

the appendices. The questionnaires were then administered to the school heads and filled up questionnaires reviewed for relevance, accuracy, and completeness upon picking.

Permission to hold Focused group discussions was sorted from the school heads before the discussion could be held. The discussions were grouped into three main agendas: school land-use practices and tree population, curriculum and tree species and school ground greening rules and tree abundance the public primary schools. Similar themes were also used during key informant interviews to get expert views. A tour of the schools was also done during which the observation checklist was filled. Besides, desk studies were also done to obtain secondary data on the study topic.

3.8 Data analysis and Presentation

Individual primary schools were the units of data analysis. Qualitative data on institutional factors and tree cover was organized into themes and categories using manual codes, then the pattern, trends and relationships among these themes and a category established. Simple descriptive statistics (mean, mode, median, standard deviation, skewness and kurtosis) was used to describe the trends of the data collected for example, sizes of school land, participants in extracurricular activities and resultant trees from various ground greening policy components. In addition, product-moment correlation was used to get the strength of the relationship between land use practices, curriculum, school ground greening policies and tree cover in schools. Linear regression analyses were also used to give predictions of specific outcomes on resultant trees from land use practices and the three forms of curriculum studies.

During data presentation, qualitative data was represented in text format while qualitative data was presented in tables, graphs, and charts. Besides, stages 2 and 3 of the forest transition theory (FT) discussed in section **2.5,** guided the discussions in chapters four and five which gives the detailed discussions on the results and findings; summery, conclusion and recommendations.

3.9 Pilot Testing

Pilot testing the trial test of instruments done before their application in the actual data collection process. It was done to emphasize the consistency of responses drawn from respondents. The process was mainly aimed at early identification of possible weaknesses of the instrument, which

would have interfered with soliciting the intended information for the research objectives. For this study, pilot testing was done in 12 (10%) of the sampled schools. Among the schools where pilot testing was done, only two schools fell in the list of the sampled schools, and they were replaced to ensure full representation of the population.

3.10 Validity of the Research Instruments

The selected tools were subjected to content validity of testing to check the format of the instruments and to ensure that the instruments contained adequate content. This process was successfully achieved with the relevant guidance from the supervisors who are research experts. The investigators ensured that the instruments were well constructed and that accurate information to answer study objectives would be obtained.

3.11 Reliability of the Research Instruments

Item analysis reliability was used to test the research instruments. It best fitted because it is a more accurate method for estimating the internal consistency of an instrument hence helped to identify the items within the instrument which were not useful or were confusing. After obtaining the total score of all the items, the means of the first and the last 27% of the 12 schools were calculated and discriminative index of not less than 0.61 was recorded. Therefore, all the items in the questionnaire were included for the study.

3.12 Ethical Considerations

The proposal was submitted to Maseno University Ethics Review Committee (MUERC) for review from which an ethical clearance letter was obtained upon approval. Subsequently, application for research license and permits from the National Commission for Science, Technology and Innovation (NACOSTI) and County Education office was made the respective authorizations obtained. In addition, a list of all public primary schools in Kisumu County was also rightfully obtained from County Education Office through an official application.

Since the main aim of the study was to determine the influence of institutional factors on tree cover in public primary schools in Kisumu County, basic ethical considerations had to be followed to ensure that the participants' rights were not infringed on. Before the actual data collection process,

the participants were informed of what the research is about, and their voluntary consent sorted using a consent form (see appendix 2). Principles of ethical research mainly confidentiality, discontinuance, autonomy, justice, fidelity, and respect for the participant's rights and dignity were adhered to the latter during data collection, presentation, and reporting. The data collected was kept in hard and soft copies and could only be accessed by the investigators.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1. Introduction

This chapter begins by giving characteristics of public primary schools in the study area. It also presents results, discussions and findings on school land use practices and tree population; curriculum and species of trees planted and managed; school level ground greening rules in relation to tree cover in public primary schools.

4.2 Characteristics of Public Primary Schools in Kisumu County

4.2.1 Land Sizes of public primary schools in Kisumu County

The table below shows the distribution of public primary school land sizes across all the seven sub-counties in Kisumu County.

Table 0.1: Public primary school land sizes in Kisumu County as at 2020

Range of land size(ha)	**Schools per Sub- County**							***Total no of public primary school***
	Kisumu central	**Kisumu East**	**Kisumu West**	**Muhoroni**	**Nyakach**	**Nyando**	**Seme**	
0.00-1.99	0	1	0	4	9	2	4	***21***
2.00-3.99	3	8	5	14	13	9	11	***63***
4.00-5.99	1	0	7	4	7	8	7	***34***
6.00-7.99	1	0	4	0	0	0	0	***5***
8.00 and above	1	0	0	0	0	0	0	***1***
Average land size(ha)	***4.5***	***2.5***	***4.6***	***3.0***	***2.7***	***3.3***	***3.2***	

16.93% (21) of the schools in Kisumu County had land sizes bellow 2.00Ha while 4.8% (6) of the schools had above 6.00 Ha. The other 78.27% (97) had their school land sizes ranging between 2Ha and 6.00Ha. 50.81% (63), which was the majority, had land sizes measuring between 2.00Ha and 3.99Ha. Besides, 27.42% (34) of the schools had between 4.00Ha to 5.99Ha of land.

Public primary schools in Kisumu West sub-county recorded an average land size of 4.6Ha. Those in Kisumu Central sub-county had 4.5Ha of land on average. The two sub-counties did not have any school with land sizes bellow 2Ha and were the only Sub-counties with schools having above 6Ha of land. Schools in Nyando, Seme and Muhoroni Sub-counties had mean sizes of 3.3Ha, 3.2Ha and 3.0Ha respectively. Together with Nyakach Sub-county, the four Sub-counties did not have any school with land size above 6.00Ha. Only schools in Nyakach and Kisumu East Sub-counties had an average land size below 2.00Ha.

Besides, despite being within or in the periphery of Kisumu City, schools in Kisumu Central and Kisumu West sub-counties had the biggest school compound sizes ranging between 2.00Ha to above 8.00Ha. This could have been attributed to the anticipated higher number of pupils they were to serve given the rapid population growth of Kisumu town as one of the major cities in Kenya. The observation was a replica of Sanoff & Walden (2016) establishment that, countries built huge schools in most of their towns and cities with the expectation of economic merits and be able to provide a more elaborative curriculum.

The minimum school land size was 0.3Ha against 0.2Ha prescribed by the ministry of education for Primary/Secondary/Colleges in urban areas. Therefore, sizes of the sampled schools, located in the rural or urban settings, had their minimum land sizes within the ministry of education acceptable range of 0.2 Ha to 1.6Ha depending on the school location (Ministry of Education, 2017). The mean size of land occupied by the sampled public primary schools was 3.26 Ha. Recording a standard deviation (Ϭ) of 1.532 and a coefficient of variance (CV) of 0.471 showed a low variance in the distribution of the public primary school land sizes. Therefore, the public primary school land size data collected had greater consistency across repeated measures and higher reliability and precision. With 3.26Ha as the mean size of land of public primary schools, then, all the 615 public primary schools in Kisumu County covered a total area of 2004.9Ha. This observation confirms Sustainability – COP (2014) and AAR (2015) Sustainability reports, which revealed that substantial land resources exist under local government authorities and public institutions like schools.

4.2.2 Tree abundance in public primary schools in Kisumu County

Public primary schools had trees scattered within the compounds, others arranged in a linear pattern or clustered in woodlots and gardens. 99.19% schools had mature or, young trees while the rest had seedlings. Table 4.4 below shows Tree abundance in the sampled schools.

Table 0.2: Tree abundance in public primary schools in Kisumu County

Range of Land Size(Ha)	No. of Trees																
	Kisumu central		**Kisumu East**		**Kisumu West**		**Muhoroni**		**Nyakach**		**Nyando**		**Seme**		***Total Indigenous***	***Total Exotic***	***Total trees***
	Ind	**Exo**	**Ind**	**Exo**	**Ind**	**Exo**	**Ind**	**Exo**	**Ind**	**Exo**	**Ind**	**Exo**	**Ind**	**Exo**			
0.00-1.99	200	100	15	59	-	-	129	233	479	791	89	40	68	183	***980***	***1396***	***2376***
2.00-3.99	306	349	821	3990	211	664	399	1370	802	772	238	380	397	1138	***3174***	***8705***	***11835***
4.00-5.99	58	33	-	-	311	184	140	1223	535	2405	187	736	162	701	***1393***	***6942***	***8335***
6.00-7.99	59	91	-	-	241	1407	-	-	-	-	-	-	-	-	***300***	***1498***	***1798***
8.00 and above	198	812	-	-	-	-	-	-	-	-	-	-	-	-	***198***	***812***	***1010***
SUB-TOTAL	***821***	***1385***	***836***	***4049***	***763***	***3915***	***668***	***2826***	***1816***	***3958***	***514***	***1156***	***627***	***2020***	***6045***	***19309***	***25354***
TOTAL	***2206***		***4885***		***4678***		***3494***		***5774***		***1670***		***2647***		***25354***		

Notes: Ind-indigenous trees Exo-Exotic trees - no school

From table 4.2, all schools had trees, either exotic or indigenous or both. Schools in Nyakach Sub County recorded the highest total number of trees at 5774. The highest total number of indigenous trees in Nyakach Sub County was 802 recorded in schools with land size between 2.00-3.99Ha. Schools with land sizes 4.00-5.99Ha had the highest total number of trees and the highest exotic trees while those with less than 2Ha had the least total number of trees and the least number of exotic trees in Nyakach. Kisumu East and Kisumu West Sub Counties had a closely similar number of trees having recorded 4885 and 4678 trees respectively. Kisumu East had less than 20 indigenous trees in schools within the land sizes less than 2.0Ha. Kisumu East with 4049 trees recorded the highest number of exotic trees as compared to all the other six Sub Counties. Muhoroni, Seme and Kisumu Central Sub Counties had a total of 3494, 2647 and 2206 trees, respectively. Across all the ranges of school land sizes in the three sub counties, there was not a single category whose total number of exotic or indigenous trees exceeded 1000. Lastly, Nyando Sub County had the least total number of trees having had 1670 trees. The mean number of trees recorded per public primary school was 48 and 156 indigenous and exotic trees respectively. Besides, schools with land size below 2Ha and those above 6Ha had the least number of both exotic and indigenous trees.

Schools with less than 1.00Ha recorded the least number of trees. It was clear that these schools, given their small spaces would prefer to have buildings and assembly than any other land use. Ailin & Nirmala, (2017) put it, school greening activities begins with prioritization of land uses. Those with above 8Ha with 1010 trees had the least total number of trees and the least number of indigenous and exotic trees while 2.00-3.99Ha with 11,835 trees registered the highest number of indigenous trees and total number of trees despite having less than 10% woodlot space as in table 4-3. Besides, despite having schools with land sizes only ranging between up to 3.99Ha, Kisumu East with 4049 trees recorded the highest number of exotic trees as compared to all the other six Sub Counties. This could have been attributed by the large number of schools within this bracket. However, it could also be because of the maximization of the school land (Wolfers, Delacote, & Serge, 2015) and ground greening being among the prioritized land uses after incentivization (Indarto & Mutaqin, 2016).

Across all the sub-counties and the category of land sizes, there were a significantly higher number of exotic trees as compared to indigenous trees. There could have been various reasons behind this observation. First, most respondents viewed exotic species as fast-growing; hence they were appropriate for the school's constant need for wood and timber. Others had more exotic trees since they were cheap and readily available. Furthermore, the respondents said that institutions that donated tree seedlings to public primary schools, in most cases, supplied more exotic trees than indigenous ones because of convenience. In contrast, due to soil conditions, some schools especially in Nyakach Sub County, worked towards replacing all the exotic trees with indigenous trees since the latter could prematurely fall due to their shallow rooting system. This is why it was only in Nyakach Sub County that the total number of indigenous trees in public primary schools exceeded 1000 trees.

Besides, a higher value of coefficient of variance for exotic (***CV=11.6%>10%)*** and indigenous (***CV=16.7%>10%***), showed a relatively higher level of dispersion in the population of trees around the mean. However, the number recorded for indigenous trees concentrated more to the mean as compared to exotic trees. Besides, it was established that there was a significantly weak positive linear correlation between the size of public primary school land and tree population **(p=0.03<0.05** and **r=0.192).** At intercept of 36.916, simple linear regression showed that for every increase in 1ha of school land size, an increase of 85 trees would be expected as in equation 1.

$$\boldsymbol{Total\ number\ of\ trees = 36.916(SLS) + 85.388}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\textit{Equation 1}$$

Therefore, the study revealed that land size significantly influenced tree cover in public primary schools. Given their land sizes (mean=3.26Ha); as established by Evergreen (2002) public primary schools have great opportunities to contribute significantly to overall community sustainability by making or contributing to environmental greening.

4.3 Land Use Practices and Population of Trees in Public Primary Schools

Land as a resource allows for a variety of uses and can meet a diverse range of school objectives through a series of activities done to generate one or more products or services. Questions on land cover and land-use practices were asked so that the relationship between land-use practices in public primary schools and the population of trees in these schools could be established.

4.3.1 Public primary school land cover

Public primary schools had specific land covers within their school compounds that helped them achieve their mandate. In all the sampled schools, a particular rule or procedure was followed while allocating space for these land covers. The study revealed that 32.26% (40) of the sampled schools did not have a school design but instead used instinct or BoM decisions to allocate space for their land covers. However, 67.74% (84) schools followed their school designs. The common land covers found were buildings, playgrounds, assembly, gardens and woodlots. Though few, other schools had teachers' quarters and water points as in figure 4.1 below.

