MAKERERE UNIVERSITY

COLLEGE OF ENGINEERING DESIGN ART AND TECHNOLOGY
SCHOOL OF THE BUILT ENVIRONMENT
DEPARTMENT OF GEOMATICS AND LAND MANAGEMENT

THE FEASIBILITY OF TAXING URBAN VACANT LAND AS A WAY TO INCREASE ON REVENUE FOR INFRASTRUCTURE DEVELOPMENT IN URBAN AREAS

BY

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JUNE 2025

DECLARATION

I, hereby declare, that this report has been composed solely by myself taking into account all that was laid out in the research proposal, and that the work accumulated is mine, unless where explicitly stated otherwise

Yours Sincerely

.....

Date

8th June 2025

AKANYIJUKA MICHAEL

APPROVAL

This is to certify that the work herein has been done and completed by the student under my supervision for the attainment of his academic award. The report has been prepared following the Makerere University Guidelines and hereon forwarded for fact check-in

Yours sincerely

.....

Date

09/06/2025

DR. RONALD SSENGENDO

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DEDICATION

First and foremost, to my dearest mother. Your unwavering love, support and belief in me have been the fuel that has propelled me forward. Your sacrifices, both big and small, have allowed me to focus on my studies and chase my academic goals. Thank you for always being my biggest cheerleaders and for always having my back. To my supervisor, Dr. Ronald Ssengendo and Mrs. Carolyne N Tumuhimbise, your guidance, insightful feedback, and dedication to guiding me have been truly invaluable regardless of the available challenges. You have challenged me to think critically, explore new perspectives, and strive for excellence. I am deeply grateful for your patience, encouragement, and the knowledge you have imparted unto me.

May the good Lord Almighty bless you all for me!

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FY	-	Financial Year
GoU	-	Government of Uganda
KCCA	-	Kampala Capital City Authority
UGX	-	Uganda Shillings
USD	-	United States of America Dollars
GDP	-	Gross Domestic Product
LVT	-	Land Value Tax
TTNB	-	Tax on Unbuilt Land

ABSTRACT

The research investigated the feasibility of introducing an urban vacant land tax in urban areas in Uganda specifically focusing on Kyanja Parish, Nakawa Division to raise revenue for local urban authorities and support infrastructure development. Utilizing a mixed research design and GIS tools including high-resolution satellite imagery from Google Earth Pro, the study identified and digitized vacant plots within a 100-meter buffer around Kyanja Parish. The analysis revealed approximately 794.89 acres of vacant land across 491 independent urban voids with a distribution favouring the outskirts of the division. Small-scale agricultural voids were the most dominant comprising 442.72 acres (≈55.7%) while open-shrub and medium-scale residential categories accounted for about 16.3% each. Residential uses collectively represented 25.0% of the total vacant land, with educational and bare-ground uses being minimal.

The market value of the vacant land was assessed using a value zone system with Kyanja Parish graded as a valuation zone at a flat rate of UGX 1.5 billion per acre as obtained from the valuers from the Office of the Chief Government Valuer. This valuation allowed for the calculation of total tax potential drawing comparisons to Tunisia's unbuilt land tax which is set at 0.3% of market value. A study by Yuan, Connolly, & Bell, (2009) explains how Tunisia implements this tax and the revenue obtained from it. Projections indicated that the urban vacant land tax could generate approximately UGX 2.2 billion from Kyanja Parish alone representing about 4% of total property rate collection for the financial year 2023/24 and 1.9% of total revenue collection.

The findings suggest that while the vacant land tax may contribute modestly to overall property tax receipts, its implementation could promote efficient land use and reduce on speculative holding. The research emphasizes the need for clear legislative frameworks, improved administrative capacities and regular updates of urban cadastres through remote sensing.

CHAPTER ONE: INTRODUCTION

1.1 Background

Urbanization is one of the keys and most significant developments that has affected human societies in recent times. It is an inter-sectoral spectacle that involves all aspects of human society and economy. According to the Uganda National Urban Policy, Uganda is experiencing a high rate of urbanization estimated at 5.2% per annum. About 20% of Uganda's population lives in urban areas and it is projected by 2050, about half of Uganda's population will be living in urban areas.

The Uganda National Urban Policy (2017) states that due to rapid urbanization, unplanned development and inadequate funding, many urban areas cannot afford to cope with the demands for infrastructural development and services. The central Government transfer of funds to Urban Local Governments are insufficient compared to the needs of urban services. The level and quality of infrastructure delivered by urban authorities do not match the needs of the population.

Uganda's Local Government (Rating) Act currently taxes only developed land, leaving vacant land untaxed. This loophole deprives local governments of vital revenue and encourages speculative landholding, which drives up property prices and creates artificial scarcity. (Kampire, 2024)

Annual taxes on land and physical properties represent the largest source of untapped municipal revenue for developing cities. As cities grow, the wealth they create becomes capitalised in the rising land values of the city. (Collier, Glaeser, Venables, Manwaring, & Blake, 2018). As a result, local governments around the world have become more interested in raising revenues from property taxes in order to finance various infrastructure projects. In many countries, property tax is a preferred form of raising additional revenues for governments. (Slack & Bird, 2007). In Africa, in particular, there has been a long tradition in these types of taxes since colonial times. This is especially the case for countries, like Uganda, which were previously under British rule since many of these countries have decentralized systems of governance that place the ability of raising property taxes in local government. (Youngman & Franzsen, 2009)

Economists have been advocating a tax on unimproved land for centuries as it is arguably a non-distortionary and therefore efficient form of taxation (George 1879). This is due to the fact

that land is in a fixed supply with its value derived primarily from its location, economic and population growth, and public investments, thus holding vacant land for long is very beneficial for owners who often keep land for speculative gains (Freire & Kopanyi 2018).

It is noted that taxing urban vacant land has an estimated potential of UGX 0.3 to 1.8 billion additional annual property tax revenue just from the Central Civic and Kololo I parishes within Kampala Central which are among the richest areas of Kampala. (Kopanyi & Haas, 2017).

1.2 Problem Statement

Most of the urban centres in Uganda are characterised by poor road network with roads having potholes, poor water drainage facilities which sometimes results into flooding, poor garbage disposal and lack of street lights. These challenges are common in almost all urban centres including Kampala City which is the main city of Uganda and they can be attributed to limited funding that is available to these local government institutions.

In the 2024/2025 Financial Year, the overall resource envelope was UGX 72.12 trillion and of this, domestic revenues accounted for UGX 31.98 trillion with local government revenue receipts totalling to UGX 293.9 billion. Out of this, local governments were allocated UGX 6.8 trillion representing 9.5% of the entire budget. Despite these allocations, local governments have continued to experience financial constraints. There is a funding gap that Local Government needs to fill in order to provide more viable services such as infrastructure, health, education, garbage and waste collection, and street lighting according to an analysis of the National Budget for Financial Year 2022/2023 and proposals for Re-allocation of these funds, "Financing Local Governments in Uganda".

As a result of the insufficient funds allocated to local government as well as the taxes collected through property rating, there have been debates and discussions regarding taxing of urban vacant land as a way to increase on funds to finance infrastructure development in urban centres. However, with all these ideas on board, the challenge has been regarding how this tax could be implemented and the justification of this tax. Therefore, there is need to study the best way this urban land tax can be implemented since there is limited research in Uganda that has been carried out before to address the same.

The research therefore aims at providing knowledge about urban vacant land, mode of assessment of the tax as well as the various policies and laws that need to be put in place to

capture this tax. The research also aims at providing the justification for imposing this tax through calculating the potential income the tax could bring in.

1.3 Objectives

1.3.1 Main objective

To assess the viability of taxing urban vacant land as a way of increasing revenue for infrastructural development in urban centres.

1.3.2 Specific Objectives

1. To determine the extent and distribution of urban vacant land
2. To find out the revenue potential from taxing vacant urban land

1.4 Research Questions

1. How best can urban vacant land tax be successfully implemented in Uganda?
2. What is the extent and distribution of urban vacant land in the selected parish in Kampala City?
3. What is the estimated amount that the urban centre authorities could earn from taxing urban vacant land?

1.5 Significance of Study

Urban local governments need resources to finance the services and activities for which they are responsible. Understanding the dynamics of local government revenue sources, capacity and management is crucial for policy makers. Many local governments depend on support from the central government. Local governments in Uganda still have low revenue collection, leading to severe service delivery gaps. As resources available to local governments continue to dwindle, options for increasing revenue to these entities must be explored.

His Excellence Yoweri Kaguta Museveni in his foreword to *Uganda Vision (2040*, 2022, p. 204) said that the Vision 2040's main aspirations were "to change the country from a predominantly low income to a competitive upper middle-income country within 30 years with a per capita income of USD 9,500." This is only possible with an intricate infrastructural network that connects everyone. Uganda is not yet there but can get there. This research could be a first step in a long journey to arrive at that goal or even supersede it. The policy makers

have been looking for a way to increase the amount of revenue needed to finance the ambitious country budget using means other than debt.

1.6 Justification

Urban vacant land, defined as land within urban boundaries that is undeveloped or underutilised, represents a significant but often untapped resource. In Uganda, considerable amounts of urban land remain vacant, frequently held for speculative purposes. This contributes to urban sprawl, limits efficient land utilization, and deprives municipalities of potential revenue. Taxing urban vacant land is a policy instrument used in various countries to disincentivize land speculation, promote development, and generate revenue for infrastructure and public services.

Kopanyi & Haas (2017) states that rough calculations suggest that over 8-10% of land in KCCA's jurisdiction remains undeveloped as of 2020. However, this is probably underestimated as it does not include abandoned buildings or excessive open spaces attached to properties, which may also fall into a definition of vacant land.

1.7 Conceptual framework

This framework explores the feasibility of using a urban vacant land tax as a way to increase revenue for infrastructure development in urban areas. It identifies key variables the relationships between them to assess the potential effectiveness, challenges, and impacts of such a tax policy.

The variables are vacant land and revenue for infrastructure development

Independent Variables

- Availability of vacant land in urban areas.