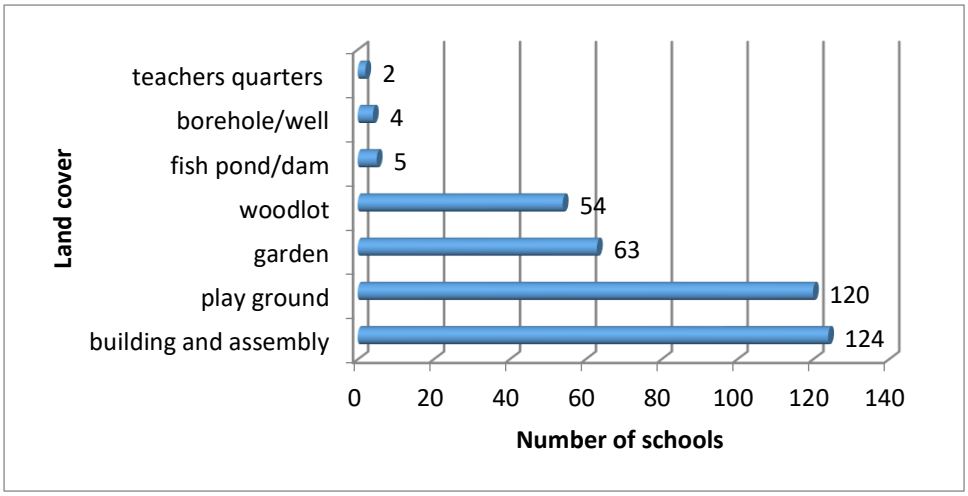


Figure 0.1: Land covers in public primary schools in Kisumu County

From figure 4.3, 100% (124) of the sampled schools had buildings and assembly while 96.77% (120) had playgrounds. 43.55% (54) had woodlots while 50.81% (63) had gardens. Water points recorded as boreholes/wells and fishponds/dams were found in 7.26% (9) schools. Lastly, only 1.61% (2) schools had teachers' quarters. In the respondents' opinion, building and assembly and playground helped the school serve its mandate more directly, hence the high frequencies. Though few, the schools which did not have playgrounds were those which had less than 1Ha of land. Therefore, it is confirmed that schools should be established in a space big enough to serve the enrolled pupils effectively as established by (Blaes, et. Al. (2013); Sanoff & Walden,(2016)). Woodlots and gardens stood out as the main forms of school greening in schools in the study area, just as established by (Browning & Rigolon, 2019). Even so, among the identified woodlots and gardens identified, there were those that were either bare or had very few trees. For instance, in

more than 10 different schools across the County, more than 80% of the trees planted in their woodlot did not survive, leaving bare holes and a few trees, therefore confirming Chawla, et. al, (2014), study findings, tree population is not only influenced by land resource availability but also modifications done on these spaces.

The study went further to assess the amount of space occupied by each land cover as summarized in Table 4.3.

Table 0.3: Space occupied by various land covers in public primary school in Kisumu County

Range of school land sizes	**Buildings & assembly**	**Garden**	**playground**	**Woodlot**	**Dam/pond**	**Teachers quarter**	***Total %used***
0.00-1.99	23.97	12.745	26.545	16	0.083	-	***71.3***
2.00-3.99	34.16	3.3	34.675	9.82	0.083	3	***83.5***
4.00-5.99	37.805	2.05	31.75	10.855	0.25	-	***82.6***
6.00-7.99	43.585	1.05	23.415	9.2	-	-	***72.65***
8.00 and above	33.3	0.25	30	10	-	-	***73.6***
Average	***31.7***	***3.12***	***28.2***	***10.14***	***0.14***	***3***	***76.3***

Buildings and assembly occupied an average of 31.7%. The average percentage of building and assembly in schools with land sizes between 7Ha and 8Ha was the highest (49.67%). It was only in schools with land sizes less than 2Ha where the percentage of space occupied by building and assembly was less than 30% as the other schools had buildings and assembly occupying between 31.5% and 39.5% of their total school land size. Besides, playgrounds occupied an average of 28.2% of the public primary schools' land size. Woodlots and gardens occupied an average of 10.14% and 3.12% of the total school space respectively. Schools with less than 2Ha recorded the largest portion covered by woodlots at 16% of their land size. The same category of schools recorded the highest space (12.74%) occupied by gardens. Categories 2.00-3.99Ha and 6.00-7.99Ha had woodlots in less than 10% of their land. The other ranges of land sizes had woodlots occupying 10% or more. Teachers' quarters found in only 1.61% of the schools occupied an

average of 3% of the total school size as dams/ponds occupied less than 1% of the school land in all the 5 schools where it was recorded. Occupying negligible space was borehole/well

Besides, table 4.3 shows that the total amount of covered space varied with the school land size and space occupied by school land covers. Those with land sizes bellow 1.99ha and those with above 6.00Ha had almost similar amount of used spaces as all recoded less than 80% of used spaced. Those schools with 2.00ha to 3.99ha had the highest percentage used spaces. The average used spaces for all the schools in Kisumu County were 76.3% while 23.7% was unused.

School land sizes as in section 4.1.2, were within the Kenya ministry of education requirements, with the smallest school having a slightly bigger space than the required minimum of 0.2Ha (Basic Education Act, 2013). However, schools which recorded as small as 0.3Ha were unable to allocate space for playground that could effectively serve the number of enrolled pupils. Therefore, as recommended by Sanoff & Walden (2016), schools should be located on sites large enough to allow outdoor real-time learning, playing and sports.

Given that trees could not be planted on structurally developed spaces within the schools nor grown in playground, it was assumed that the only quantifiable spaces which could have trees were the garden and woodlot. However, on some occasions trees would be scattered within the open spaces or grown along the boundaries. However, these spaces along the boundaries were negligible and, in most cases, difficult to quantify. Therefore, with the assumption, 63.04% of school land was occupied by structures and playgrounds, while 13.26% had different forms of greening from trees to crops. As already established in section 4.1.3, schools with less than 1Ha preferred to have buildings and assembly than any other land use including playgrounds. Therefore, as Ailin & Nirmala, (2017) established, school greening activities begins with prioritization of land uses.

4.3.2 Land use practices and their contribution to tree abundance

Educational activity, tree nursery, kitchen gardening, forestry, recreational and agroforestry were the common land use practices the sampled schools, as shown in figure 4.2 bellow.

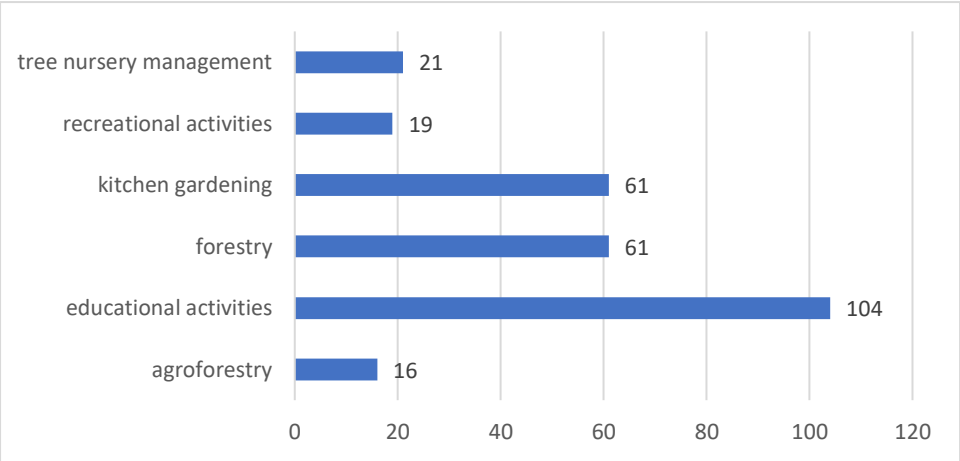


Figure 0.2: *Land-use practices in public primary schools*

Educational activities were in 83.87% (104), recreational activities that lead to tree cover establishment were in 15.32% (19) while tree nursery management was in 16.93% (21) of the sampled schools. Kitchen gardening and forestry indicated by gardens and woodlots, respectively, were present in 49.19% (61) schools each while agroforestry was in 12.90% (16) schools. Though all schools had educational activities, it was not in all the schools where these activities could result in tree planting and management. This was similar to what Gibb, (2016) and Mitchell & Fisette, (2018) found out that education for sustainable develoment was negatively influenced by environmnetal education being made a classroom afare. Furthermore, with reference to table 4.4, woodlots covered an average of 10.14% of the school land size. The percentage translated to 207.71Ha of the total land covered by public primary school in Kisumu County as per section 4.1.2. Apart from forestry, agroforestry and kitchen gardening were the other land-use practices whose land sizes could be quantified. Being captured as gardens they covered an average of 3.12% of the total public primary school land translating to 10.02Ha of the total 2004.9Ha covered by all public primary school in the entire County. This proves that public primary schools have the capacity to set aside at least 10% of their land for tree cover as established by (Evergreen , (2002); Janet, (2005) & Hanifah, et.al , (2015)).

The above land-use practices were assessed to get their contribution to the tree population in public primary school as in table 4.4.

Table 0.4: *Resultant trees from land use practices in public primary schools in Kisumu County*

Land Use Practice	Land Size (Ha)							
	0.00-1.99	***2.00-3.99***	***4.00-5.99***	***6.00-7.99***	***8.00 and above***	***Total***	***Contribution (%)***	***Mean***
Forestry	609	2473	4455	513	509	**8559**	**33.76**	**140**
Educational activities	0	1030	86	4	0	**1120**	**4.42**	**11**
Tree nursery	0	550	0	0	0	**550**	**2.17**	**29**
Kitchen gardening	28	253	103	75	17	**476**	**1.88**	**8**
Agroforestry	0	73	80	0	0	**153**	**0.6**	**10**
Recreational activities	0	34	31	0	0	**65**	**0.26**	**4**
Total	**637**	**4413**	**4755**	**592**	**526**	**10923**	**43.08**	

Forestry, found in 61 schools, contributed to the highest number of trees compared to other land uses across all the school land sizes. 8559 trees from forestry formed 33.76% of the total tree population in all the sampled schools with an average of 140 trees per school. Schools with land sizes 4.00-5.99 Ha had the highest number of trees resulting from forestry activities followed by those which had 2.00-3.99Ha. Forestry in schools with land size below 2Ha and above 6Ha contributed to less than 1000 trees per category. Therefore, forestry denoted by woodlots in the sampled schools can be a great complement to forest cover as established by Emmanuel & Diverson (2010). In second place were educational activities which resulted to a total of 1120 trees. With a average of 11 trees per school, educational activities contributed to 4.42% of the total Tree abundance in public primary schools in Kisumu County. Educational activities in schools with land sizes bellow 2 Ha and above 8Ha did not yield any tree. However, schools with land sizes between 2Ha and 4Ha had the highest number of trees from educational activities. Besides, the number of trees from educational activities decreased with increase in school land size.

Tree nursery management contributed to 550 trees in total which formed 2.17% of the 25,354 trees found in all the sampled primary schools. All of which come from schools with land sizes between 2Ha and 4Ha. Further, with an average of 8 trees per school, kitchen gardening found in 61 schools contributed to 476 trees, that is, 1.88% of the total Tree abundance in public primary schools in Kisumu County. Kitchen gardening practiced in schools with land sizes between 2Ha- 4Ha resulted to the highest number of trees compared to other land size categories. Apart from Forestry, among the other land use practices, it was only kitchen gardening which contributed to trees across all the school land sizes. On the other hand, agroforestry contributed to 0.6% (153 trees) of the total Tree abundance with an average of 10 trees per schools. Just as educational activities, trees from agroforestry were only found in schools with land sizes between 2Ha and 6Ha. Lastly, recreational activities found in18 schools resulted to the least number of trees in the sampled schools. Having resulted to 65 trees, recreational activities in public primary schools formed 0.26% of the 25,354 trees found in all the sampled schools.

Generally, land use practices in public primary schools contributed to 43.08% (10923 trees) of the total Tree abundance. Though not included in the questionnaire, the respondents explained that the other trees existed before they were posted in the current stations and could not associate them with any specific practice. Though planted in their error, others could still not be obviously linked to a certain land use practice. Apart from agroforestry and forestry, number of trees from land use practices peaked in schools with 2 to 4 hectares of land then gradually reduced as the sizes of land increased. With respect to school land sizes, the number of trees from land use practices increased from schools with less than 2Ha of land up to those with 4Ha-6Ha then reduced as the land sizes increased. Further, with respect to the mean number of trees per land use practice; educational activities, forestry, tree nursery and agroforestry contributed to at least 10 trees per school. Therefore, apart from tree nursery, agroforestry and kitchen gardening (Zinck, Emily and Carola (2013); Kyule, Ochieng', Nkurumwa (2015) and Sivarajah, et al. (2018)) educational activities contributed greatly to the population of trees in public primary schools and hence helped in solving various physical, social, economic and environmental problems.

With reference to table 4.1, schools in Kisumu Central, Kisumu East and Kisumu West which were within or in the periphery of Kisumu city formed most of those schools with land sizes above 6Ha.

Subsequently, table 4.4 shows that the number of trees from land use practices reduced in this category of schools. This could be attributed to the type of land covers and the sizes of space they occupy in these schools. Furthermore, 100% of the sampled schools had buildings and assembly while 96.77% and occupied the highest percentage of public primary school space. This showed that buildings, assembly and playgrounds were the most prioritized school land covers in public primary schools. This could have been so because of their contribution to primary school's mandate. Furthermore, spaces occupied by playgrounds and building and assembly in Kisumu County schools were distributed closer to the mean because their size requirements were documented in the guidelines for primary schools (Department of Education and Skills, 2010) & (Basic Education Act, 2013). Therefore, as established by Sanoff & Walden (2016) that countries built huge schools in most of their cities for economic and curriculum advantages. The number of trees from land use practices reduced with increase in land size due to prioritizations in land allocation for different land covers. This saw schools in urban areas with land sizes above 6Ha building huge and many classes and have big playgrounds aimed at efficiently serving the high number of registered pupils.

Excluding the outliers (Rae Kaju primary school which had a total of 3084 trees from land use practices and those whose land use practices did not have any tree) the mean number of trees from the six land use practices was 147 trees. A greater standard deviation (179.67>147) and coefficient of variance (CV=32280.18) showed that the number of trees from land use practices were spread out away from the mean. Further, a high value of Kurtosis (Kurt=6.68>3 and skewness (skew=2.46>2) showed a slightly long tailed leptokurtic variance in the number of trees from land use practices in public primary schools.

Further analysis to establish the relationship between trees from the land use practices recorded and tree population in public primary schools was carried out as in table 4.6 bellow.

Table 0.5: Regression on resultant trees from land use practices and total tree population in schools

Regression on resultant trees from land use practices and total tree population

Variable	Estimates	SE	t-value	Pr(>/t/)
Intercept	151.387	24.5859	6.157	1.07e-08***
Educational activities	-0.279	0.453	-0.616	0.539
Kitchen gardening	7.992	3.311	2.413	0.017*
Agroforestry	7.739	5.812	1.332	0.186
Recreational activities	0.364	5.012	0.073	0.942
Forestry	1.946	0.169	11.492	<2e-16***
Tree nursery	8.897	0.761	11.695	<2e-16***

Regression on space occupied by land covers and Tree abundance

Variable	Unstandardized coefficient	SE	Standardized coefficient	t-value	P-value
Buildings	1.315	1.671	0.064	.787	.433
Field	22.123	34.928	0.052	.633	.528
Garden	377.967	178.997	0.174	2.112	.037*
Woodlot	432.688	86.141	0.420	5.023	4.53e-05***

*Notes: Significance codes- 0 '***' 0.01 '*'*

From the analysis trees from land use practices had a highly significant positive correlation with tree population in public primary schools **(r^2=0.843 & p=1.07e-08).** The value of r-squared obtained showed that 84.3% of the total trees present in public primary schools could be explained by the trees from various land use practices in these schools. In every situation the output from a piece of land always depends on the modifications and management activities carried out on the land in question just as was explained by Blaes, et al., 2013. From Blaes, et al., 2013 and Deakin,

et. al. (2016) point of view it was expected that 100% of the trees counted in the schools should be attached to a particular land use practice. However, this was not the case as 15.7% of the trees could not be attached to any land use practice especially those scattered around the school compound. This was highly attributed to inadequate record keeping of tree planting activities as eluded by the respondents.

Further, from the regression analysis forestry (**p=2e-16)**, tree nursery (p=**2e-16)** and kitchen gardening (p=**0.017)** had a significant correlation with tree population in the sampled schools. Similarly, the subsequent analysis on space covered by land covers and Tree abundance showed that for every 1Ha increase in space for garden and woodlot, there would be a statistically significant increase in the total number of trees in public primary school **(P<0.05)** by 378 and 433, respectively. The highly significant level of correlation for forestry and tree nursery could be explained by the fact that these land use practices purely deal with tree management and that their major output is trees. The two and kitchen gardening are majorly ground greening practices hence the significance. As Evergreen (2002), Mbora, et.al (2008) & Ochieng, et. Al. (2015) put it, setting up woodlots, tree nursery and kitchen gardening are the major ways schools contribute to environmental greening; meet present and future demand for planting material and equip learners with appropriate knowledge, skills and techniques they can apply to promote agroforestry even out of school

On the other hand, educational activities and recreational activities done in built areas and fields had insignificant correlation with the number of trees **(p>0.05)**. Subsequently, space in hectares for buildings and fields were found not significantly correlated with the total number of trees. This could be explained by the nature of land covers-buildings and field- which allows for minimal consideration of trees as output. Even though, agroforestry is a ground greening land use practice, it had insignificant relationship with total number of trees. This could have been because of of its frequency and difficulty to access – at the right time, in the right quantities and of high quality – the trees that they want to plant (Food and Agriculture of the United Nation, 2007).

Therefore, number of trees from land use practices could be obtained by:

$$\boldsymbol{LUT = 151.378 + (-0.279 \times EDT) + (7.992 \times KGT) + (7.739 \times TA) + (0.364 \times RAT) + (1.946 \times FT) + (8.897 \times NMT)} \quad \textbf{.....equation 2}$$

Where:

LUT-trees from land use practices

EDT-trees from educational activities

KGT- trees from kitchen gardening

TA-trees from agroforestry

RAT-trees from recreational activities

FT-trees from forestry

NMT-trees from nursery management

Further, with reference to table 4.4, the sampled schools had an average of 76.3% of their land used and 23.7% unused spaces. Therefore, if part (10%) of the unused spaces were to be used for tree cover establishment while the rest (13.7%) left for other school developments, the following increase in number of trees will be achieved respectively.

When the 10% is added to garden:

$$\boldsymbol{Additional\ trees\ from\ garden = 0.1\ of\ SLS \times 0.174} \quad \textit{.....Equation 3}$$

When the 10% is added to woodlots:

$$\boldsymbol{Additional\ trees\ from\ woodlot = 0.1 of\ SLS \times 0.42} \quad \textit{..... Equation 4}$$

Therefore, from objective one results and discussions, it could be deduced that apart from the total land size, tree population in a public primary school did depend on the space occupied by green land covers and the management and modifications done. Further, the number and species of trees resulting from these modifications and management varied among the found land use practices. Just as Blaes, et. al., (2013) and Deakin, et. al. (2016) suggested that apart from the availability of resources, embracing efficient strategies aimed at increasing tree cover will help correct the imbalance in various land uses and solve various environmental problems. Therefore, if part of the unused spaces were to be used for tree cover establishment, it would assist in solving various environmental problems and socio-economic challenges within the public primary school and the surrounding communities, as established by Sivarajah, Smith & Thomas (2018).

4.4 School Curriculum and Species of Trees in Public Primary Schools

4.4.1 Tree cover content in the primary school curriculum

Tree cover content in primary schools was assessed in two categories: lower primary and upper primary curriculums. With reference to Bolscho & Hauenschild (2006) and Gachuru (2010) study findings, the assessment was based on the teachers' understanding of the curriculum provisions and expectations. This is because the two sets of studies discovered that green curriculum success depends much on the teachers' understanding and preparation.

It was observed that forestry was not offered as a subject in primary schools as a separate subject both in lower and upper primary, just as established by Agea et al., (2009). However, elements and concepts of forestry were integrated in a number of prescribed subjects in the curriculum by the ministry of education. The mean number of subjects promoting actual tree cover establishment in the lower primary was 7. 42.74% (53) of the schools had more than 10 subjects promoting tree cover establishment activities out of which 94.34% (50) felt that all the 11 taught subjects in lower primary had components that lead to actual tree planting or management. Only 1.6% of the respondents felt that only agriculture had concepts which could directly translate to tree planting.

In Upper Primary, the mean number of subjects promoting actual tree cover was 4. The number of subjects that promoted actual tree cover establishment in upper primary was near evenly distributed but with most schools having between 1 and 2 subjects, these were, science and/or Christian Religious Education (CRE). Since the study was based on teachers understanding, 25% (31) of the respondents felt that all the 5 subjects taught in upper primary had tree cover contents. However, there were teachers who treated *insha* and composition as separate subjects and that, they too had some aspects of tree cover establishment. One of the respondents said,

> *'We have Insha and Composition in their own slots in our school timetable and there are instances when we have topics related to tree planting or management while teaching them. Therefore, I can say all the seven subjects in the timetable promote tree cover establishment'*

However, since number of examinable subjects as set by the ministry of education is 5, these schools were categorised under those with 5 subjects as in table 4.6. Otherwise, 61.29% (80) of the school heads felt that not all the contents of the taught subjects could translate to actual tree planting

and management with 6.45% respondents feeling that only Christian religious education (C.R.E) had such content. Besides, the number of indigenous and exotic trees planted and managed by pupils were assessed in the sampled schools and summarized in table 4.6.

Table 0.6: Subjects promoting actual tree cover establishment in primary school and their resultant trees

Number Of Subjects	Indigenous Planted	Exotic Planted	Indigenous Managed	Exotic Managed
		Lower Primary		
1	0	0	0	2
2	0	30	24	12
3	4	4	2	17
4	24	0	11	9
5	4	4	3	7
6	40	1300	5	3
7	80	0	39	18
8	50	1240	6	5
9	0	0	0	1
10	120	10	4	3
11	121	251	67	45
Grand Total	***443***	***2839***	***161***	***122***
p value	0.278	0.892	0.662	0.932
		Upper Primary		
1	34	20	13	8
2	140	1550	28	15
3	11	34	27	11
4	0	0	6	21
5	95	135	64	48
Grand total	***280***	***1739***	***138***	***103***
p value	0.181	0.203	0.488	0.204

Note: Number of trees planted and managed was cumulative number per term

From table 4.7, in a term lower primary pupils planted 61.91% (443 indigenous and 2839 exotic trees) and managed 54.01% (161 indigenous and 122 exotic trees). Schools with 4 subjects planted only indigenous trees, those with 6 subjects planted the highest number of trees in a term while those which had 1 and 9 subjects did not plant any exotic nor indigenous trees. Schools with 6 and 8 subjects were the only category of schools which planted more than 1000 trees in a term while

the rest planted less than 500 trees in total. Besides, all schools with 1-5 subjects taught in lower primary, planted and managed less $\leq$ 30 trees in total in a term. Schools with 5 subjects managed the highest number of trees in a term while those with 9 subjects managed only one tree hence the least there was. Schools with 11 subjects had the highest number of both exotic and indigenous trees managed in a term.

In a term, upper primary pupils planted a total of 38.09% trees (280 indigenous and 1739 exotic) and managed 45.99% trees (138 indigenous and 103 exotic). The number of exotic trees planted or managed exceeded their indigenous counterparts in all schools except for those who had only 1 subject. Schools which had 2 subjects planted 83.7% (1690 trees); the highest and were the schools which planted more than 1000 trees in single term. The rest planted less than 400 trees with majority having planted below 100 trees. Schools which had 4 subjects promoting trees cover where the only category of schools which did not plant any exotic nor indigenous trees in a term. Schools with 5 subjects managed 35.27% (112 trees); the highest number of trees in a term, while those with 1 subject managed only 8.71% (21 trees); the least there was. Trees managed in a term across all the categories of subjects did not exceed 100 trees.

In general, the number of exotic trees planted and managed exceeded their indigenous counterparts in almost all the schools with different number of subjects. This may have been so because of the school preferences on tree species and availability of the tree seedlings as suggested by the respondents of the study. Further, Indigenous trees managed during classes in most categories of subjects exceeded exotic trees managed. The total numbers of trees planted and managed by upper primary school pupils were less than those planted by lower primary pupils in a term. The median number of trees planted during lessons in the sampled schools was 1 while the mean was 6 trees. However, most schools did not plant trees during lessons. A greater standard deviation (11>6) and coefficient of variance (CV=135.36) showed that the number of trees from planted during lessons in public primary schools were spread out away from the mean. Further, a high value of Kurtosis (Kurt=6.88>3 and skewness (skew=2.54>2.00) showed a slightly long tailed leptokurtic variance in the number of trees planted and managed during lessons. A correlation analysis was also carried out as presented below

Table 0.7: Correlations on number of subjects and trees (exotic and indigenous) planted by pupils during lessons

	Upper primary Subjects	Lower Primary Subjects
EXO Trees Planted Per Lesson	r= -0.1624746	r= 0.02587932
IND Trees Planted Per Lesson	r= -0.1499721	r=0.05253432

Subjects promoting tree cover establishment in lower primary, and trees planted and managed by the lower primary pupils recorded a significantly very weak positive correlation with trees planted by the lower schoolers. On the other hand, subjects in upper primary recorded a very weak negative correlation with trees planted and managed. The negative correlation coefficients obtained for upper primary and positive coefficients for lower primary, could have been attributed to the teachers' understanding on tree cover content in the two sets of syllabus. Out of the 124 head teachers, 45.97% of the teachers believed that subjects promoting tree cover in upper primary were relatively inadequate while 31.50% teachers had the same feeling for lower primary syllabus. This was because, as the respondents said, pupils in upper primary were taught to pass their examinations with very little stress on bringing up environmentally conscious individuals, since curriculum for upper primary classes was grade oriented. 68.5% of the respondents believed that lower primary curriculum was adequate since it had been strengthened, its institutional strategies improved, and materials updated. However, as was Slate, et. al, (2008) finding, they viewed it as a new thing and that understanding it and eventual impact realization would take a while. Their view could be the explanation behind the weak positive correlation as the curriculum was in its early stages of implementation. As some of the head teachers said,

> *"The competency-based curriculum is a good thing with promising results; however, understanding it so that it can properly be implemented will take a while."*

> *"Competency-based curriculum in lower primary is well integrated and will yield positive results upon full implementation."*

However, the head teachers believed that lower primary curriculum had the potential of giving primary schools fundamental importance in developing behavior and comprehensive views of the surrounding environment just as established by Anto´nio, Teresa, & Costa (2006).

In addition, linear regression analysis on number of subjects and number of trees managed or planted was conducted. From the results (table 0.1 in appendices) shows high predictive values **(p>0.05)** for all the four response variables; exotic trees planted, indigenous trees planted, exotic trees managed, and indigenous trees managed was obtained both for lower and upper primary. Beside the value of r-squared obtained showed that only 17% of the total Tree abundance could be explained by the number of subjects taught in primary school.

Zinck & Carola, (2013), concluded that the attempts to provide an understanding of the environment are closely related to the teaching methods and students' learning. Therefore, in addition to curriculum content, information on the teaching-learning process in public primary school was obtained. 85.48% (106) of the sampled schools had both indoor and outdoor lessons. 14.52% (18) schools did not have outdoor lessons even though, Bolscho & Hauenschild (2006), concluded that students' activities outdoors have shown to be more creative than in classrooms with positive effects on learning and cognitive qualities. The schools without outdoor lessons attributed their teaching-learning process to inadequate time and space in the ratio of 8:1. In Kenya, the ministry of Education set the official school hours for all primary schools to be 8.00am to 3.30pm. Within which, the respondents said they were directed by the National Institute for Curriculum Development to do at most 8 lessons per class. This meant that each lesson was to take at most 35 minutes; however, in some instances certain subjects would go for only 20 minutes especially in the lower primary where the numbers of subjects were increased. Therefore, to the respondents, this was very little time to allow for outdoor learning activities.

In the 106 schools which had outdoor lessons, the frequency of outdoor lessons varied from one school to another. The table below shows the exclusive distribution of outdoor lessons per term.