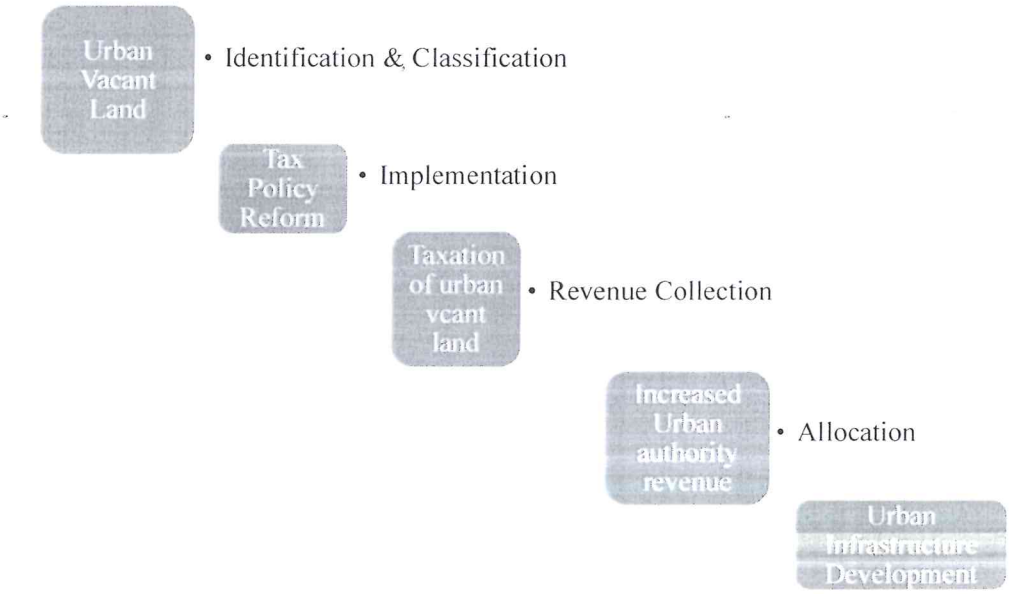
Dependent Variables

- Revenue for Infrastructure Development

1.7.1 Process of relation of research variables

Taxing urban vacant land enabled by policy and legal reforms can convert lost revenue into a sustainable source for infrastructure development in urban centres. This process is strengthened

by community engagement and political will and can lead to more productive land use, urban renewal and equitable service provision.



1.8 Scope

1.8.1 Content Scope

This research used both primary and secondary data. The study clearly defined what vacant land is, determined the undeveloped /vacant plots within the selected parish of Kyanja, Nakawa Division, Kampala City, came up with a proper assessment rate and in this case adopted the case for Tunisia, developed a well thought process of ascertaining the market value of these vacant plots, what policies or laws need to be developed or amended to cater for this provision as well as the estimated the amount of tax that could be earned from taxing the vacant land.

1.8.2 Geographical scope

The study was focused on urban areas in Uganda, where vacant land taxation could impact revenue generation and infrastructure development. The researcher considered Kampala City which is the capital city of Uganda with high demand and value of land and considered Kyanja Parish within Nakawa Division Kampala City.

1.8.3 Time scope

The secondary data collected had a time limit but preference was made to the past 15 years i.e., between 2012 and 2025.

This project was completed in 17 weeks commencing on February, 2025 to May 31^{h}, 2025. Two weeks were sufficient to collect data and the rest were used to conduct the several analyses required to complete the specific objectives, analyses and write a final copy.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The growing challenges faced by urban areas, such as infrastructure deficits, housing shortages, and inefficient land use, have led to the exploration of alternative revenue sources to fund urban development. One such potential source is the taxation of urban vacant land which aims to generating funds for infrastructure development. This literature review examines the existing research on vacant land taxation, infrastructure financing, and the social, economic, and political feasibility of implementing such a tax.

Urban land, and the physical properties on this land, represent the largest source of untapped municipal revenues in many developing cities. Land and property fees only account for 0.5% of GDP across sub-Saharan African countries, as compared to around 2% in OECD countries. (Collier, Glaeser, Venables, Manwaring, & Blake, 2018). Policymakers can choose to tax land but not immovable properties, immovable properties alone, or some combination of land and immovable properties.

2.2 Defining Urban Vacant Land

The term of vacant land is broad and diverse, but it is usually defined as under-utilized lands including bare soil, derelict land, abandoned buildings and structures, brown fields, green fields, uncultivated land or marginal agricultural land and recently razed land (Bowman & Pagano,2004; Pagano & Bowman, 2000).

According to The American Planning Association (APA), there are two definitions of vacant land: a) "lands or buildings that are not actively used for any purpose," and b) "a lot or parcel of land on which no improvements have been constructed" (Kim, Miller, & Nowak, 2018)

In New York City, the Department of Finance defined vacant land as "on which no lawful structure exists and which is not otherwise being used for any purpose for which it may lawfully be used" (City of New York, 2010).

2.3 Background on Land Value Taxation

Land value taxation including urban vacant land taxes, has long been discussed in urban economics and public finance. Henry George, a prominent economist in the late 19th century, proposed that taxing land based on its value, rather than on improvements (like buildings),

would encourage efficient land use, reduce speculation, and generate public revenue (George, 1879). The theoretical underpinnings of LVT suggest that taxing underutilized land can encourage landowners to either develop or sell their property, thus alleviating urban sprawl and increasing the tax base for cities (Ekelund & Robert, 2007)

Land value taxation has progressed and evolved since Henry George presented his ideas in the last century. Variations of land value taxation have been implemented in limited cases around the world with varying degrees of success. Despite the complexities of many taxation schemes, such as the income tax, a clear concept like land value taxation has much merit.

2.4 Bases For Assessment

2.4.1 Market Value Based Assessment

The market value is regarded as a better tax base as it closely reflects the benefits from services in property values. (Bird & Slack, 2006). Properties close to transit systems or parks enjoy higher values than those properties farther off. Market value has an advantage of capturing the amenities of the neighbourhood, amenities that have often been created by government expenditures and policies

Take an example of two identical properties where one is located near a park while the other is adjacent to a factory, in the market value-based assessment itis fairer because the property next to the park pays higher rates.

Market value also captures growth and development in an area/neighbourhood as it takes into consideration relative changes in values over time. The change could be as a result of some places becoming more desirable with time.

2.4.2 Area Based Assessment

This basically involves levying an average unit tax per m2 on vacant land. A charge is levied per square metre of the land area. This kind of assessment is mainly used in central and Eastern Europe. It is also very important in areas where agricultural land is taxed.

Real estate taxation based on area often includes tax tables calculated per square meter for real estate clusters in different areas. In this system, additional tax on vacant land may apply a simple rule such as doubling the tax rate for vacant urban and. Area-based taxation is

commonly used in countries where the real estate market is underdeveloped, making it difficult to determine market values. (Nguyet, 2024)

2.5 Case Studies of The Introduction of a Vacant Land Tax In African Countires

2.5.1 Democratic Republic Of Congo (Nzewanga, 2009)

The Democratic Republic of Congo (DRC) is an example of a francophone African country that has a tax on vacant land. The tax is based on the surface area and is, as per the legislation, determined by projections of the vacant land on to the edges of rooves. The law on land tax differentiates localities based on their attractiveness for settlement and gives them ranks. Depending on the rank, the areas will fall into different tax brackets. The payment of this tax is fully the responsibility of the owner of the land. However, although this vacant-land tax and other land taxes exist in DRC legislation, their actual implementation is limited. In fact, in 2008, less than 1% of revenue collected by the General Tax Administration was attributable to the overall general land tax and even less was attributable to a vacant-land tax. This is due to the fact that its enforcement is difficult both administratively but also politically; the Congolese population believe the land belongs to their ancestors and is also a fundamental part of their lives. Therefore, they do not see the reason behind paying such a tax. Given this political sensitivity, the government has also not pushed on the enforcement of the tax. (Larangeira, 2003)

2.5.2 Case Study For Tunisia (Yuan, Connolly, & Bell, 2009)

Tax on Unbuilt Land (TTNB)

The tax on land is a rather insignificant source of local revenue and Its receipts represented only 1.6 percent of total local revenues and 6 percent of total property tax revenues. Owners of unbuilt land are liable for TTNB. Since there is considerable problem with establishing the ownership of land in Tunisia, it is preferable to withhold payment of tax until a building permit is requested (with little penalty). The tax base is either the market value of the land or the surface area of the land when market value is not available, which is often the case.

Tax Rates

The TTNB tax rate is 3/10 of 1 percent of the market value of the unbuilt land (i.e.10 percent of rental value which is 3 percent of the land value). When the area-based approach has to be

applied, the central government sets by decree the tax amount per square meter, which varies by city according to the urban plan set by the Ministry of Urban Affairs. The tax rates are TND 0.3 per square meter, TND 0.09 per square meter, and TND 0.03 per square meter for land located in high, medium and low urbanization zones respectively.

Exemptions

TTNB exemptions apply to agricultural land, land in no-building zones, land reserves, land subdivided into lots until ceded by the developer, and land owned by the state or the municipality.

2.6 Experience On Taxing Vacant Urban Land Outside Africa

Different countries have different ways of defining vacant land and different priorities for vacant land tax.

Table 1: Experience in identifying vacant land and tax rates location

Table 1: Experience in identifying vacant land and tax rates Location	**Type of land subject to vacant land tax**	**Tax rate**
Harrisburg City, Pennsylvania, America	Property tax is divided into: - Land applies to all types of land - Asset attached to land	- Land: 3% of assessed land value - Asset attached to land: 0.5% of assessed asset value
Seoul city, South Korea	- Surcharge tax on vacant properties. - Vacant land for at least 2 years.	- 2% for used land - 5% if land left vacant for 2 - 3 years. - 7% if land left vacant for more than 3 years - 8% if land left vacant for more than 5 years - 9% if land left vacant for more than 7 years - 10% if land left vacant for more than 10 years
Marikina city, Philippines	The land area is larger than 1,000square meters, half of which is still unimproved. Residential plots, regardless of land area, half of them are still unused or unrenovated.	- Additional tax at the rate of 2.5% per annum on the assessed value of the property
Bogota city, Colombia	Zoning: Land that is urbanized but not yet developed, land that is urbanized but has no construction work.	2004: - Vacant land: tax rate 1.2%–3.3% of assessed land value.