Table 0.8: Distribution of outdoor lessons in a term in public primary schools

Number of outdoor lessons	Count of schools	Sum of frequency of outdoor lessons
Not sure	38	n/a
1	21	21
2	5	10
3	6	18
4	17	68
8	1	8
12	8	96
24	10	240
Grand Total	**106**	**461**

35.85%(38) schools could not quantify the number of the outdoor lessons they had in a term as they understood that it depended on the teacher's understanding, subjects and topic requirements which to them varied from class to class. However, 64.15% (68) schools had between 1 to 24 outdoor lessons per class in a term among which 16.94% (21) had 1 outdoor lesson in a whole term. 9.4% (10) of the schools had at least one outdoor lesson per week translating to 24 lessons in a term. 4.71% (5) of the schools had 2 lessons, 5.66% (6) had 3 lessons, 16.04% (17) had 4 lessons, 0.94% (1) had 8 outdoor lessons, 7.54% (8) had 12 outdoor lessons per week. The number of lessons per week translated to between 8 to 240 lessons per term with a total of 461 outdoor lessons in the County.

In general, the above variation in the type of teaching-learning method and the number of outdoor lessons was because of the difference in subject requirements as understood by the respondents and their teaching staff. Most respondents understood that certain subjects like Science, Agriculture and Technology and Religious Education required obvious outdoor classes, unlike other subjects like languages. Janet (2005) in a study also found out that certain subject areas or grade levels lent themselves more easily to using the green school grounds as an outdoor classroom and lack of obvious curricular links is a critical barrier that limits outdoor learning.

Further the study assessed the outdoor lessons activities done by public primary school pupils. An average of 90% of the schools that had outdoor lessons did not plant any tree and 75% did not manage any tree during outdoor lessons. Averagely, the number of schools which did tree management practices during their outdoor lessons was slightly higher than those who did tree planting. Despite Puttick & Hughes (2018) discovery that practical tree planting and management helps young people to generate a sense of self-transcendent purposefulness and to foster feelings of nurture and care for the natural world, not every outdoor lesson yielded to actual tree planting or management in both lower and upper primary classes. The number of trees planted and managed per outdoor lessons was obtained and summarized in table 4.9.

Table 0.9: Trees planted and managed during outdoor lessons in public primary schools

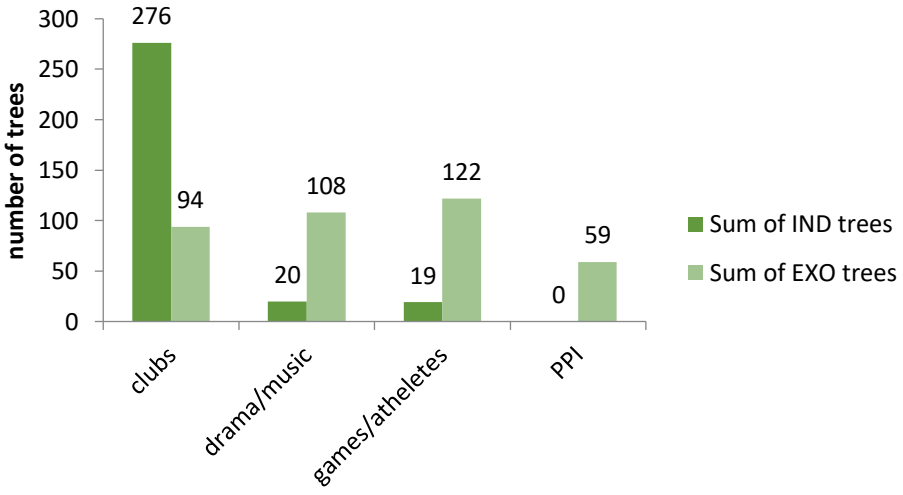
Activity During Outdoor Lessons	**Number of Outdoor Lessons**								**Grand Total**
	#	**1**	**2**	**3**	**4**	**8**	**12**	**24**	
Indigenous planted per term	0	0	10	0	168	24	241	0	443
Exotic planted per term	0	20	50	0	248	0	121	2400	2839
Indigenous trees managed per term	0	49	12	42	48	0	5	5	161
Exotic trees managed per term	0	48	63	40	47	0	6	5	209

Schools which could not quantify the number of outdoor lessons did not plant nor manage any trees during outdoor lessons. In addition, schools which had 3 outdoor lessons did not plant any tree while those with 8 outdoor lessons did not manage any tree. Schools which had 24 outdoor lessons planted 73.13% of the total trees planted during lessons in public primary schools while those with 1 lesson planted 0.61% (20); the least there was. In contrary, schools with 1 outdoor lesson managed the highest number of trees (26.22%) while those which had 24 lessons managed the least number (2.70%) of trees per lesson. Besides, Schools which had less than 3 outdoor lessons per term recorded a higher number of total trees managed than those planted, this was opposite for the schools which hard 4 outdoor lessons and above. The table also shows that the total number of trees planted (3282 trees) exceeded the total number of trees managed (370 trees). The number of exotic trees planted and those managed were higher than the indigenous trees planted and managed. Schools which had 1 and 24 outdoor lessons made exceptions as they planted only exotic trees while those which had 8 outdoor lessons planted only indigenous trees. Generally, the range of

exotic and indigenous trees planted was higher than the range in the number of exotic and indigenous trees managed. There was appositively skewed leptokurtic distribution of the number of trees planted and managed during outdoor lessons.

4.4.2 Co-curricular activities and corresponding tree species

Four common co-curricular activities (*games/athlete, drama/music, clubs, PPI (Programme for Pastoral Instructions)* were identified in public primary schools in Kisumu County. 98.39% (122) schools participated in games/athletics while drama/music was in 87.10% (108) and formed the second popular co-curricular activities in the county. Clubs and PPI were in 75.81% (94) and 56.45% (70) of the sampled schools respectively. Among the clubs recorded include environmental, wildlife, scouting, peace, and debate clubs. It was also discovered that in 80% of the cases, the whole school was involved in these activities; however, in some schools, only participants took part in co-curricular activities. In the latter circumstances, the whole school community could be reached and be encouraged through tree planting and management sessions. Related themes could also be used to reach the entire school population, for example, music or drama themes and debate titles. The following counts of trees were recorded to have resulted from various co-curricular activities in public primary schools



Key: PPI- programme for pastoral instruction

Figure 0.3: T*rees from co-curricular activities*

Clubs contributed to 53% (370 trees) with 49% (182) more indigenous trees than exotic trees. Drama/music activities resulted to 18.34% (120) of the total number of trees from co-curricular activities. Unlike clubs, exotic trees from drama/music exceeded their indigenous counterparts with 68.75% (88) trees. Games/athletics contributed to 20.2% (141) trees; 73.05% (103) more exotic than indigenous trees. Lastly, PPI contributed to 8.45% (59 trees). It was only PPI which contributed to only exotic trees. Unlike the trend of exotic trees which almost leveled across all the co-curricular activities, number of indigenous trees decreased from clubs to PPI.

Despite being in 75.81% schools, clubs contributed to more than half of the trees from all the co-curricular activities in the sampled schools. This was more than the number of trees from either games/athletics or drama/music which were recorded in more than 85% of the sampled schools. This could have so because, clubs' activities in most cases lent themselves more to actual tree planting and management which is not always the case for other co-curricular activities (Gachuru, 2010; Zinck & Carola, 2013; Hafiffah et.al , 2014, Hanifah, et.al, 2015; Osiyo, 2016).

In general, 70.16% of the sample primary schools did not have any tree resulting from co-curricular activities. With the mean of 10 trees per school, co-curricular activities contributed to 2.75% (698) of the total Tree abundance in public primary schools in Kisumu County. The number of trees from co-curricular activities in public primary schools spread out away from the mean (SD>10 & CV>10). The distribution of trees from co-curricular activities formed a slightly long tailed leptokurtic curve ((Kurt=7.53>3 and skewness (skew=2.83>2.00). Besides, there was a moderate positive correlation between trees from co-curricular activities and total Tree abundance in all the schools studied **(r=0.393).**

4.4.3 Extra-curricular activities and tree species in public primary schools

28.23% (35) of the sampled schools had extracurricular activities, of which adopt a tree was the only activity recorded in all these schools. 4.25% boys and 3.75% girls were involved in the adopt a tree initiative in the ratio of 10:9 and contributed to 5.17% of the total Tree abundance in all schools in Kisumu County. Out of which 5.41% (71) trees were indigenous trees while 93.94% (1241) were exotic trees. Thus, the initiative contributed more to exotic trees compared to indigenous trees in Kisumu County. 51 exotic trees and 7 indigenous trees were the most recurrent

number of trees from extracurricular activities. Generally, a relatively high variance was recorded for both exotic and indigenous trees from extracurricular activities. Exotic trees from extracurricular activities recorded a positively high leptokurtic variance indicated by greater kurtosis and skewness values (Kurt=4.6>3 and skew 5.0>1). However, indigenous tree recorded a normally skewed leptokurtic curve (Kurt=4.4>3 and skew=0).

Further, analysis on the number of the number of participants in extracurricular activities showed that, the minimum number of boys involved in the extracurricular activities was 5, even so, in some schools there were no girls involved in the same activities. The total number of pupils involved in extracurricular activities identified was 5.16%; 2133 of 41348 pupils enrolled in public primary schools by 2018 as recorded in the Kisumu County KIDP report, (2018). A relatively high variance **(CV=1.37 & 1.21)** was recorded for both boys and girls involved. In both cases there was a positively high leptokurtic variance indicated by high kurtosis and skewness values **(Kurt=8.76 & 5.99>3 and skew=2.94 & 2.48>1)**.

4.4.4 Influence of the three forms of curriculum on tree species

Number of outdoor lessons in the sampled schools had a positive correlation with the trees planted **(r=0.357)** and those managed **(r=0.128).** Linear regression analysis was done to scientifically understand the relationship between the number of outdoor lessons and the number of trees planted and managed during these lessons.

Table 0.10: Linear regression on trees planted and managed during outdoor lessons per term

		Estimates	***Standard Error***	***T-Value***	***P-Value***
Trees planted	*intecept*	*-3.44*	*14.731*	*-0.233*	*0.816*
	FOL	*7.857*	*1.861*	*4.221*	*4.7e-05****
Trees managed	*Intecept*	*3.390*	*0.590*	*5.742*	*6.99e-08****
	FOL	*-0.1067*	*0.075*	*-1.431*	*0.155*

Notes: FOL-frequency of outdoor lessons *Significance codes- 0 '***'*

The change in number of trees planted were highly significant with a single change in the number of outdoor lessons given the smaller p-value **(p=*4.7e-05*<0.05).** However, there was insignificant scientific evidence that change in the frequency of outdoor lessons could significantly influence the number of trees managed in primary school due to a greater p-value **(p=0.155>0.05).** Therefore, the regression analysis showed that changes in the number of outdoor lessons in public primary school would significantly affect the number of trees planted as compared to trees managed. Therefore, though curricular performance depends on teachers' understanding of the curriculum provisions and expectations (Bolscho & Hauenschild (2006); Gachuru (2010)) and ideally use the National Standards or a state-level equivalent to guide their planning (Mitchell & Fisette, 2018), school activities should involve more than simply listening or writing done in classrooms since outdoor classes are an ideal vehicle for learning and socialization (Merike, Emer, & Cliona, 2010). The following equation could therefore be used to predict the number of trees planted with a single increase in the number of outdoor lessons in a term in public primary school:

$$\boldsymbol{trees\ planted = 8 \times number\ of\ outdoor\ lessons - 3.44 \ldots\ldots\ldots\ldots}\ \textit{Equation 5}$$

Further, multiple linear regression analysis was done on co-curricular activities and total population of trees in public primary schools.

Table 0.11: Linear Regression analysis on trees resulting from co-curricular activities and Tree abundance in public primary schools

	Estimate	***Standard Error***	***t Stat***	***P-value***
Intercept	172.513	29.149	5.918	0.000***
clubs	3.192	1.114	2.865	0.005**
games/athletics	33.474	44.272	0.756	0.451
drama/music	-24.503	58.072	-0.422	0.674
PPI	-4.967	8.692	-0.571	0.569

*Notes: PPI-Programme for Pastoral Instructions Significance codes- 0 '***' 0.001'**'*

The predictive analysis conducted helped in singling out the co-curricular activities to intensify when a school wishes to increase its tree cover. The results showed that clubs **(p=0.005),** was the

only co-curricular activity with statistically significant relationship with the total population in public primary schools. Besides, with reference to figure 4.3, clubs contributed the most to tree population compared to other co-curricular activities. Gachuru (2010), in a study also affirmed that clubs were the most useful co-curricular activity in creating awareness, advocacy, maintenance and conservation of the school environment.

On the other hand, games/athletics, drama/music and PPI, having a possible zero (0) value at 95% confidence level and a higher p value **(p=0.451, 0.674, 0.569>0.05),** it was not certain that they significantly affected the total populations in these schools. This could be explained by the mission of these co-curricular activities which does not directly translate tree planting or management but may have different ways of promoting tree cover establishment in schools. As established by Anto´nio, Teresa, & Costa (2006); Zinck & Carola (2013); Miriam, Ochieng' & Agnes (2015) themes used in other co-curricular activities like drama/music and games/athletics also come in handy as far as creating awareness is concerned just as it was established by various studies. The prediction depicted by the regression analysis output was summarized as:

$$\boldsymbol{Number\ of\ trees} = (\mathbf{3.192} \times \boldsymbol{trees\ from\ clubs} + \mathbf{33.474} \times \boldsymbol{trees\ from\ games} - \mathbf{24.503} \times \boldsymbol{trees\ from\ drama} - \mathbf{4.967} \times \boldsymbol{trees\ from\ PPI}) + \mathbf{172.513}$$

Equation 6

Besides, the study established a weak positive correlation (**r=0.256)** between number of tree from extracurricular activities and the total tree population in public primary schools in Kisumu County. Further, there was a positive correlation among boys and girls involved in the extracurricular activities and the corresponding exotic(**r=0.013)** and indigenous trees **(r= 0.923)** in public primary schools. Furthermore, developing and running a linear regression model showed that for resultant exotic trees, increasing the number of either boys or girls involved has a significant effect on the resultant trees. The significance level was also recorded if the prediction was done for the indigenous trees. It meant that increasing the number of boys participating in the extracurricular activities had positive significance to the resultant exotic trees; however, increasing the number of girls would negatively affect the number of exotic trees. However, there would be a positive change in the total number of exotic trees which would arise from the activity.