		- For land that has been used in urban areas, the rate is from 0.4% (residential use) to 1.5%(financial institutions) In 2016, for vacant urban land, the tax rate is 30%
Ireland	The tax applies to land that is vacant, suitable for the provision of housing and located in an area where there is a need for housing	In 2018, the tax rate was increased from 3% to7% of the market value of vacant land.
Washington DC, America	Vacant land	In 2017, the tax rate is 5% of the market value of vacant land

Source: (Altman, Wahba, Orloff, & Armitahmasebi, 2016)

2.7 The legal framework surrounding local government revenue collection

The parent law governing local governments' revenue collection is embodied in the Constitution (Article 191) and elaborated in the Local Governments Act (Section 80 and schedule V). According to Article 152 of the Constitution of the Republic of Uganda, no tax shall be imposed except under the authority of an Act of Parliament. The authority of Local Governments to collect revenue is granted under Article 191 of the Constitution and enabled by Section 80 of the Local Government Act (Cap 243) under the Fifth Schedule. The power and authority to levy and collect fees and taxes are provided under Section 80 (3) of the Local Government Act (Cap 243), which provides that: Local Governments may levy, charge and collect fees and taxes, including rates, rents, royalties, stamp duties and registration and licensing fees and the fees and taxes that are specified in the Fifth Schedule to this Act. Provisions are also included in the Local Government Act (Cap 243) on sharing of revenues between higher and lower local governments. Section 85 of the Act provides specific guidance on the percentage of revenue to be retained or distributed to lower councils, further operationalized by Regulation 39 of the Local Government (Financial and Accounting) Regulations, 2007.

Other enabling laws include: a) Article 196 (a) requires each Local Government to draw up and maintain a comprehensive list of all its internal revenue sources and to maintain data on its total revenue potential, Local Governments Rating (Amendment) Act , Trade Licensing Act Cap 101, LG (Amendment No2) Act- 2008, LG (Rating) Act – 2005,2006, Physical planning Act, Registration of Titles Act Cap 240, Traffic and Road safety Act 1998, The Markets Act, Cap 94, The Hotels Act, Cap 90, The Fish Act, Cap 93, The Cattle Traders Act, Cap 224,The

Public Health Act 1964, Land Act Cap 227, The Liquor Act, Statutory Instrument No 54 of 2011

2.8 Sources of revenue for local government

The locally raised revenues (LRRs) are expected to be received from within the jurisdiction of the LG. Locally raised revenues are categorized under Tax revenues,

Non Tax revenues and Other Revenues.

Tax Revenue is comprised of:

Local Service Tax (LST). LST is levied by LGs on the wealth and income of the following categories of people: Persons in gainful employment; self-employed and practicing professionals; self-employed artisans; businessmen and businesswomen; and commercial farmers.

Local Government Hotel Tax (LGHT). LGHT is levied on hotel and lodge accommodation per room per night and the tax is paid per room occupied.

Non-Tax Revenue is comprised of:

Property Related Charges. These are charged by Local Governments in consultation with the Ministry of Lands and Urban Development and they include

Land Premium, Processing of Applications Fees, Consent to Transfer Fees/ Charge, Valuation Fees, Conveyance Fee, Building Plans Approval Fee, Building Inspection Fee, Survey fees and Land Inspection Fees.

Business/ Trading licence; this is a regulatory fee for a business to operate in the locality. The rate is based on the type of business and locality in which it is found.

2.9 Need for Infrastructure Development

The rapid growth of urban populations necessitates the expansion and upgrading of essential services such as transportation, water supply, sanitation, and energy. In Uganda, the current infrastructure is often inadequate to support the burgeoning urban population, leading to issues like traffic congestion, inadequate water supply, and frequent power outages. Real estate development in urban areas must therefore be complemented by substantial investments in infrastructure. Public-private partnerships (PPPs) have emerged as a viable solution, enabling

the government and private sector to collaborate on large-scale infrastructure projects. (Nakato, 2024)

2.10 Financing Of Public Infrastructure in Local Urban Areas

Government of Uganda embraced the policy of decentralisation by devolution, which recognises local governments as frontline actors in the provision of services to the citizens. This policy shift is well enshrined in the Constitution of the Republic of Uganda 1995 (as amended), and the Local Governments Act (CAP 243). According to Article 191 of the Constitution and Sec 80 of the LGA (CAP 243), LGs are required to prepare their own development plans and budgets, mobilise revenues locally to facilitate funding for recurrent and development expenditure for service delivery. LGs expect their financing to come from three primary sources: Government grants that come directly from the Consolidated Fund and cover the wage and non-wage recurrent expenses; Local revenues that the LGs collect through taxes and fees levied in their communities and; Grants or loans from development organizations which are usually used for capital development projects; Occasionally, some LG sections benefit from transfers from other LG sections that had surplus financing. The Government grant allocation is subdivided into 3 categories: Unconditional grant, the minimum amount required to provide decentralized services. This covers the recurrent budget; the conditional grant enables LGs to carry out plans in conjunction with line ministries; the equalization grant supports poor LGs and boosts their budgets.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

A research methodology describes the techniques and procedures used to identify and analyze information regarding a specific research topic. It is a process by which researchers design their study so that they can achieve their objectives using the selected research instruments. It includes all the important aspects of research, including research design, data collection methods, data analysis methods, and the overall framework within which the research is conducted. (Creswell & Creswell, 2018)

The research also can be summarised as the blueprint for the collection, measurement and analysis of data. The style in which the report was prepared followed the instructions laid out in the Makerere University Dissertation/Thesis Report guidelines.

3.2 Research Approach

A mixed study research approach was employed. This combines both quantitative and qualitative research methods in a single study to gain a more comprehensive understanding of a research problem. This approach involves collecting and analysing both quantitative (numerical) and qualitative (non-numerical, descriptive) data, and integrating the findings to draw richer inferences than either method alone. (Creswell & Creswell, 2018)

Qualitative Research was used to gather perceptions, opinions and in-depth insights from various stakeholders involved in land use, taxation, urban planning, and public policy.

Quantitative research was used to obtain the available vacant plots in Kyanja and understand the extend and distribution of these parcels as well as assessing the estimated revenue potential.

The researcher also reviewed case studies from different countries experiences regarding taxing of vacant/unimproved land.

3.3 Research Design

Research designs are types of inquiry within qualitative, quantitative, and mixed methods approaches that provide specific direction for procedures in a research study. (Creswell & Creswell, 2018)

The research explored the convergent parallel design. This design is when data collection and analysis of both quantitative and qualitative data occur simultaneously and are analysed separately. This design aims to create mutually exclusive sets of data that inform each other.

3.4 Study Area

The study was conducted in Kyanja parish, which is located in Kampala Nakawa Division, Kampala City. Kyanja, a burgeoning secondary suburb located approximately 11 kilometers northeast of Kampala's central business district (CBD) has quietly established itself as a promising retail hub evidenced by the mushrooming neighbourhood malls catering to the vibrant and expanding residential community in the area. Kyanja provides an ideal case for assessing the feasibility of imposing taxes on vacant urban land to boost revenue for infrastructure development.

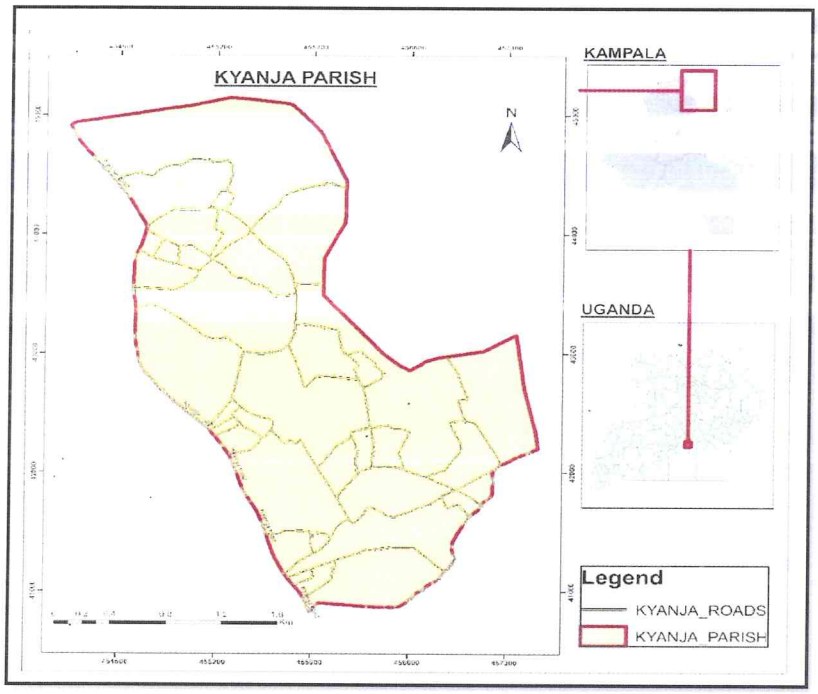


Figure 1: Study area Map

3.5 Study Population

The study population consisted of key stakeholders who have direct or indirect involvement in land ownership, taxation, and urban planning in Kampala and Uganda at large. This included Kampala Capital City Authority (KCCA) Officials –from the Physical Planning Department and Revenue Collection department, District Physical Planners, Physical Planning Experts, Tax Experts and Real Estate and Property Valuation Experts – Professionals provided insights on the property values and real estate market in Kyanja.

3.6 Sampling design and procedure

3.6.1 Purposive Sampling

This technique was used to select key informants who hold specialized knowledge about land taxation, urban development, and public finance.

Table 2:table showing the number of respondents

Respondents	Quantity
Representative from the Physical Planning Department KCCA	1
Representative from Revenue Collection department, KCCA	1
Physical Planning Expert	1
Tax Expert	1

These participants were chosen based on their expertise and relevance to the study.

3.6.2 Snowball sampling

Snowball sampling is a recruitment technique in which research participants are asked to assist researchers in identifying other potential subjects.

The researcher also relied on the already listed research participants to recommend other participants who are knowledgeable in the research area.

3.7 Sample size

The size of the sample is a crucial consideration in research design. A larger sample generally provides more accurate and reliable results, as it reduces the margin of error. However, larger samples also require more time and resources to collect data. Researchers must balance the desired level of accuracy with the practical constraints of their study to determine an appropriate sample size.