Four schools out of those who participated in extracurricular activities were randomly picked to predict the number of trees that would be realized if the numbers of boys and girls participants were increased by 20, respectively. It was realized that there would be an increase of 19 to 43 in the number of exotic trees as shown below.

35Boys, 35 Girls -***22 additional exotic Trees***

30Boys, 30 Girls- ***19 additional exotic Trees***

35Boys, 35 Girls- ***22 additional exotic Trees***

45Boys, 32 Girls- ***43 additional exotic Trees***

The same schools used to predict exotic trees were also used to predict number of indigenous trees when participants were increased by 20. These schools, which initially did not have indigenous trees from extracurricular activities, would be able to have 1 to 3 indigenous trees from such activities.

35Boys, 35 Girls- 3 ***additional indigenous trees***

30Boys, 30 Girls- 3 ***additional indigenous trees***

35Boys, 35 Girls- 3 ***additional indigenous trees***

45Boys, 32 Girls- 1 ***additional indigenous trees***

4.5 School ground greening rules and tree abundance in Public Primary Schools

4.5.1 General school rules in relation to tree cover

All the public primary schools studied had rules espoused in the school motto/vision/mission statements. These statements provided the basis for the school community's actions and reasoning just as Hanifa et al. (2015) pointed out that one of the steps in developing a greening and sustainability culture is writing a vision or mission. Every statement had an area of emphasis. 43.5% of the schools had their statements emphasizing on academic excellence and 29.84% had hard work as the main emphasis on their statements. These numbers were presumably because of the principal mandate of primary schools as understood by the respondents. Discipline, life skills and holistic development was emphasized in statements of 10.48%, 7.26% and 4.84% of the schools respectively. On the other hand, environmental consciousness was only emphasized in statements of only 2.42% of the sampled schools; the least there was. Hanifa et al. (2015) pointed out that through summing up school's understanding of sustainable development in mission and

vision; schools get to develop a culture of sustainability. However, the frequency for academic excellence (43.5%) versus environmental consciousness (2.42%) in the mission/vision statements was a reflection of Slate, Craig, Karen, Jeanie, & Tracy, (2008) findings while doing a study on the school mission statement and school performance. Even so, 61% of the respondents believed that environmental consciousness should form a more significant part of the school rules as it will bring up a more holistic and responsible generation. Conversely, 36% felt that their statements were okay or good enough to help the school achieve its mandate while 3% felt the need to espouse more disciplines in their motto/mission/vision statements.

Besides, rules on resource allocation with respect tree cover in public primary schools were studied. As established by Oduol et al. (2006); Gibb, (2016), the most important step in developing a greening and sustainability culture is not only in the vision statement but also in the legislative documents of the institution. Therefore, the study looked at rules on allocation for three main school resources: land, finance and time. Whereby, 73.39% of the sampled schools had rules on allocating their resources. Out of which 67.03% felt that provisions in the land allocation rules was adequate. However, for finance allocation, all schools except one felt that provisions in the finance allocation rules was inadequate. On time allocation, only 41.13% out of the 124 schools had tree planting days or days commemorated by tree planting. Out of which 85% had world environmental day or annual general meetings as their tree planting days. In other schools, tree planting events were organized during pre-school graduation ceremonies, teachers' farewell parties or new buildings' inaugurations. It was during these occasions when education and forestry officials were involved in tree planting or tree management in public primary schools. These findings were in line with Ailin & Nirmala (2017) results which revealed that in despite stakeholders preferring children to be educated under a green curriculum than simply being inside a green building, especially finance was a significant challenge in the development of a 'green curriculum' within the context of ESD goals. Similar observations were made in various studies and included in several reports [(Mogaka, Gacheke, Turpie, Emerton, & Karanja, 2001); (NEMA , 2012); (AAR group, 2014); (Chawla, Keena, Pevec, & Stanley, 2014)]

With the available resources and set school ground greening rules, trees planted annually in the sampled primary schools were assessed against the total number existing during the time of visit.

In 2018 and 2019, the maximum number of trees planted in a public primary school was 500, while the exclusive least number planted was 2. However58.87% (73 schools) did not plant any tree during this period. A relatively high variance (CV=2.5) was recorded for number of trees planted annually. Similarly, a positively high leptokurtic variance indicated by high kurtosis and skewness values (Kurt=9.39>3 and skew=3.08>1). Both observations showed that the number of trees planted annually had a higher peak yet were close to the mean with more values in the distribution tails. However, there were schools in which the cumulative number of trees present was lower than the number planted. Notably, the number of trees planted and those present were below 500 trees with only one school that had 2500 trees present during the time of the study.

Obtaining a positive correlation of ***r=0.338*** showed that the number of trees planted during tree planting days and the number present (cumulative number of trees planted on tree planting days over some time) had a positive correlation. This explained the increase in the mean from 38 for trees planted annually to 67 for trees present.

4.5.2 School ground greening rules and their contribution to tree cover

Apart from the general school rules discussed in section 4.4.1, 77.42% had school ground greening rules in unwritten forms, except Rae Kajulu primary school that had them documented as '***tree for life policy'***. 12 categories of school ground greening rules were common in the sampled schools as in figure 4.6 below.

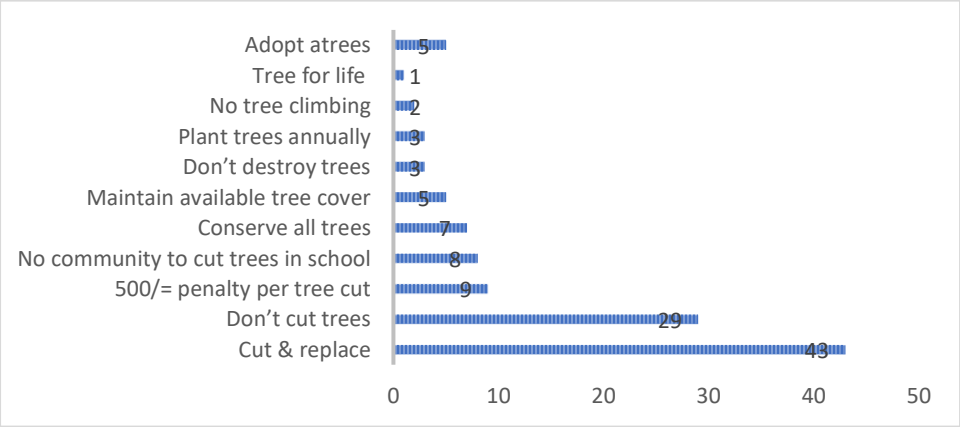


Figure 0.4: components of SGGR in public primary schools

'Cut and replace' policy was prevalent as it was found in 34.68% of the schools, followed by 'don't cut trees' found in 23.39% of the schools. The other policy components were found in not more than 7.62% of the sampled schools. It was noted that some of these policies, for example, 500/= penalty for any tree cut, were derived from the location or county policies. Therefore, they were being enforced not only by the individual schools but also by the area's administration and forestry department. However, those restricting community members from cutting trees within the school compound were majorly enforced by the area administration through the area chiefs.

The 12 school ground greening rules were assessed to get their contribution to tree population and results presented in figure 4.6.

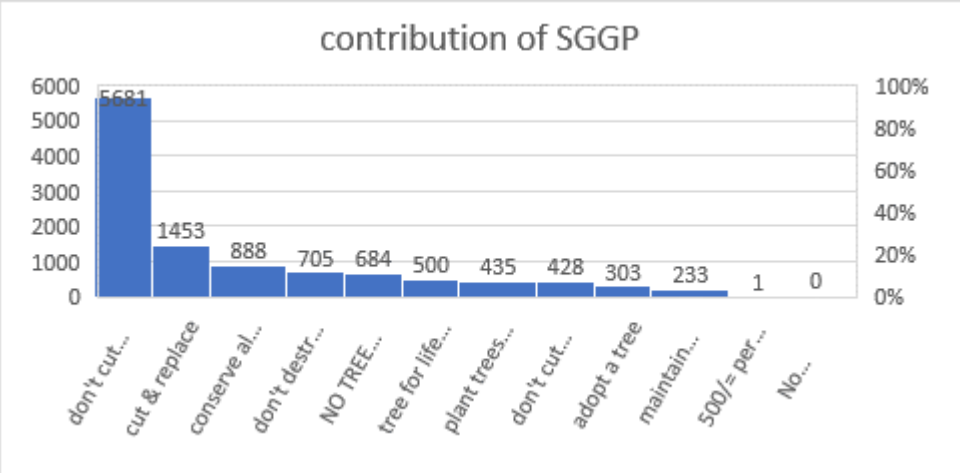


Figure 0.5: Contributions of SGGR to tree cover in public primary schools

'*Do not cut trees'* contributed the highest number of trees in Kisumu County, having resulted to 50.23% (5681 trees) followed by '*replace cut tree'* policy, which contributed 12.13% (1453 trees). Conserve all trees, no tree climbing and tree for life policy contributed to between 1.97%-3.50% (500-888 trees) while plant trees annually, adopt a tree and maintain available tree cover contributed to less than 1.97% (500 trees). Community restriction on cutting trees within the public primary school did not contribute to any tree in these schools. Generally, restrictions on tree cutting contributed to more trees as compared to those geared towards planting new trees. Secondly, those policies which were derived from or enforced by external departments very few trees, if any.

Nevertheless, with reference to forest transition, discussed in chapter 2, socio-ecological feedback seems to better explain a slowdown of deforestation and stabilization of forest cover, which are driven by policies aimed at restricting tree cutting (Indarto & Mutaqin, 2016). Besides, socio-economic factors account for afforestation and re-forestation occurring when there are visible opportunities. Therefore, just as Lambin & Meyfroidt, (2010) concluded after a study, that focus should be shifted from halting deforestation to increasing regeneration in order to ensure more permanent social and ecological benefits of tree cover policy. However, this was not the case as public primary schools seemed to concentrate on the implementation of those policies which halt deforestation among other school ground greening policies which geared towards tree cover regeneration.

Further, the study found out that *'Do not cut trees'* rule, need for shade and windbreaks, soil conservation and urge to maintain the available tree cover were among the reasons why 38.71% of the schools did not cut their trees. However, as explained by Indarto & Mutaqin, (2016), in the early stages of forest transition, trees are fell due to various inevitable reasons; 61.29% cut their trees for timber or wood, to create space for other land covers or removed old and fallen trees for safety reasons. With most schools cutting 4 trees per year, public primary school in Kisumu County cut an average of 6 trees annually. The minimum number of trees cut annually was 2 to a maximum of 48 trees per year. Even so, 27.45% schools replaced the cut trees because of the strict rule(s) they had on tree cutting and replacement or maintenance of the available tree cover. However, 72.55% schools did not replace them because of the belief that the cut trees will sprout again while others were discouraged by the harsh and unfriendly neighbouring community.

Generally, the total number of trees from the school ground greening rules was 43.51% (11,031 trees) with a range of 892 trees. The average number of trees from school ground greening rules was 88 trees, standard deviation of 170 trees (**sd> $\bar{x}$**). The distribution of trees from co-curricular activities formed a positively long tailed leptokurtic curve ((**Kurt=9.79>3** and skewness (**skew=3.03>2.00**).

Further, analysis of variance curried out on the total Tree abundance in public primary schools and trees resulting from school ground greening rules showed that the sample variance from the two sets of data were significantly unequal [(**F=2.99>1.35** (f-critical) and **p=1.79e-4<0.05**]. Finally, a

positively modest correlation **(r=0.43)** was obtained between the number of trees from school ground greening rules and the total Tree abundance in public primary schools. This was a confirmation of forest transition theory critic by Indarto & Mutaqin (2016), school practices and decision-making processes on school ground greening are influenced by rules guided by school routine and values (Gibb, 2016).

CHAPTER FIVE

SUMMARY, CONCLUSIONS & RECOMMENDATIONS

5.1 Introduction

This section gives a succinct summarization of the fundamental aspects of this study. It highlights the basic ideas, concepts and methods that are deducible from the previous chapters. It also makes conclusions that reflect on the research objectives and study questions. Besides, the chapter gives recommendations as per the main research questions and areas for further research.

5.2 Summary of Findings

Each public primary school covered an average of 3.26Ha land with an average of 23.7% unused spaces. 32.26% of the schools did not have school designs; hence used instinct or BOM decisions to assign space for various land covers and uses. The most common land covers identified were buildings, playgrounds, assembly, woodlots and gardens while a few schools had teachers' quarters and water points. Apart from those schools which had woodlots or gardens, most schools did not have specific designated areas for trees or could not immediately quantify areas with trees especially those along boundaries. Further, educational activity, tree nursery management, kitchen gardening, forestry, recreational and agroforestry were the common land use practices across all the sampled schools. Forestry, tree nursery and kitchen gardening were the only practices with scientifically significant correlation with tree population in schools given their p-value ($p<0.05$). Furthermore, for every 1 ha increase in space for garden and woodlot among the other land uses, a significant increase in the total number of trees would be expected. Therefore, tree population in a public primary schools had appositive correlation with the school land size **(r=0.192)**, space occupied by green land covers and management and modifications done in these institutions **(r^2=0.843)**.