The researcher considered all the undeveloped plots in the selected parish by the use satellite imagery where the undeveloped plots were digitized.

3.8 Research Tools/Data Collection

3.8.1 Study-Area Delineation and Projection Verification

The official Kyanja Parish boundary polygon was acquired from the Kampala Capital City Authority GIS department and loaded into ArcMap via the Catalog pane. Data Frame Properties confirmed that the layer used the Arc 1960 UTM Zone 36N coordinate system; any nonconforming layers were reprojected using Data Management Tools - Projections and Transformations - Project, with the appropriate geographic transformation selected to maintain alignment. This ensured that all subsequent spatial analyses and area calculations were performed within a consistent metric framework.

3.8.2 Imagery Acquisition, Georeferencing, and Clipping

High-resolution satellite imagery was exported from Google Earth Pro by framing Kyanja Parish with a 100 m buffer to support control-point placement. The TIFF export (4 800 × 3200 px) was then added to ArcMap and georeferenced using at least six well-distributed ground control points placed on road intersections and building corners. A first-order polynomial rectification yielded an RMS error below 1.5 pixels, and the resulting georeferenced raster was clipped to the parish extent via Spatial Analyst - Extraction -Extract by Mask, producing an Image in .tif format.

3.8.3 Vacant-Parcel Feature Class Creation and Digitization

A file geodatabase named was created in ArcCatalog. Within it, a new polygon feature class, was defined Arc 1960 UTM 36N. Attribute fields like Parcel ID (Long Integer), Land_Use_Category (Text, length = 50), and Area_m2 (Double) were specified during creation. In ArcMap's Editor Session, snapping was enabled (vertex and edge, tolerance = 0.5 m) to the clipped imagery and boundary. All visibly vacant parcels identified by unroofed lots, bare soil, and open grounds were traced, and sequential Parcel_ID values were assigned. Edits were saved intermittently to prevent data loss.

3.8.4 Spatial Validation and Clean-up

A Select by Location operation ensured that all digitized polygons lay completely within the parish boundary; any features crossing the boundary were either deleted or snapped back inside. Finally, the Check Geometry tool identified invalid geometries (self-intersections, zero-area features), which were corrected manually in a subsequent edit session.

3.8.5 Thematic Classification and Domain Configuration

The official land-use map obtained directly from the GIS Department of Kampala Capital City Authority (KCCA) was loaded into ArcMap and used as the primary source for classification. A Spatial Join was performed between Vacant Land and the KCCA land-use layer, transferring the existing land-use codes to each vacant-parcel polygon. In the resulting attribute table, the Land_Use_Category field was populated with those KCCA codes, which were then reviewed and, if necessary, recoded to match the four defined categories (e.g., reclassifying "Industrial" to Brownfield). All category definitions (e.g., Brownfield as derelict industrial sites) were documented in the metadata to ensure thematic consistency.

3.8.6 Topology Construction and Quality Assurance

Within the feature dataset, a topology was created with a cluster tolerance of 0.001 m and two rules: "Must Not overlap" and "Must Not Have Gaps" for the Vacant Land layer. The topology was validated in ArcMap; errors were systematically reviewed in the Error Inspector. Overlaps were resolved via the Merge and Reshape tools, and gaps were filled using Auto-Fix or manual polygon creation. Validation continued until the topology reported zero errors.

3.8.7 Area Computation and Spatial Statistics

The **Add Geometry Attributes** tool populated the Area_m2 field with precise polygon areas in acres. A **Summary Statistics** table was generated (case field = Land_Use_Category, statistic = Sum of Area_m2) to quantify total vacant area per category.

3.8.9 Cartographic Layout and Export

In Layout View, the map frame was arranged on an A4 portrait canvas. The final layouts were exported as PDFs and a TIFF with LZW compression.

3.8.10 Computation of market values

Through the use of the available data that was obtained from real estate agents based in Kyanja regarding the available vacant plots for sale and the recently sold vacant plots, the researcher came up with a standard land rate per acre. The researcher considered Kyanja Parish as a valuation zone. A valuation zone is a principle in zoning applied by valuers where a front band of space is valued at one rate. The total area of each plot in acres obtained was then multiplied with the land rate per acre to obtain the market value.

3.8.11 Obtaining the assess mate rate.

Through case studies and reviewing of the literature, the researcher adopted Tunisia as a case study. In Tunisia, Tax on Unbuilt land represents only 1.6 percent of total local revenues and 6 percent of total property tax revenues. The Tax on Unbuilt Land (TTNB) tax rate is 3/10 of 1 percent of the market value of the unbuilt land.

Owners of unbuilt land are liable for TTNB. Since there is considerable problem with establishing the ownership of land in Tunisia, it is preferable to withhold payment of tax until a building permit is requested (with little penalty).

3.9 Primary Data collection methods

3.9.1 In depth interviews

The researcher carried out oral interviews with Kampala Capital City Authority (KCCA) Officials – One Representative from the Physical Planning Department and one representative from Revenue Collection department, Five District Physical Planners and one Physical Planning Expert who provided insights and views regarding the tax.

The researcher also contacted the valuers from the office of the Chief Government Valuer to establish the market values of Kyanja Parish.

3.9.2 Direct observation

The researcher carried out site inspections of the various vacant properties in the selected parishes to do ground truthing.

3.9.3 Document Analysis

Use of the available urban cadastre from KCCA GIS Department to obtain the available vacant land in the selected parishes.

KCCA tax records.

Urban development plans and policy documents.

Reports from the Ministry of Lands, Housing, and Urban Development.

Real estate market analysis reports

3.10 Data analysis

The data analysis involved both quantitative and qualitative techniques.

3.10.1 Quantitative data

The survey data was analysed with GIS tool; Archmap which mainly generated maps. Descriptive statistics then summarized the data obtained as to obtain graphs.

3.10.2 Qualitative data

The qualitative data was analysed by the Narrative analysis method which basically was used to interpret research participants' opinions and views regarding the urban vacant land tax.

3.11 Data quality control

In order to maintain the data quality required for objective research, the researcher followed a list of guidelines as stated below:

I. The researcher did not falsify, fabricate or plagiarize any data. It was reported as plainly as it was collected while giving credit to the persons involved in collection where necessary, after permission was sought from them.

II. The researcher did not change the way the respondent answered questions. The responses were analysed as they were provided by the respondents.

III. While using projections made by different people in secondary data, the researcher credited where it was due by citing and referencing accordingly.

IV. The researcher did ground truthing of some selected vacant parcels

3.12 Ethical considerations

These refer to a set of principles to guide the entire research process. It is the code of conduct to be adhered to as data is being collected, analysed and processed. These considerations have a number of other uses as well such as protecting the rights of research participants, enhancing research validity and maintaining scientific integrity.

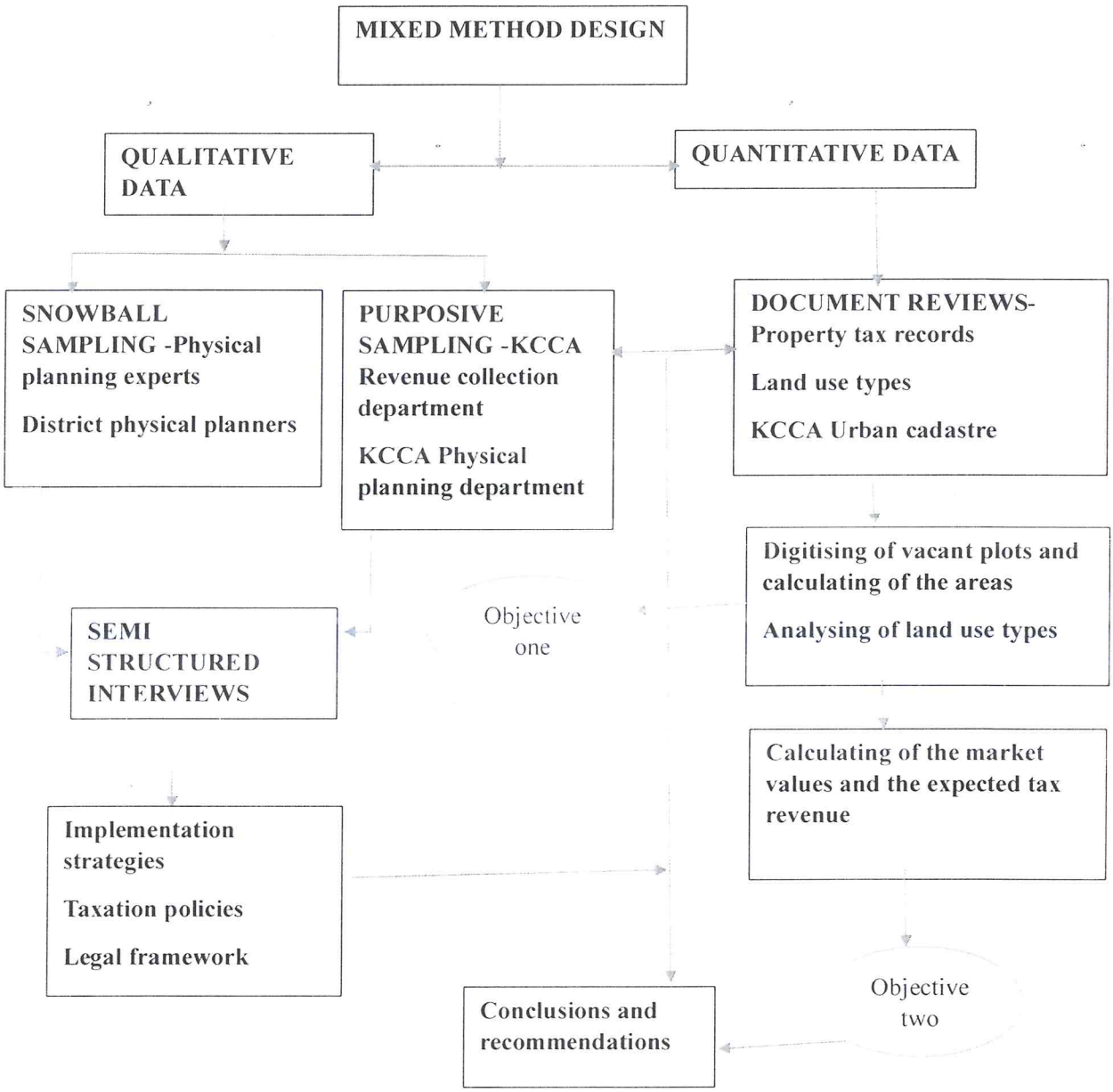
I. Informed consent: All participants were informed prior about the purpose of the study, the risks and benefits of participation, and the right to withdraw at any time.

II. Confidentiality: All data was kept confidential. Participants were not identified in any reports or publications.

III. Anonymity: The survey was anonymous. Interviews were confidential.

IV. All the work was double checked to ensure it was free of any plagiarism, research misconduct and only accurate results were presented.

3.13 METHODOLOGY FLOW CHART



CHAPTER FOUR: PRESENTATION OF RESULTS

4.1 Specific objective one: To identify urban vacant land in Kyanja Parish.

The researcher identified roughly 794.89 acres of vacant land on 491 independent urban voids. These parcels were distributed relatively evenly across the Kyanja Parish, but the large and completely vacant parcels are located mainly on the outskirts of the division.

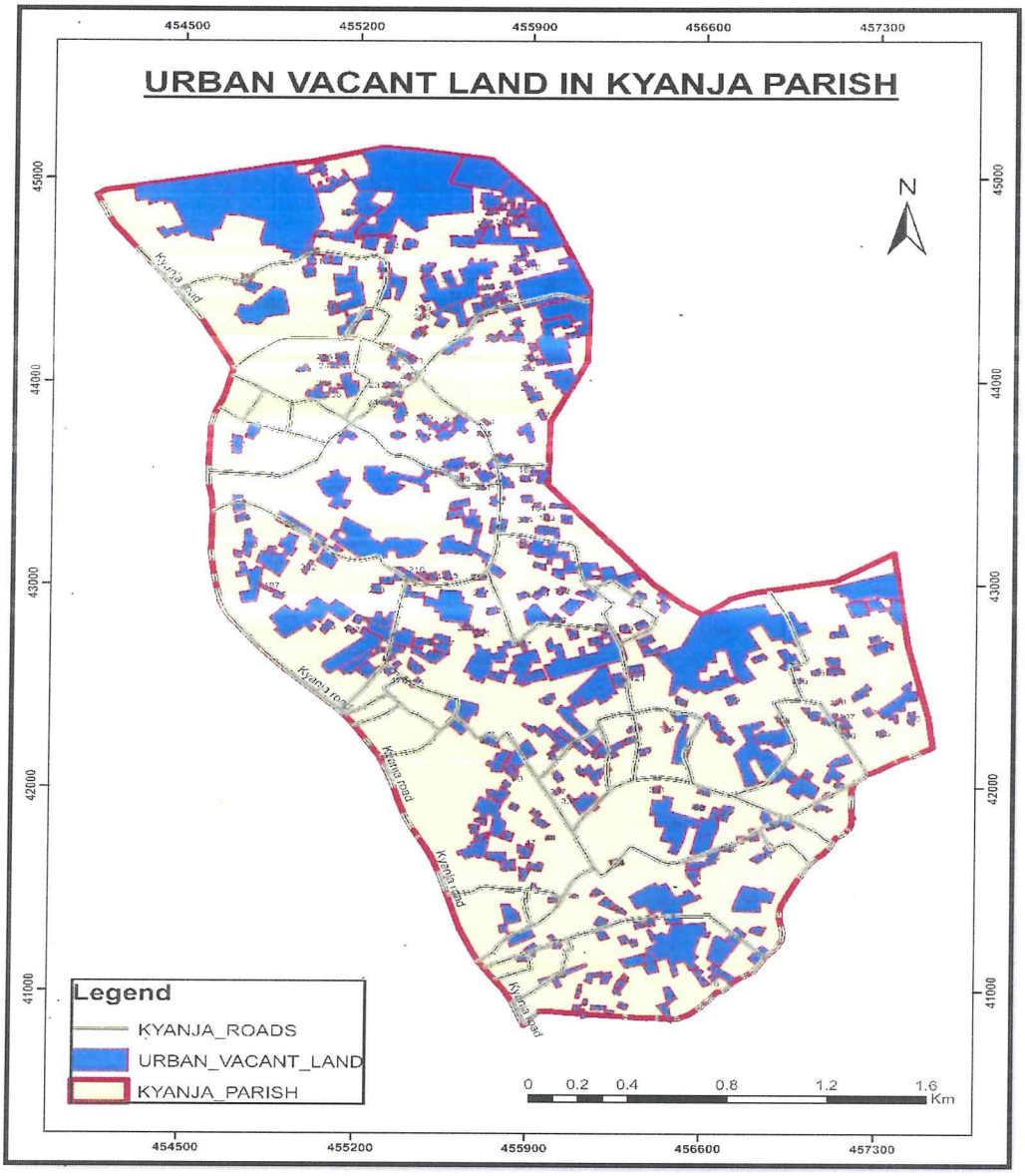


Figure 2: Urban Voids in Kyanja Division

A total of 491 discrete urban vacant land, occupying 794.8881 acres in aggregate, were delineated across Kyanja Parish (Figure 2). These voids are relatively evenly dispersed throughout the study area; however, the largest contiguous parcels (>5 acres) cluster predominantly along the peripheral zones particularly to the northern margins suggesting a gradient of land-use intensity decreasing toward the outskirts.

4.2 Urban Vacant Land Distribution Across Different Villages in Kyanja Parish

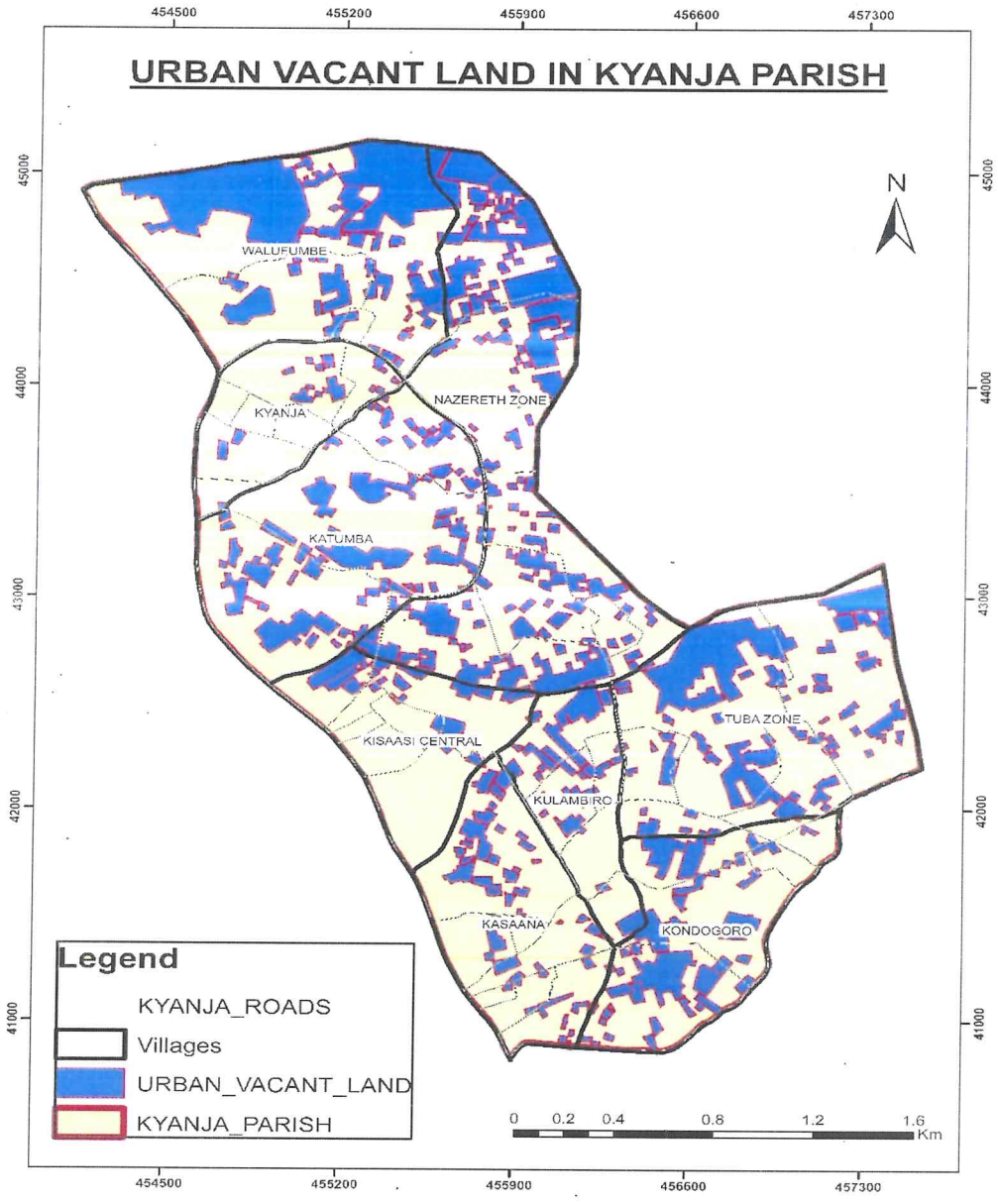


Figure 3: Vacant land distribution across villages

4.3 Land uses in Kyanja Parish

The land-use map of Kyanja Parish classifies the entire study area into eight primary categories small-scale agriculture, open shrubs, low-, medium-, and high-density residential, bare ground, education, and commercial residential using a standardized colour scheme.