The mean number of subjects promoting actual tree cover establishment was 7 in lower primary and 4 in upper primary with sciences, technical subjects and Christian Religious Education coming out strongly among other subjects. However, the number of subjects taught in both lower and upper primary was insignificant in predicting the total number and species of trees planted or managed during lessons. Furthermore, 85.48% of the schools had both indoor and outdoor lessons as the

teaching-learning process for these subjects. The other 14.52% attributed their indoor teaching-learning process to inadequate time and space in the ratio of 8:1. Even so, not all outdoor lessons translated to actual tree planting or management in the County. However, the number and species of trees planted **(r=0.357, p=4.7e-05)** and those managed **(r=0.128, p=6.99e-08)** significantly depended on the number of outdoor lessons and kind of activities done during these lessons. Results on co-curricular activities showed that clubs contributed the most tree abundance and had statistically significant relationship with the number and species of trees as compared to the other co-curricular activities. Lastly, 28.23% of the schools in Kisumu County had extracurricular activities and adopt a tree initiative was the only extracurricular activity recorded. Increasing the number of participants in adopt a tree initiative would result in an increase in the resultant exotic and indigenous trees in public primary school. Basically, there was a positive correlation between the three forms of curriculum studied and tree species in primary schools (curricular, **r=0.125**, co-curricular, **r=0.393**, extracurricular, **r=0.256**). However, there was a weak negative correlation among the three forms of the curriculum with regards to tree species; hence, the number and species of the tree resulting from one form of curriculum did not necessarily affect the number and species resulting from the other forms

100% of the sampled schools had policies and rules that were summarized in the individual school motto, vision or mission statements providing basis for school community actions and reasoning. However, environmental consciousness was emphasized in statements of 2.42% of the schools as academic excellence was the highest recorded (43.48%). Even so, 78.23% of the sampled schools had school ground greening rules in unwritten forms except Rae Kajulu which had it documented as *'tree for life policy'.* Policies which restricted tree cutting contributed the most to tree cover in public primary schools in the County as compared to those geared towards planting new trees. On resource allocation, 99.19% of the schools felt that finance allocation policy for tree cover establishment was inadequate while 67.03% felt that land allocation policy was adequate. 41.13% had days set aside for or commemorated by tree planting and management activities. The cumulative number of trees planted on these days over some time, significantly increased with the increase in the number planted. Furthermore, public primary schools in Kisumu County cut an average of 6 trees annually with some schools replacing them because of their strict rules on tree cutting and replacement or maintenance of the available tree cover. However, most schools did not

replace the cut trees because they believed that they would sprout while others were discouraged by the harsh and unfriendly neighbouring community. Therefore, it was not apparent that the number of trees cut in a given public primary school directly informed the number planted for replacement. Generally, there was a positive correlation between school ground greening rules and tree abundance in public primary schools **(r=0.43).**

5.3 Conclusions

Based on the first objective of the study, it could be deduced that apart from school land size, there was a positive correlation between school land use practices and tree population in public primary schools. To be specific, forestry and gardening were the main land use practices which had a significant positive correlation with the tree cover in public primary schools among the other identified land use practices.

Data derived from the second objective led to the conclusion that both lower and upper primary had subjects with forestry elements promoting actual tree planting and management. However, the number and species of trees planted or managed during lessons did not necessarily depend on the number of these subjects per class but on the teaching-learning method used. Further, singling out the co-curricular activities to intensify when a school wishes to increase its tree cover; clubs stand a chance, not only because it contributed the highest number of trees, but also because it had a statistically significant relationship with the total tree population in public primary schools. Further, increasing the number of participants in adopt a tree initiative, the only extracurricular activity identified, significantly increased the number of resultant trees, both exotic and indigenous. In general, primary school curriculum has a positive correlation with trees species in primary schools.

Even though, few schools had their motto, mission or vision emphasizing on environmental consciousness, many public primary schools had school ground greening policies in unwritten forms. Those which restrict tree cutting contributed the most to tree cover in public primary schools as compared to those geared towards planting new trees. Apart from the SGGR rules, public primary schools also have resource allocation rules which also positively influence tree cover in schools. Thus, it could be deduced that school ground greening rules had a positive influence on tree cover in public primary schools irrespective of its form.

5.4 Recommendations

1. The existence of unused spaces in public primary schools showed that there was a possibility of increasing tree cover using these spaces. Secondly, the study showed that increasing the space under trees had a potential increasing the total number of trees in public primary schools. Therefore, with proper record keeping, public primary school should set aside part of their unused spaces to bring up active woodlots and gardens with the aim of increasing tree cover in these institutions.
2. Outdoor lessons provide a platform for practical tree planting and management, therefore, should be part of the teaching-learning process of subjects promoting tree cover establishment in all primary schools. Clubs being the only co-curricular activity with statistically significant correlation with tree population in primary schools should be intensified through resource allocation and technical training to increase tree cover in public primary school. Else, the number of participants in extracurricular activities should be increased as much as possible to increase the number of exotic and indigenous trees in schools.
3. School mission, vision or motto provides the basis of school community actions and reasoning. That being so, primary schools should have their statements also emphasizing on environmental consciousness. Consequently, school ground greening rules plays a crucial role in controlling tree cover in public primary school. Therefore, every school should have ground greening policy either restricting tree cutting or promoting tree planting and should include aspects of resource allocation for tree cover establishment.

5.5 Areas for Further Research

1. The researcher recommends a similar study with different methodology used and scope in terms of type of public institution to be studies.

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APPENDICES

Appendix 1: Research permits and licenses

REPUBLIC OF KENYA

MINISTRY OF EDUCATION
State Department of Early Learning & Basic Education

Telegrams:"schooling",Kisumu
Telephone: Kisumu 057 - 2024599
Email: countyeducation.kisumu@gmail.com

When replying please quote

COUNTY DIRECTOR OF EDUCATION
KISUMU COUNTY
PROVINCIAL HEADQUARTERS NYANZA
3RD FLOOR
P.O. BOX 575 – 40100
KISUMU

REF: CDE/KSM/GA/3/24 IV/86

9th January, 2020

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION
AMOLLOH ACHIENG– NACOSTI/P/19/3085

The above named is from Maseno University.

This is to certify that she has been granted authority to carry out research on ***"Influence of Institutional Factors on Tree Cover in Public Primary Schools in Kisumu County, Kenya"*** for the period ending **19th December, 2020.**

Any assistance accorded to her to accomplish the assignment will be highly appreciated.

ORINA NYANKIRA
For: COUNTY DIRECTOR OF EDUCATION
KISUMU COUNTY

FOR: COUNTY DIRECTOR OF EDUCATION KISUMU

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **867333**

Date of Issue: **19/December/2019**

RESEARCH LICENSE

This is to Certify that Ms.. AMOLLOH ACHIENG of Maseno University, has been licensed to conduct research in Kisumu on the topic: INFLUENCE OF INSTITUTIONAL FACTORS ON TREE COVER IN PUBLIC PRIMARY SCHOOLS IN KISUMU COUNTY, KENYA for the period ending : 19/December/2020.

License No: **NACOSTI/P/19/3085**

867333

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
Fax: +254 057 351 221
Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 27th February, 2020

TO: Amolloh Melyne Achieng'
PG/MSC/NS/00149/2017
Department of Environmental Science
School of Environment and Earth Sciences
Maseno University
P. O. Box, Private Bag, Maseno, Kenya

REF: MSU/DRPI/MUERC/00802/19

RE: Influence of Institutional Factors on Tree Cover in Public Primary Schools in Kisumu County, Kenya. Proposal Reference Number MSU/DRPI/MUERC/00802/19

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 27th day of February, 2020 for a period of one (1) year. This is subject to getting approvals from NACOSTI and other relevant authorities.

Please note that authorization to conduct this study will automatically expire on 26th February, 2021. If you plan to continue with the study beyond this date, please submit an application for continuation approval to the MUERC Secretariat by 15th January, 2021.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach the MUERC Secretariat by 15th January, 2021.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

Thank you.

MASENO UNIVERSITY SECRETARY 27 FEB 2020 ETHICS REVIEW COMMITTEE

Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee.

Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY

SCHOOL OF GRADUATE STUDIES

Office of the Dean

Our Ref: MSC/NS/00149/017

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 9th Oct, 2019

TO WHOM IT MAY CONCERN

RE: PROPOSAL APPROVAL FOR AMOLLOH MELYNE ACHIENG'— MSC/NS/00149/2017

The above named is registered in the Master Science Programme of the School of Environment and Earth Sciences, Maseno University. This is to confirm that her research proposal titled "**Influence of institutional factors on tree cover in public primary schools in Kisumu County, Kenya**" has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.

Prof. J.O. Agure
DEAN, SCHOOL OF GRADUATE STUDIES

DEAN SCHOOL OF GRADUATE STUDIES MASENO UNIVERSITY 09 OCT 2019 P.O. BOX PRIVATE BAG, MASENO

Appendix 2: Sample of Informed Consent Form

CONSENT FORM FOR A STUDY ON INFLUENCE OF INSTITUTIONAL FACTORS ON TREE COVER IN PUBLIC PRIMARY SCHOOLS IN KISUMU COUNTY, KENYA

PART I: INFORMATION SHEET

Principal investigator: Amolloh Melyne Achieng' **STUDENT REG NO.:** MSC/NS/00149/017

Co-investigators: Prof. Raphael J. A. Kapiyo – Lecturer Maseno University

Dr. Ben M. Akala- Lecturer Maseno University

Study Location: Kisumu County

Purpose of the Study: To determine influence of institutional factors on tree cover in public primary schools in Kisumu County, Kenya.

Description of the study: The study will be undertaken in public primary schools in Kisumu County only. Data on Institutional land use, school curriculum and school ground greening rules in relation to number, species and distribution of trees in these schools will be collected once in each of the sampled schools. Questionnaires will be administered to schools' heads within a maximum period of 30minutes per section. Secondly, within 1hour each, three focus group discussions with the teachers, pupils from lower primary (classes 3-5) and pupils from upper primary (classes 6-8) will be done. The FGDs will only be done in 10% of the 123 sampled schools, which will be randomly selected per sub-county. Also, photographs, video or audio recording may be done during the data collection processes, especially during observations and focus group discussions.

Most importantly, the respondent(s) will be at liberty to choose to or not to participate in the study. He/she may also choose not to answer any question(s) and that there will be no offense if he/she wishes to withdraw from being part of the study at any time.

Potential harm: No known risk or harm may result from this study.

Potential benefits: Upon request, the respondent(s) will be able to access the final study report.

Confidentiality: Respondent is assured that NO information which may reveal his/her identity will be released or published without their consent and that data collected will only be accessed by the investigators and Maseno university ONLY.

CONTACT PERSON

For any questions about this study or any other related concerns you are free to contact **Amolloh Melyne Achieng'** (principal investigator) **through 0705246320**/0774430948 or write to her through **P.O BOX 120 Maseno** or **amollohmely@gmail.com**

However, for any questions on research participants rights, please contact **The Secretary, Maseno University Ethics Review Committee, private bag, Maseno: tel: 057-51622, 0722203411, 0721543976,0733230878; Email Adress: muerc-secretariate@maseno.ac.ke or**

muerc-secretariate@gmail.com

PART II: Certificate of Consent (this is a mandatory section)

I have been invited to participate in research on influence of institutional factors on tree cover in public primary schools in Kisumu County, Kenya. I certify that I have read the above information, or the information has been read to me. Also, I have had the opportunity to ask questions for clarity and my questions were answered to my satisfaction. Therefore, I voluntarily give consent to be part of this study.

Signature……. Date ……..

(For researcher only)

I have accurately read out the information in the first section and responded to the raised questions. I affirm that the respondent has not been forced in to giving consent and that it has been given freely and voluntarily.

Name…… Signature……. Date ……

Appendix 3: Sample Questionnaire

QUESTIONNAIRE ON INFLUENCE OF INSTITUTIONAL FACTORS ON TREE COVER IN PUBLIC PRIMARY SCHOOLS IN KISUMU COUNTY, KENYA

I am undertaking an academic study on **"*Influence of Institutional Factors On Tree Cover in Public Primary Schools in Kisumu County*, *Kenya*."** The information obtained will strictly be used for academic purposes and not any other purposes. Remember, you do not need to indicate any form of personal identification like name or identification number on this questionnaire and that your participation is voluntary.

SECTION A: General information

School Name……..…GPS Coordinates……..

1. Position of the person interviewed…… Sex [F] [M]

2. What is the location of the school?

[ ] Urban area [ ]Rural area

3. What is the category of the school?

[ ] Mixed day
[ ] Mixed boarding
[ ] Girls boarding
[ ] boys boarding
[ ] Mixed boarding and day

SECTION B: SCHOOL LAND USE PRACTICE AND TREE POPULATION

4. What is the size of the school compound?.....
5. Apart from where the school facilities sit on, are there any other pieces of land owned by the school?

   [ ] Yes [ ] No

If yes, how many are they?..... Cumulatively, what is their size in acres?.....

6. In what ways is the school land used?

Land use	Space occupied
I.	
II.	
III.	
IV.	
V.	
VI.	
VII.	

7. Does the school have a spatial plan? [ ] Yes [ ] No
   If no, what criterion is used for space allocation for different land uses in the school?
   ……..…… ……..…….
8. Are there spaces within the school that are specifically set aside for tree cover establishment? [ ]Yes [ ] No

If yes, which areas? Indicate number of trees planted (multiple choices are possible)

Area/location	**Number of trees**	
	Indigenous	***Exotic***
o Along the boundaries		
o In the agricultural fields		
o In the woodlot area		
o Along the paths		
o Scattered areas within the school		

If No, why?.....
What is your view on this?…… …….

9. Which of the following land-use practices are done in your school? Mark and indicate the number of the resulting trees in each case.

Practice	**Number of trees**	
	Indigenous	***Exotic***
[ ] Educational activities		
[ ] Agroforestry		
[ ] Tree nursery management		
[ ] Kitchen gardening		
[ ] Forestry		
[ ] Recreational activities		
[ ] Cultural practices		

10. Which tree management practices are done in the school? (using representative letters indicate responsible party and frequency)

Management practice	**Responsible party (*teachers-T, pupils-P, both teachers and pupils-TP, garden man-G)***	**Frequency** ***(daily-D,weekly-W, termly-TM, yearly-YR)***
[ ] Tree nursery management		
[ ] Tree planting		
[ ] Tree naming and numbering		
[ ] Tree weeding		
[ ] Tree pruning		
[ ] Fruit orchard		

11. Was your school selected for public school greening initiative by the government of Kenya?

[ ] Yes [ ] No

If No, Why?.....

If yes

a) How many tree planting sessions have been done per financial year?.....

b) How many trees were planted? [ ] Indigenous…….. [ ] Exotic……

c) How many trees survived to date?

Indigenous…….. Exotic……

SECTION C: SCHOOL CURRICULUM AND TREE SPECIES

12. How many subjects promote tree cover establishment in the primary school curriculum?

Lower primary …….. Upper primary…….