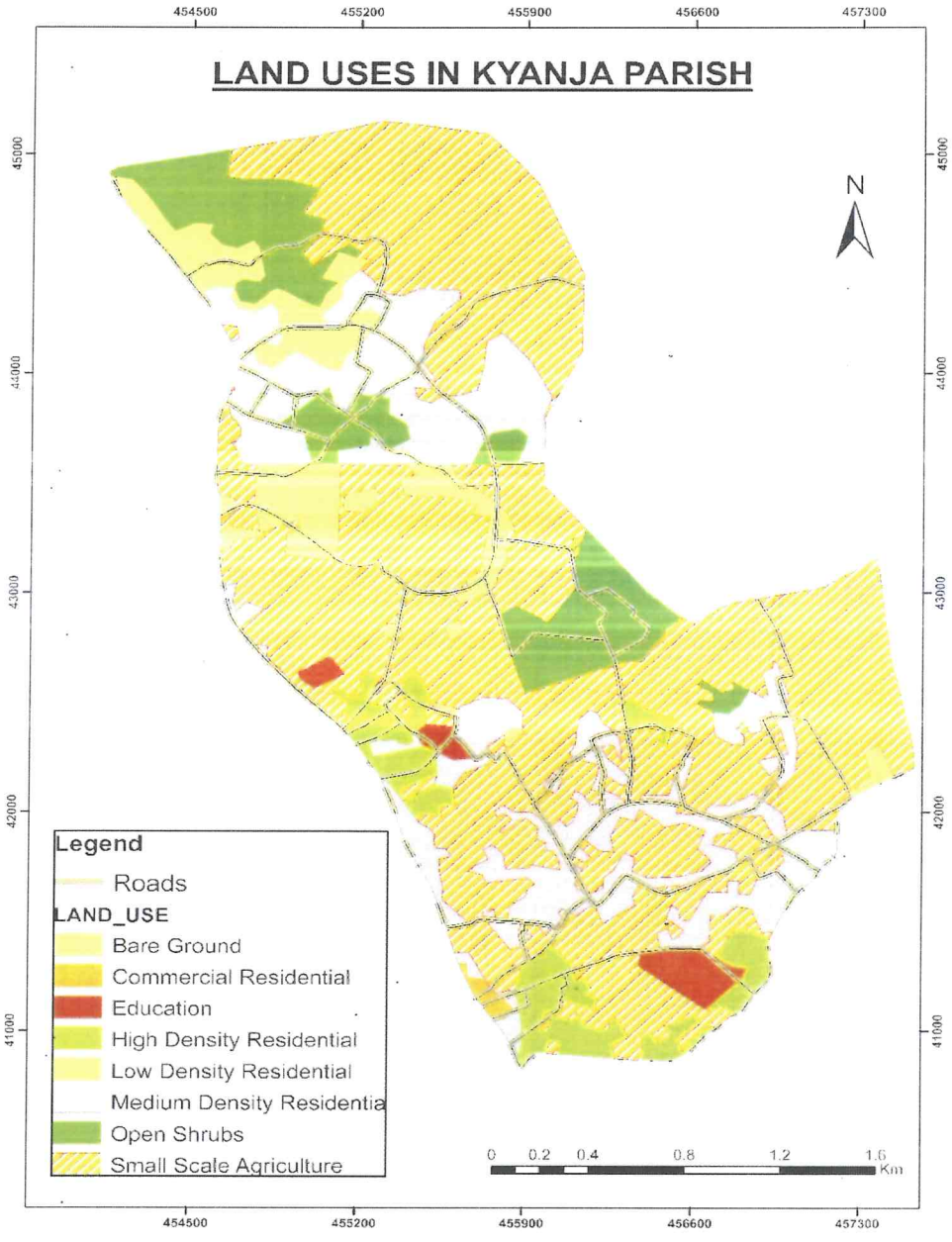


Figure 4: Land Uses in Kyanja Parish

4.4 Categorisation of urban vacant land in the different land use classes according to size

Small-scale agricultural voids dominate the vacant-land inventory, comprising 442.72 acres (≈55.7 % of the total), while open-shrub and medium-scale residential categories each account for approximately 16.3 % of the area. Together, residential uses (low-, medium-, and high-density) represent 25.0 % of the total vacant land. Educational and bare-ground uses are minor (<3 %), and no voids were recorded in commercial-residential zones as show in Table 1 below.

Table 3: Classification Of Urban Vacant land in the different land uses according to Size

Land Use	Total area (acres)	Percentage of Total
Small scale agriculture	442.71	55.7
Open Shrubs	129.51	16.3
Medium Scale Residential	129.63	16.3
Low scale Residential	44.49	5.6
Education	3.05	3.1
High density residential	25.00	2.6
Bare ground	20.48	0.4
Commercial residential	0	0
Total	794.89	100

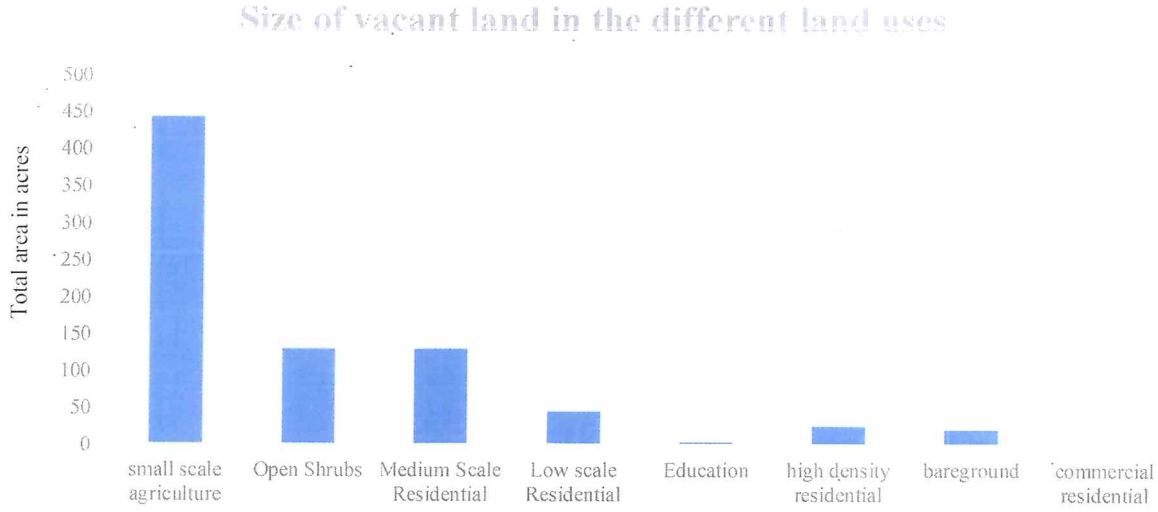


*Figure 5: **Sizes of Urban Voids in Percentage***

4.5 Zoning classification

When sorted by zoning classification according to the KCCA zoning guidelines from the physical planning department, there were 0 vacant land in commercial land use, 7 for bare

ground use, 33 for high density residential use, 10 for education uses, 29 for low scale residential use, 102 for medium scale residential use, 41 for open shrubs zone and 269 for small scale agriculture. The proportional contributions of each land-use category to total void area (Figure 4) mirror the tabulated values: a pronounced dominance of agricultural voids, secondary peaks for open shrubs and medium-scale residential, and negligible representation of educational and commercial categories.

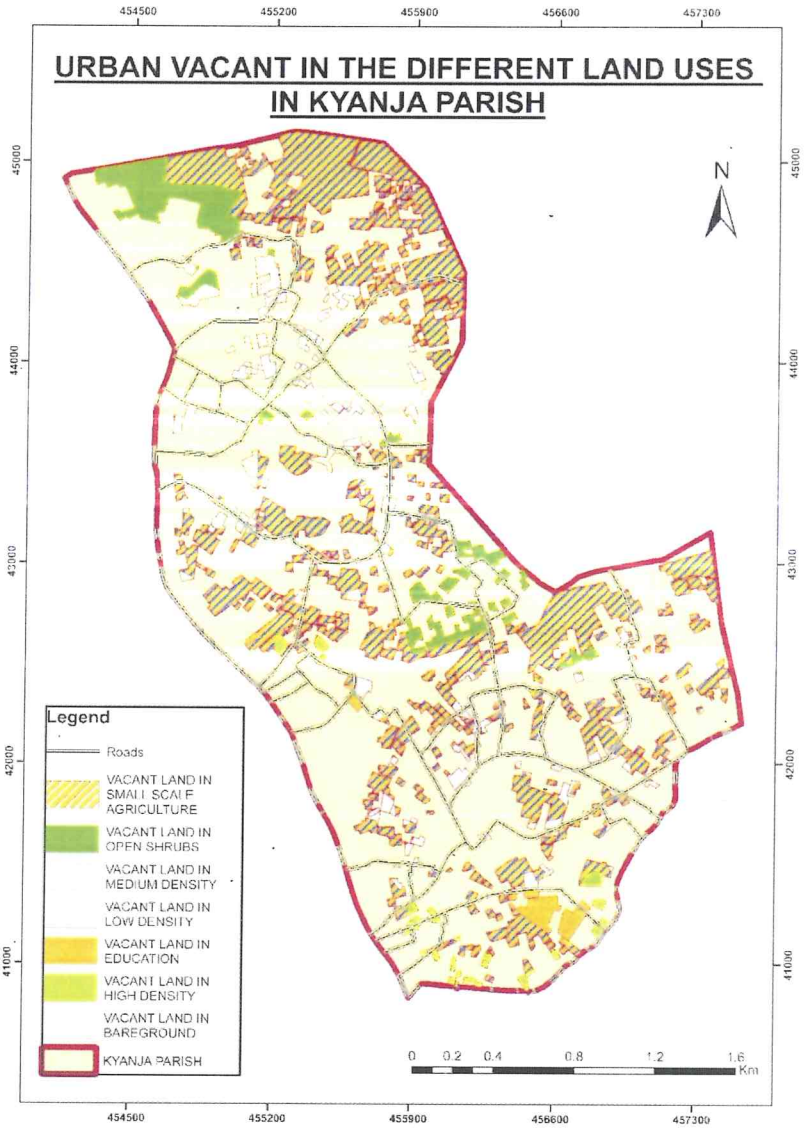


Figure 6: ***Urban Vacant land under the different land use classes***

Table 4: Number of vacant land parcels in the different land use Classes

Land Use	Number of Vacant land parcels
Small scale agriculture	269
Open Shrubs	41
Medium Scale Residential	102
Low scale Residential	29
Education	10
High density residential	33
Bare ground	7
Commercial residential	0
Total	491

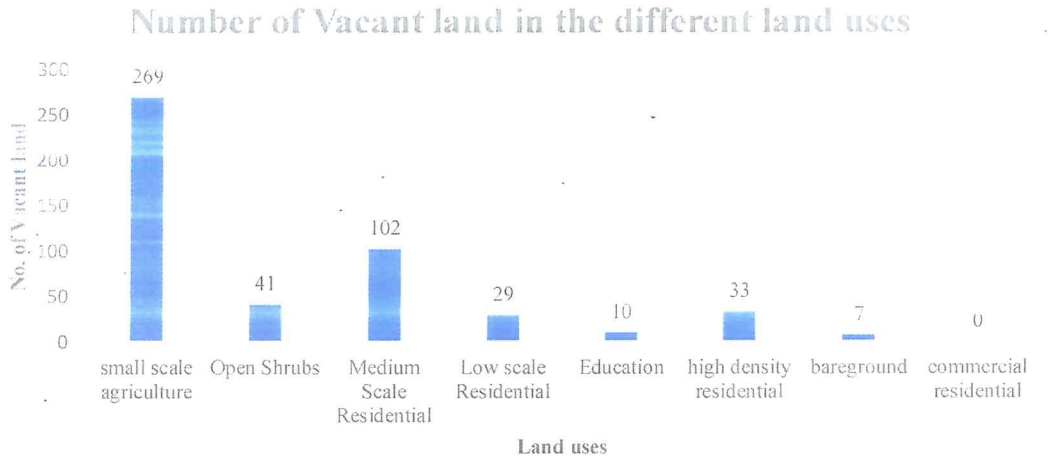


*Figure 7: **Land uses against Number of Vacant lots***

In terms of parcel frequency, small-scale agriculture again leads (269 parcels; ~54.8 %), followed by medium-scale residential (102 parcels; ~20.8 %). The remaining categories each constitute fewer than 10 % of the total void count, with no commercial-residential parcels identified.

4.6 Validation of the vacant parcels

By use of systematic sampling, the researcher selected every 10th member from a population of 491 parcels after randomly choosing a starting point of the 10^{th} parcel that was mapped. This therefore makes it a total of 45 parcels which were visited to verify if they were actually vacant.

The coordinates of the selected parcels were obtained and the sites visited to verify by ground truthing.

A site profile of the parcels that were ground truthed was made and these contain a write-up on observations from the site visit as well as photos.

The photos were taken upon visiting some sites and serves to represent the current condition of the land.

4.7 Specific objective two: To find out the Revenue Potential from Taxing Vacant Urban Land

The researcher adapted an assessment rate of 0.3% of the market value as is the case in Tunisia. The study by Yuan, Connolly, & Bell (2009) shows that property tax in Tunisia is represented by only 1.6 percent of total local revenues and 6 percent of total property tax revenues. While this is not very significant, it is one step to exploiting the potential of this tax. There is limited literature regarding this tax in other countries.

Through consultations with valuers from the office of the Chief Government Valuer the researcher considered the land rate per acre at UGX 1,500,000,000(1.5billion). A flat rate was considered since the study area was taken as a valuation zone.

Using the total computed areas in acres for each plot, the researcher multiplied the areas by the rate per acre to obtain the market value for each plot.

The assessment rate of 0.3% was then multiplied by the market value to obtain the annual tax on vacant urban land.

A total sum of approximately UGX 2,217,131,731 was obtained as the potential revenue from this tax.

According to the KCCA Budget Framework Paper FY 2023/24, approximately UGX 380 billion was the proposed budget with approximately UGX 196 billion going to Programme 09; Transport Infrastructure and Services which is approximately 52% of the total budget.

The KCCA Revenue Collection Report shows that UGX 114 billion was collected in the financial year 2023/24 with property taxes contributing the significant amount of approximately UGX 56 billion which is about 49% of the total collections.

According to the Uganda Budget Information, Nakawa Division analysed property rates for a new valuation roll worth UGX 2.24 billion against a target of UGX 3.67 billion achieving a performance of 61% in the Financial Year 2020/2021

Therefore, introducing this tax on urban vacant land has the potential of contributing approximately UGX 2.2 billion just from Kyanja Parish. This approximately 4% of the total of the total property rate collection in the financial year 2023/24 and approximately 1.9% of the total revenue collection.

4.8 Results from the interviews conducted by the researcher

The researcher conducted semi structured interviews and the following respondents were interviewed. These were interviewed to obtain their views and opinions regarding introduction of the tax and implementation.

All the respondents suggested that an enabling legislation must be adopted to support the introduction and enforcement of such a tax.

4.8.1 Views from the representative from KCCA revenue collection department

Strengthening collaboration between KCCA, Ministry of Lands and local authorities to improve land ownership data transparency and reduce overlaps/conflicts in land records.

Launch awareness campaigns to inform landowners about the implications of holding vacant land and the potential penalties or incentives under the new tax framework.

There should be an investment in capacity building through training and recruiting of more staff to enable implementation of the tax.

4.8.2 Views from the representative from KCCA physical planning department

Urban vacant land should be well defined and limited to any idle or unbuilt land in the designated urban area. Exemptions should be given to land belonging to schools, government institutions and community spaces like play grounds, green spaces.

Institutionalize the use of GIS and remote sensing tools for regular identification and monitoring of vacant parcels across Kampala.

Regular updating of the urban cadastre

4.8.3 Views and opinions of the physical planning expert.

Urban areas should be clearly defined. The Uganda National Urban Policy defines urban areas as a town council, municipality, city or metropolitan area. For purposes of this tax, it should first be piloted in the capital city, Kampala and then later to the other cities.

The tax may not be successful in some areas like town councils and municipalities as some of these are elevated to these statuses for political reasons and majority of the land is still vacant. Therefore, introduction of this tax would be unfair since most of the owners may not have the ability to pay the tax.

4.8.4 Views and opinions of the Tax Expert

While considering introduction of this tax, the major canons of taxation which are; equity, certainty, economy and convenience should be fully taken into consideration.

Who is eligible to pay? Section 6(1) of the Local Government (Rating) Act provides "that the person liable for payment of the property tax shall be the owner of the property in respect of which the assessment is made." Therefore, anyone who owns a vacant parcel in the designated urban area shall be liable to pay.

CHAPTER FIVE: DISCUSSION OF RESULTS

5.1 Introduction

This chapter provides an in-depth discussion of the findings of the study in relation to the objectives set out and within the broader context of urban planning, land management, and local revenue enhancement.

The study identified up to 794.89 acres of vacant land, scattered across 491 independent urban voids in Kyanja Parish. This indicates that there is a significant amount of underutilized land within this urban space; one that is under pressure from population increase and infrastructure development. Spatial distribution showed that larger parcels that are fully vacant lie mostly on the edges of the parish while smaller parcels are interspersed within more developed areas.

Such findings are aligned with the urban development patterns commonly observed in fast-growing urban regions whereby land at the core is developed first, thus leaving vacant parcels at the outskirts as development spreads outwards. However, relatively even distributions of smaller parcels within the developed areas may suggest some land speculation, fragmentation of ownership or institutional inefficiencies in land management.

The land-use classification also gave a further explanation on the characterisation of these urban voids. The major land use was very small-scale agriculture that constitutes over 55% of the vacant land by area and more than half of the total parcel count. The prominence of agricultural use highlights the coexistence of rural and urban uses within Kyanja Parish. Other land uses of open shrubs and medium-scale residential activities provide further landscape complexity, while land-use categories such as education, bare ground, and high-density residential make only the slightest contribution to the total parcels mapped. The absence of vacant parcels within commercial residential land-use adds a clear dimension to the zoning structure of Kyanja Parish and hints at the spatial control mechanisms that may influence land occupancy.

Data verification was another major step undertaken in the form of ground truthing, where the 45 parcels (roughly every 10th parcel of the 491 mapped parcels) were actually field-checked. This systematic sampling method provided a good cross-check and also presented potential advantages regarding sample size and observer error. Validation regarding the acreage of the parcels was not done as this could involve identifying of the different owners of the parcels to

seek for permission. Where the photos were taken, permission was sought from the caretakers who were on ground. Additionally, the study was conducted over a short duration (3 Months) which could not enable the researcher to validate all the plots.

Objective Two assessed the potential revenue from levying a 0.3% assessment rate on vacant urban parcel market values as adopted from Tunisia as a case study which also levies this similar tax. Given that land alone is being assigned a market value via a flat land rate of UGX 1.5 billion per acre, the analysis finds an estimated annual potential revenue in the range of UGX 2.2 billion from Kyanja Parish alone.

On relative percentages, this amount could be around 4% of the total property tax revenue collected in the year 2023/24, and about 1.9% of the total KCCA revenue collection. The potential revenue also amounts to approximately the same amount of property tax revenue collected in Nakawa Division in the financial year 2020/2021.

While these revenue returns might appear relatively low compared with the larger budgetary framework, focusing on the productive capacity of these revenues could offer an important complementary revenue stream for urban infrastructure development projects particularly in transport infrastructure where constraints in resources still appear to dominate.

Interviews with the KCCA departments of physical planning and revenue collection and independent experts in physical planning and taxation provided the study with practical and very meaningful views. Respondents were all on the same page in affirming the need for a legal framework that would make taxation on vacant urban land enforceable. Many stakeholders felt that the definition of "vacant land" must be precise enough to exclude parcels of land allocated for the use of essential services such as educational institutions and community spaces. Additionally, they indicated collaboration between different government agencies as well as the best use of GIS and remote sensing technologies for monitoring changes in land occupancy.

The challenges that have been listed in stakeholder interviews for example the capacity building needed, increased data transparency, and regular updating of record should be taken seriously otherwise they could affect the administrative feasibility as well as acceptability of the vacant land tax. Secondly uneven landscape of city development, whereby some urban areas might have more vacant plots depending on historical or political reasons and this may complicate uniform enforcement of the tax policy. Therefore, despite high revenue boost

potential, the implementation process must be closely regulated to avoid disparities and effectiveness in operations.

As the review of the evidence and case studies from Haas and Kopanyi (2018) noted that this vacant land tax has a potential of UGX 0.3 to 1.8 billion additional annual property tax revenue just from the Central Civic and Kololo I parishes which are among the richest areas of Kampala. This amount though insignificant could be additional source of revenue.