13. Rate the tree cover content in the primary school curriculum

Lower primary [ ] adequate [ ] inadequate

Upper primary [ ] adequate [ ] inadequate

Give reason for your answer.

Lower primary ……

Upper primary ……

14. Does the content of the subjects encourage actual tree planting and management in the school? [ ] Yes [ ] No

If yes, how? (tick where applicable. multiple choices are possible)

Activity	Species of trees		
	Indigenous	*Exotic*	*Both*
[ ] Tree planting			
[ ] Tree nursery management			
[ ] Tree naming and numbering			
[ ] Tree management practices			

If no, why?…… ……..……

What is your take on this?.....

15. How is the tree cover teaching-learning process undertaken in your school?

[ ] indoor lessons only [ ] out door lessons [ ] Both

If the lessons are done indoors only give reasons,

[ ] Inadequate space [ ] Inadequate time

What is your take on this?.....

16. If outdoor lessons are included; How often are they done in a term?…….

17. How many trees are planted and or managed per outdoor lesson?

Number planted		Number managed	
Indigenous	Exotic	Indigenous	Exotic

18. Does the school participate in co-curricular activities? [ ] Yes [ ] No

If no, why?.....

……

If yes, which co-curricular activities does the school participate in? (Indigenous number of trees which have resulted from each extracurricular activity)

Activity	No and species of trees	
	Indigenous	*Exotic*
[ ] Games/athletics		
[ ] Drama/music		
[ ] Clubs		
[ ] PPI		

19. Which group of pupils are involved or reached through these activities?

[ ] The whole school [ ] Participants only

20. How do the above activities inform and encourage tree cover establishment?

[ ] Use of related themes [ ] Tree planting

[ ] Tree management [ ] Vision or mission statements of the clubs

21. Does the school administration organize for forestry open days? [ ] Yes [ ] No

If no, why?.....

What is your comment on this?.....

If yes, how often; ……

Which activities are done during the forestry open days?

……..…… …….…….

…… ……..

22. Which other extracurricular activities does the school participate in to creates awareness on and promote tree cover establishment in the school?

[ ] Tree labeling and numbering [ ] Adopt a tree [ ] Nursery management competition

23. How many pupils participate in these extracurricular activities? Boys…… Girls……..….

24. How many trees in the school have resulted from these extracurricular activities?

Indigenous……exotic……

SECTION D: SCHOOL GROUND GREENING RULES AND TREE ABUNDANCE

25. What is the emphasis eluded by the school vision/mission statements?

……

What is your take on this?.....

26. What is the vision/mission statement?.....

.....

27. In what form is the school ground greening rules? [ ] Written [ ] Unwritten

28. List the school ground greening rules components and their contribution to tree cover in the school.

Principle (e.g., cut one plant two)	The corresponding number of trees	
	Indigenous	Exotic
i.		
ii.		
iii.		
iv.		
v.		

29. Is there policy provision for space and finance allocation for tree planting and management in the school? [ ] Yes [ ] No

If no, why?.....

If yes, how adequate is the allocation?

Land [ ] Adequate [ ] Less adequate

Finance [ ] Adequate [ ] Less adequate

30. Does the school have a tree planting day?

If No, why?.....

If yes, which days and what is the estimated number of trees planted?

Day	**Estimated Number of Trees Planted**	
	Indigenous	***Exotic***

31. Where are the tree seedlings planted on tree planting day(s) sourced from?

……

32. Indicate where they are planted and how many are currently present?

Planting location within the school	**Number of trees present**
[ ] Along the boundaries	
[ ] In the agricultural fields	
[ ] In the woodlot area	
[ ] Along the paths	
[ ] Scattered areas within the school	
[ ] In the fruit orchard	

33. What other activities apart from tree planting are done on such occasions?

[ ] Weeding [ ] Pruning [ ] Fencing [ ] Watering [ ] Tree naming and numbering

34. Has the school administration been cutting any/some trees in the compound?

[ ] Yes [ ] No

If yes, give reasons? (Multiple responses are possible)

[ ] To replace very old trees

[ ] For safety reasons

[ ] To provide wood fuel
[ ] To provide timber

Any other reason(s), specify…….……
……
Roughly how many trees are cut within a year?
Indigenous…….. Exotic…….
35. How many are replaced? Indigenous……..... Exotic…….
If Not replaced, give reasons why?
.....
If the trees are not cut, give reasons?.....
……
37. Does the school administration have plans to establish or expand tree cover?
[ ] Yes [ ] No
If no, what is your take on this?
…….....
If yes, which plans?
……. ……
…….. ……
38. What is the role of the school Board of Governors on school ground greening?
……..…… …….……

Appendix 4: Observation Checklist

School Name……..…GPS Coordinates……..

Variable	**Finding**
Number of trees available in the school	**<u>Indigenous</u>** **<u>exotic</u>**
Trees' distribution	[ ] Linear [ ] Scattered [ ] Clustered
Age of the trees (give in the percentage of the total number of trees available in the school)	Seedling…….. Young……... Mature…….
Condition of the trees (health and physical management)	
Soil erosion indicators [rank evident(s) using scale of 0-3] [ ] Very serious-3 [ ] Serious-2 [ ] Less serious-1 [ ] None -0	

Appendix 5: Key Informant Interview Guide

Key informant from the education sector

1. Is there awareness creation programs to educate the public primary schools on tree cover related policies? *(which, how, when*
2. Do you have a mechanism that ensures that school designs incorporate tree cover establishment? *(which mechanism, the significance of these mechanisms, compliance level)*
3. Does the content and implementation of primary school curriculum responsive as far as tree cover establishment is concerned? What are your recommendations?
4. Do you have any allocations from your office that support tree planting and management in public primary schools? *(which, when, how)*
5. Do you have programs that involve public schools in your jurisdiction to take part in tree cover establishment? *(how often, which activities, how many schools involved so far)*
6. Do the public primary schools have the needed capacity to establish and manage woodlots in their compounds? *(include how)*
7. Where are we as far as tree cover in schools is concerned? What is the way forward
8. What plans does your office have in ensuring that public primary schools contribute to national tree cover? *(give the whole framework: what, where, how, who & when).*

Key informant from the forestry sector

1. Are there awareness creation programs to educate the public primary schools on tree cover related policies? *(which, how, when)*
2. Do you have a mechanism that ensures that school designs incorporate tree cover establishment*? (which mechanism, the significance of these mechanisms)*
3. Do you have partnership programs that involve public schools in your jurisdiction to take part in your tree cover establishment activities? *(how often, which activities, how many schools involved so far)*
4. Do your extension services extend to public primary schools? *(how often, which group is targeted, which activities)*
5. Do the public primary schools have the needed capacity to establish and manage woodlots in their compounds? *(include how)*
6. How do you plan to tap the opportunity in using public primary schools in your vicinity to increase tree cover (can include plans to implement school greening initiative launched by his Excellency, the president)? *(give the whole framework: what, where, how, who & when)*

Key informant from the Administrative Sector (Area Chiefs)

1. Do you have tree-planting programs that involve public schools in your jurisdiction to take part in tree cover establishment? *(how often, which activities, how many schools involved so far)*

2. Do you have a mechanism that ensures that school designs incorporate tree cover establishment? *(which mechanism, the significance of these mechanisms, compliance level)*
3. Do you have any allocations from your office that support tree planting and management in public primary schools? *(which, when, how)*
4. How do you ensure that trees in public primary schools within your jurisdiction are protected from the adjacent community?
5. What plans does your office have in ensuring that public primary schools contribute to national tree cover? *(give the whole framework: what, where, how, who & when).*

Key informant from PTA (Parents Teacher Association)

1. Is the association aware of the tree cover related policies and land use policies?
2. Do the public primary schools have the needed capacity to establish and manage woodlots in their compounds? *(include how)*
3. Do you have a mechanism that ensures that school designs incorporate tree cover establishment? *(which mechanism, the significance of these mechanisms, compliance level)*
4. Do you have tree-planting programs that involve pupils and parents from public schools to take part in tree cover establishment?
5. Where are public primary schools as far as tree cover is concerned? What is the way forward? *(the ideal)*
6. What plans do you have in ensuring that public primary schools contribute to national tree cover? *(give the whole framework: what, where, how, who & when).*

Appendix 6: Focus Group Discussions Guide

SECTION A: LAND USE PRACTICES

Q1. Rank various school land uses according to the amount of space each occupies?

Q2. Are there open/unused spaces within the school compound?

Q3. Which areas within the school compound are specifically set aside for the purposes for tree cover establishment? Is the space set aside for tree cover establishment enough?

Q4. Does the school design effectively allow for tree cover establishment?

Q5. Which tree management practices are done in the school? (Include responsible party)

SECTION B: INCORPORATION OF TREE COVER ESTABLISHMENT IN SCHOOL PROGRAMMES

Q6. How many subjects promote tree cover establishment in the primary school curriculum?

Rate the content (adequate/inadequate).

Q7. Does the content in the subjects encourage actual tree planting and management in the school? How

[ ] Tree planting [ ] Tree nursery management

[ ] Tree naming and numbering [ ] Tree management practices

Q8. How is the teaching-learning process done (hint: indoor, outdoor, both)- include frequency and activities done.

Q9. Does the school have extracurricular activities that encourage tree cover establishment in the school? (Which activities, participants, how they promote tree cover establishment)

SECTION D: SCHOOL GROUND GREENING RULES

Q10. What is the emphasis eluded by the school motto/vision/mission statement?

Q11. List school ground greening guidelines used in the school

Q12. Does the school have tree planting days (which days, activities done, species dealt with)?

Q13. Does the school have open days for interaction between the school community and KFS foresters or extension officers?

Q14. Does the school have open days for interaction between the school community and KFS foresters or extension officers?

Q15. Has the school administration been cutting any/some trees in the compound? (how often, why,) are they replaced?

Appendix 7: Sample Frame

S/No.	SCHOOL NAME	enrolment	No.	SCHOOL NAME	enrolment	S/No.	SCHOOL NAME	enrolment	No.	SCHOOL NAME	enrolment
1	Arina	**1779**	51	Nyamasaria	**1615**	101	Kawino	**548**	151	Ulalo	**436**
2	Arya	**1834**	52	Nyamonge	**527**	102	Kibwayi	**531**	152	Uradi	**289**
3	Central	**1640**	53	Nyatege	**367**	103	Kirembe	**352**	153	Usare	**509**
4	Dunga	**378**	54	Obino	**333**	104	Kisian	**705**	154	Usoma	**397**
5	Ezra Gumbe	**932**	55	Obwolo	**1338**	105	Kodiaga	**758**	155	Wachara	**494**
6	Highway	**636**	56	Ofunyu	**411**	106	Kotetni	**704**	156	Wandega	**162**
7	Joel Omino	**1945**	57	Ogango	**580**	107	Kuoyo	**549**	157	Yath Rateng	**427**
8	Joyland	**223**	58	Okago	**154**	108	Lisuka	**440**	158	Achego	**162**
9	Kaloleni	**164**	59	Okok	**860**	109	Lwala Kadawa	**199**	159	Achuodho	**353**
10	Kibuye Girls	**346**	60	Omungi	**497**	110	Maliera	**362**	160	Amilo	**513**
11	Kibuye Mixed	**430**	61	Ong'adi	**464**	111	Marera	**532**	161	Ang'ogo	**242**
12	Kisumu Union	**403**	62	Orongo	**626**	112	Maseno Girls	**393**	162	Bacho	**147**
13	Kondele	**1773**	63	Oyola	**314**	113	Maseno Mixed	**1012**	163	Bishop Okoth	**235**
14	Kosawo	**2750**	64	Rae Kanyaika	**902**	114	Maseno School For The Deaf	**162**	164	Chemelil B1	**381**
15	Kudho	**968**	65	Rae Kajulu	**690**	115	Mawembe Kodero	**457**	165	Chemelil Factory	**604**
16	Lake	**1479**	66	Ragumo	**507**	116	Mbaka Oromo	**436**	166	Cheptuiyet	**255**
17	Lutheran Special	**103**	67	Rarieda Kaloo	**571**	117	Mboto Sunrise	**255**	167	Dr Robert Ouko	**317**
18	M. M. Shah	**2498**	68	Renja	**413**	118	Mkendwa Muslim	**476**	168	Gatundu	**42**
19	Magadi	**1428**	69	Rweya	**454**	119	Nametsa	**183**	169	God Abuoro	**185**
20	Manyatta	**2868**	70	Senior Chief Onunga	**36**	120	Nawa	**189**	170	God Nyithindo	**248**
21	Manyatta Arab	**6637**	71	St. Francis Nyamonge	**503**	121	Ngege	**252**	171	Got Ruke	**209**
22	Mathew Ondiek	**400**	72	St. John's Masawa	**571**	122	Nyaduong	**218**	172	Gul Primary	**282**
23	Migosi	**2050**	73	St. Jonhn's Oriang	**561**	123	Nyakongo	**528**	173	Homalime Primary	**313**
24	Obinju Kanyakwar	**780**	74	St. Mark Nyabera	**1091**	124	Nyakune	**165**	174	Jaber Primary	**188**
25	Pandpieri	**1338**	75	Tido	**693**	125	Nyanginja	**412**	175	Jagir Singh Primary	**152**
26	Shaurimoyo	**859**	76	Wandiege	**714**	126	Nyawara	**468**	176	Kandege Primary	**338**
27	St. Pauls Kanyakwar	**840**	77	Aboge	**191**	127	Obambo	**490**	177	Kang'o Primary	**417**
28	St. Vitalis Nanga	**1302**	78	Agulu	**377**	128	Obede	**429**	178	Karunga Primary	**129**
29	Victoria	**1407**	79	Akingli	**163**	129	Ochok Kadongo	**670**	179	Keyo Primary	**334**
30	Xaverian	**1632**	80	Alara	**603**	130	Odowa	**349**	180	Kibigori Primary	**506**
31	Alango	**590**	81	Arude	**311**	131	Ogada	**610**	181	Kibigori Railways	**722**

32	Angira	**714**	82	Bar Andingo	**602**	132	Ogal	**422**	182	Kibos Prison Primary	**1277**
33	Anywang'	**274**	83	Bar Mathonye	**396**	133	Ogongo	**340**	183	Kibos School For The Blind	**151**
34	Ayaro	**419**	84	Bar Ogwal	**560**	134	Okore Ogonda	**584**	184	Kibos Sugar Research	**568**
35	Bukna	**863**	85	Bar Union	**813**	135	Oluowa	**459**	185	Kigoche Primary	**358**
36	Bungu	**137**	86	Bara	**191**	136	Ongalo	**538**	186	Kiliti Primary	**664**
37	Buoye	**617**	87	Chulaimbo	**317**	137	Orinde	**350**	187	Kipchorian Primary	**190**
38	Bwanda	**258**	88	Dago Kokore	**541**	138	Osiri	**388**	188	Kipturi	**188**
39	Chiga	**309**	89	Dago Thim	**461**	139	Oyiengo	**262**	189	Kodhiambo Primary	**450**
40	Got Nyabondo	**465**	90	Dr. Robert Ouko	**307**	140	Rota	**481**	190	Kolang'	**204**
41	Kadiju	**385**	91	Dwele	**411**	141	Sabako	**605**	191	Kore	**177**
42	Kasagam	**766**	92	Eluhobe	**338**	142	Sabembe	**299**	192	Koru	**434**
43	Kianja	**690**	93	Esivalu	**225**	143	Sanganyinya	**244**	193	Koru Township	**603**
44	Kibos	**627**	94	Gee	**350**	144	Sianda	**232**	194	Kware	**136**
45	Kindu R.C	**571**	95	Geta	**344**	145	Sidika	**261**	195	Lwala	**247**
46	Kunya	**510**	96	Gombe Kokulo	**261**	146	Sinyolo	**621**	196	Magare	**443**
47	Mayenya	**489**	97	Gongo	**182**	147	St. Aloys Ojolla	**601**	197	Makindu	**393**
48	Mbeme	**640**	98	Huma	**346**	148	Sunga	**418**	198	Marega	**554**
49	Nyaimbo	**234**	99	Kanyamedha	**1414**	149	Thim Bonde	**283**	199	Mariwa	**330**
50	Nyalunya	**703**	100	Kanyamony	**564**	150	Tiengre	**891**	200	Masara	**553**
201	Mashambani	**100**	251	Sanda	**152**	301	Kanyalwal	**206**	351	Oboch	**321**
202	Menara	**506**	252	Sang'ayo	**331**	302	Kanyateng	**210**	352	Obugi Nam	**352**
203	Mikiria	**367**	253	Sauset	**349**	303	Kasawo	**107**	353	Obuon	**208**
204	Milenye	**306**	254	Simbi Luora	**208**	304	Kawili	**152**	354	Obuora	**396**
205	Minyange	**258**	255	Songhor	**298**	305	Keyo Nyadundo	**93**	355	Ochol	**241**
206	Mitando	**208**	256	St Joseph Ngula	**153**	306	Kibwon	**193**	356	Ochwado	**212**
207	Miwani Estate	**283**	257	St. George Wuok	**404**	307	Kobeto	**280**	357	Odhong	**181**
208	Miwani Section Iii	**213**	258	Tamu Central	**164**	308	Kobong'o	**253**	358	Ogeka	**178**
209	MH Factory	**699**	259	Tamu	**455**	309	Kodum	**305**	359	Ogilo Komulo	**348**
210	MH	**699**	260	Thurbie	**285**	310	Kokungu	**330**	360	Olembo	**233**
211	MH Township	**632**	261	Tonde	**280**	311	Konditi	**267**	361	Olwa	**330**
212	Mutwala	**532**	262	Wagai	**277**	312	Kosogo	**357**	362	Olwalo	**162**
213	Ngeny	**339**	263	Wambi	**315**	313	Kowire	**460**	363	Ombugo	**263**
214	Ngeny Special	**28**	264	Waware	**212**	314	Kusa	**286**	364	Onego	**350**
215	Ngere Kagoro	**400**	265	Yago	**227**	315	Lisana	**225**	365	Ongielore	**201**
216	Ngiti	**154**	266	Yawo	**411**	316	Lwanda	**269**	366	Onwang'o	**172**
217	Nyadundo	**340**	267	Abwao	**166**	317	Magunga	**446**	367	Onyinge Nazarene	**311**
218	Nyakoko	**731**	268	Achego	**408**	318	Maraba	**227**	368	Onyuongo R.C	**241**
219	Nyakunguru	**401**	269	Achingure	**179**	319	Mbora	**168**	369	Oremo	**323**
220	Nyalenya	**353**	270	Agai	**889**	320	Mbugra	**348**	370	Orobi	**129**
221	ND	**166**	271	Aic Innis Edu. Centre	**332**	321	Michura	**203**	371	Othith	**202**
222	Nyang'	**280**	272	Akado	**254**	322	Miriu	**359**	372	Otho Abwao	**170**

223	Nyang'oma	**397**	273	Anding'o Bware	**129**	323	Miruka	**162**	373	Pap Ndege	**119**
224	Nyangore	**207**	274	Anding'o Opanga	**239**	324	Moro	**251**	374	Paplisana	**352**
225	Nyangoto	**340**	275	Aomo	**345**	325	Naki	**254**	375	Pawtenge	**483**
226	Nyarenda	**250**	276	Apoko	**283**	326	Ndori B.C	**247**	376	Pedo	**301**
227	Nyatao	**564**	277	Apondo Kasaye	**267**	327	Ndori R.C	**387**	377	Pundo	**239**
228	Obago	**371**	278	Asawo	**318**	328	Nduga	**160**	378	Rachier	**357**
229	Obiayo	**270**	279	Bala	**340**	329	Ngege	**227**	379	Radienya	**370**
230	Obumba	**737**	280	Barkawarinda	**246**	330	Ng'omo	**571**	380	Rae Mixed	**364**
231	Oduwo	**543**	281	Bodi	**400**	331	Ng'ope	**225**	381	Rae	**348**
232	Ogen	**484**	282	Bugo	**307**	332	Nyabola	**340**	382	Ragen A.I.C	**428**
233	Ogilo	**350**	283	Bungumeri	**244**	333	Nyabondo Boys Boarding	**433**	383	Ragen M.H.M	**310**
234	Ogwedhi	**470**	284	Burkamach	**201**	334	Nyabondo Day	**406**	384	Rakwaro	**297**
235	Ogwodo	**570**	285	Burkamwana	**346**	335	Nyabondo Girls Boarding.	**486**	385	Ramula Odowa	**233**
236	Okwach	**409**	286	Bwaja	**295**	336	Nyabondo Mixed	**224**	386	Rarieda Kokech	**232**
237	Oliko Oliero	**620**	287	Chachi	**346**	337	Nyadero	**411**	387	Saka	**90**
238	Omanyi	**133**	288	Cherwa	**361**	338	Nyadina	**432**	388	Sango Buru	**364**
239	Ombeyi	**655**	289	Dirubi	**370**	339	Nyagweno	**363**	389	Sang'oro	**263**
240	Onenonam	**241**	290	Got Onyuongo	**227**	340	NK Mixed	**147**	390	Siany	**261**
241	Orago	**230**	291	Gulmaembe	**151**	341	Nyaksure	**210**	391	Sigoti	**228**
242	Orenge	**588**	292	Guu	**254**	342	Nyakwere	**136**	392	Soko	**79**
243	Oroba	**582**	293	Holo	**108**	343	Nyalng'anya	**281**	393	Sondu Union	**511**
244	Osembe	**190**	294	Kabete	**390**	344	Nyalunya R.C	**324**	394	St Patricks Obange	**401**
245	Osengteti	**234**	295	Kabondo	**422**	345	Nyamanyinga	**245**	395	St. Agnes Obanda	**369**
246	Osiri Migere	**492**	296	Kabuya	**306**	346	Nyamarimba	**389**	396	St. Aloys Gem	**320**
247	Oyani	**292**	297	Kachan	**415**	347	Nyamarumbe	**321**	397	St. Hilary Kajimbo	**160**
248	Pawteng	**632**	298	Kagwel	**198**	348	Nyawalo	**375**	398	St. Jerome Anding'o Olasi	**163**
249	Ramula	**298**	299	Kamtudi	**218**	349	Nyong'ong'a	**350**	399	St. Mairead Oriang	**311**
250	Rang'ombe	**453**	300	Kandiege	**388**	350	Obingo	**291**	400	St. Martins Special	**168**
401	St. Mary's Kananda	**414**	451	Korwana	**328**	501	St. Christopher Ayweyo	**375**	551	Magwar	**481**
402	St. Peter's Kogola	**373**	452	Kosida	**487**	502	Sare	**340**	552	Malela	**195**
403	St. Regina Aponde	**196**	453	Kowalla	**354**	503	Siany Kabonyo	**243**	553	Manywanda	**263**
404	St. Teresas Girls-Bolo	**299**	454	Kowuor	**362**	504	St.Anne's Ahero	**1994**	554	Mariwa	**324**
405	Thurdibuoro	**211**	455	Kuth Awendo	**360**	505	Ugwe	**387**	555	Mayieka	**572**
406	Thurgem	**479**	456	Lela	**276**	506	Wanganga	**331**	556	Mbeka	**246**
407	Tulu	**173**	457	Luora Ayweyo	**306**	507	Waradho	**214**	557	Milugo	**246**
408	Urudi	**377**	458	Mao	**380**	508	Withur	**614**	558	Miranga	**320**
409	Wasare	**252**	459	Masogo	**130**	509	Yogo	**471**	559	Mirieri	**335**

410	Wenwa	**260**	460	Mbega	**326**	510	Abol	**263**	560	Nanga Koker	**315**
411	Achego Central	**145**	461	Migingo	**823**	511	Aduong Monge	**144**	561	Ndiru	**633**
412	Akwanya	**322**	462	Miguye	**209**	512	Akado	**615**	562	Nduru Kadero	**481**
413	Alendu	**611**	463	Miringo	**426**	513	Akonya	**363**	563	Nduta	**355**
414	Angoro	**244**	464	Nduru M.H.N	**490**	514	Alungo	**500**	564	Ngere	**383**
415	Apondo	**496**	465	Nyachoda	**358**	515	Alwala	**377**	565	Ngop Ngeso	**195**
416	Arombo	**330**	466	Nyakakana	**293**	516	Ami	**160**	566	Ngutu	**398**
417	Awasi	**807**	467	Nyakongo	**307**	517	Anyanga	**147**	567	Nyabera	**198**
418	Ayucha	**519**	468	Nyalenda	**459**	518	Asino	**260**	568	Nyaguda	**271**
419	Bonde Kakoko	**384**	469	Nyamasao	**376**	519	Asol	**158**	569	Nyalik	**287**
420	Bondo Kacola	**274**	470	Nyamkebe	**396**	520	Atol	**132**	570	Nyamboyo	**273**
421	Boya	**465**	471	Nyamrundu	**486**	521	Atoya	**327**	571	Nyamgun	**584**
422	Bunde	**502**	472	Nyamware	**625**	522	Awanya	**292**	572	Nyamisiri	**151**
423	Bungu Koraga	**228**	473	Nyangande	**573**	523	Barkorwa Mixed	**610**	573	Nyamor	**261**
424	Bwanda	**546**	474	Nyarombe	**221**	524	Bonde	**402**	574	Nyarombo	**403**
425	Disi	**472**	475	Nyomwaro	**711**	525	Dago Kanyagaya	**370**	575	Nyatigo	**219**
426	Ger Liech	**311**	476	Obugi	**603**	526	Diemo	**546**	576	Nyaundi	**158**
427	Holo Orucho	**452**	477	Odienya	**511**	527	Got Agulu	**181**	577	Nyawanga	**312**
428	Hongo Ogosa	**260**	478	Ogenya	**511**	528	Got Odongo	**255**	578	Obola	**606**
429	Hongo Radhiang	**194**	479	Ogwedhi P.A.G	**405**	529	Gumo	**377**	579	Ochara	**268**
430	Kadete	**409**	480	Ojere	**311**	530	Jimo	**222**	580	Ochok	**342**
431	Kagimba	**253**	481	Ojienda	**351**	531	Jonyo	**625**	581	Odienya Kagayi	**172**
432	Kaluore	**204**	482	Okana	**507**	532	Kajulu	**392**	582	Ogona Kadero	**170**
433	Kamunda	**225**	483	Okanja	**589**	533	Kaloka	**217**	583	Ojolla Kadero	**235**
434	Kandaria	**482**	484	Okiro	**241**	534	Kamagore	**617**	584	Okode	**382**
435	Kanyangoro	**393**	485	Olasi	**492**	535	Kambudi	**195**	585	Okuto	**258**
436	Kanyipola	**376**	486	Ombaka	**394**	536	Kamonye	**186**	586	Olare	**79**
437	Karanda	**970**	487	Ombaka Special	**82**	537	Keyo Kodo	**224**	587	Oluti	**203**
438	Karombe	**435**	488	Onera	**276**	538	Kindu	**442**	588	Ombo	**257**
439	Kasangany	**141**	489	Ongeche	**415**	539	Kirindo	**266**	589	Omore	**149**
440	Kasuna	**465**	490	Onjiko	**532**	540	Kit Mikayi	**312**	590	Omuya	**454**
441	Katolo	**356**	491	Onjiko Kobongo	**433**	541	Kitare	**466**	591	Onyinjo	**252**
442	Kibarwa	**349**	492	Onongno	**319**	542	Korumba	**161**	592	Opande	**302**
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444	Kochieng	**257**	494	Oseth	**151**	544	Kuoyo Kaila	**515**	594	Oruga	**430**
445	Kogwedhi	**418**	495	Osino	**244**	545	Kwoyo Kowe	**366**	595	Osewre	**475**
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448	Kolunga	**480**	498	Ranjira	**453**	548	Lieye	**426**	598	Pap Othany	**308**
449	Konim	**418**	499	Reru A.I.C	**580**	549	Lunga	**286**	599	Pith Kabonyo	**305**
450	Korowe	**345**	500	Rongo	**584**	550	Magwako	**335**	600	Pith Kochiel	**169**
601	Rabongi	**171**	605	Rapogi	**327**	609	Rodi	**241**	613	St. Elizabeth Girls	**281**
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