Observations from various countries provide valuable insights into both the successes and limitations of vacant land taxation. Take an example for Aliquippa (City in Pennsylvania) the adoption of a land value tax in 1988 not only increased land tax revenues but also spurred economic revitalization, showcasing the potential fiscal and developmental benefits of such policies. (Charles, 2019)

International experiences also highlight the importance of utilizing technology and modern valuation techniques to refine property assessments. Condogan, Han, & Lu (2023) proposed implementation of the K-segment model which divides a single property assessment model into multiple segments and employs sub-models for each serve as an illustration of efforts aimed at achieving a more accurate and fair valuation process.

5.2 Potential for Further Research

Different approaches and methods can be undertaken to establish the value of the vacant plots For example adopting of the area-based mode of assessment and attaching a rateable value per square metre and estimating unit taxable value of vacant land.

Use of Regression modelling that requires land sales transaction data. The data is used to develop a formula for projecting market value of vacant urban land.

Understanding what urban planning implications such a vacant land tax may have.

Further research is also needed to understand both what type of land remains vacant and why.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions for Objective One;

The study provided a comprehensive analysis of urban vacant land in Kyanja Parish, revealing a large inventory of parcels predominantly used for small scale agriculture and dispersed across the parish with notable clustering on the outskirts. The identification and categorization process supported by both remote sensing and systematic ground truthing of 45 parcels suggest the data collection process is trustworthy and reliable with some limitations to the sample size itself. Furthermore, the study indicates that the introduction of a vacant land tax could capture approximately UGX 2.2 billion in annual revenue a financial contribution amounting to about 4% of the KCCA property tax revenue in the financial year 2023/24.

6.2 Conclusions for Objective Two;

Although the potential for revenue is not very high when compared to the overall KCCA budget, it still reflects a big step in economic policy by making sure that the land is used at its best. This idea confirms the importance of providing a well-structured legislative framework, increasing administrative capabilities and incorporating advanced tracking technologies so that the tax can be implemented proficiently. The views obtained from the stakeholders cannot be stressed strongly enough as these are critical for implementation of this tax.

6.3 RECOMMENDATIONS

1) Vacant land can be defined basing on the physical planning zones of those urban areas. For example, existence of undeveloped parcel in an area zone for residential purposes automatically qualifies it to be taxed. This would make it easy to identify the vacant plots.
2) Consider taxing according to the acreage and not a flat rate for all areas. Large chunks be taxed at a lower rate and small plots charged at a higher rate instead of applying a flat rate for all sizes of land.
3) Invest in regular updating of the urban cadastre using GIS and remote sensing technologies. This will improve the accuracy of vacant land identification as well as reducing the potential for data errors and facilitate more effective tax collection

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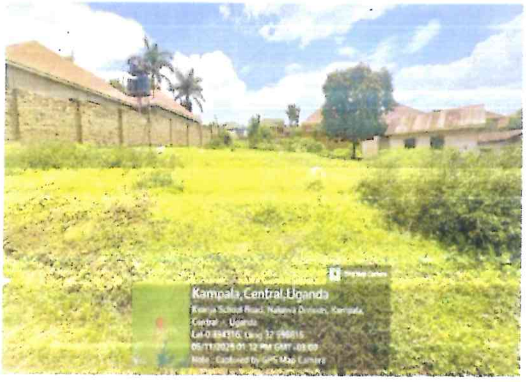
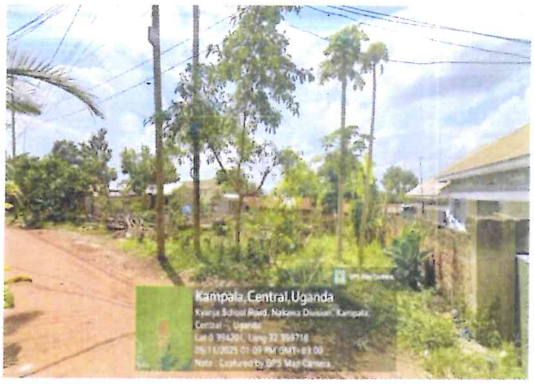
APPENDICES

Appendix 1: Pictorial Evidence of Some of the Vacant Plots in Kyanja Parish





Appendix 2: Working Sheet for Obtaining Revenue Potential

Area in acres	Land Rate per Acre	Market value	0.3% of the market value
0.201683	1,500,000,000	302,524,500	907,574
0.235805	1,500,000,000	353,707,500	1,061,123
0.145186	1,500,000,000	217,779,000	653,337
0.344556	1,500,000,000	516,834,000	1,550,502
0.165706	1,500,000,000	248,559,000	745,677
0.268486	1,500,000,000	402,729,000	1,208,187
0.496826	1,500,000,000	745,239,000	2,235,717
0.448256	1,500,000,000	672,384,000	2,017,152
0.361658	1,500,000,000	542,487,000	1,627,461
0.135501	1,500,000,000	203,251,500	609,755
0.189045	1,500,000,000	283,567,500	850,703
0.270069	1,500,000,000	405,103,500	1,215,311
0.586838	1,500,000,000	880,257,000	2,640,771
0.655042	1,500,000,000	982,563,000	2,947,689
0.610823	1,500,000,000	916,234,500	2,748,704
0.945385	1,500,000,000	1,418,077,500	4,254,233
0.240087	1,500,000,000	360,130,500	1,080,392
2.46504	1,500,000,000	3,697,560,000	11,092,680
0.99346	1,500,000,000	1,490,190,000	4,470,570
0.468655	1,500,000,000	702,982,500	2,108,948
0.918673	1,500,000,000	1,378,009,500	4,134,029
9.99582	1,500,000,000	14,993,730,000	44,981,190
1.10039	1,500,000,000	1,650,585,000	4,951,755
1.35965	1,500,000,000	2,039,475,000	6,118,425
0.556833	1,500,000,000	835,249,500	2,505,749
0.455267	1,500,000,000	682,900,500	2,048,702
0.282474	1,500,000,000	423,711,000	1,271,133
0.541887	1,500,000,000	812,830,500	2,438,492
6.9970298	1,500,000,000	10,495,544,700	31,486,634
0.503877	1,500,000,000	755,815,500	2,267,447
0.283447	1,500,000,000	425,170,500	1,275,512
0.531693	1,500,000,000	797,539,500	2,392,619
0.330395	1,500,000,000	495,592,500	1,486,778
0.0849444	1,500,000,000	127,416,600	382,250
0.24046	1,500,000,000	360,690,000	1,082,070
0.600594	1,500,000,000	900,891,000	2,702,673
0.322167	1,500,000,000	483,250,500	1,449,752
0.486975	1,500,000,000	730,462,500	2,191,388
1.4468499	1,500,000,000	2,170,274,850	6,510,825
1.61751	1,500,000,000	2,426,265,000	7,278,795
0.172003	1,500,000,000	258,004,500	774,014
0.180755	1,500,000,000	271,132,500	813,398
0.459714	1,500,000,000	689,571,000	2,068,713
1.0678999	1,500,000,000	1,601,849,850	4,805,550
0.495744	1,500,000,000	743,616,000	2,230,848
0.536295	1,500,000,000	804,442,500	2,413,328
0.696401	1,500,000,000	1,044,601,500	3,133,805
0.148794	1,500,000,000	223,191,000	669,573
0.147091	1,500,000,000	220,636,500	661,910
0.443896	1,500,000,000	665,844,000	1,997,532
3.0769999	1,500,000,000	4,615,499,850	13,846,500
0.28229	1,500,000,000	423,435,000	1,270,305
1.7965	1,500,000,000	2,694,750,000	8,084,250

0.36019	1,500,000,000	540,285,000	1,620,855
0.390138	1,500,000,000	585,207,000	1,755,621
0.46923	1,500,000,000	703,845,000	2,111,535
0.279031	1,500,000,000	418,546,500	1,255,640
0.266198	1,500,000,000	399,297,000	1,197,891
1.0248899	1,500,000,000	1,537,334,850	4,612,005
0.231556	1,500,000,000	347,334,000	1,042,002
0.22171	1,500,000,000	332,565,000	997,695
0.493666	1,500,000,000	740,499,000	2,221,497
1.40391	1,500,000,000	2,105,865,000	6,317,595
2.0438199	1,500,000,000	3,065,729,850	9,197,190
0.369824	1,500,000,000	554,736,000	1,664,208
0.320923	1,500,000,000	481,384,500	1,444,154
1.16664	1,500,000,000	1,749,960,000	5,249,880
0.234542	1,500,000,000	351,813,000	1,055,439
1.25427	1,500,000,000	1,881,405,000	5,644,215
2.52442	1,500,000,000	3,786,630,000	11,359,890
1.24629	1,500,000,000	1,869,435,000	5,608,305
0.243264	1,500,000,000	364,896,000	1,094,688
0.245988	1,500,000,000	368,982,000	1,106,946
1.42558	1,500,000,000	2,138,370,000	6,415,110
0.282948	1,500,000,000	424,422,000	1,273,266
5.2733402	1,500,000,000	7,910,010,300	23,730,031
0.521485	1,500,000,000	782,227,500	2,346,683
1.1253999	1,500,000,000	1,688,099,850	5,064,300
8.7407904	1,500,000,000	13,111,185,600	39,333,557
0.447791	1,500,000,000	671,686,500	2,015,060
2.77933	1,500,000,000	4,168,995,000	12,506,985
0.738655	1,500,000,000	1,107,982,500	3,323,948
4.6543798	1,500,000,000	6,981,569,700	20,944,709
2.35918	1,500,000,000	3,538,770,000	10,616,310
1.16491	1,500,000,000	1,747,365,000	5,242,095
3.58917	1,500,000,000	5,383,755,000	16,151,265
6.3014598	1,500,000,000	9,452,189,700	28,356,569
0.438193	1,500,000,000	657,289,500	1,971,869
0.266573	1,500,000,000	399,859,500	1,199,579
0.74216	1,500,000,000	1,113,240,000	3,339,720
1.56793	1,500,000,000	2,351,895,000	7,055,685
0.393714	1,500,000,000	590,571,000	1,771,713
2.1308401	1,500,000,000	3,196,260,150	9,588,780
0.334267	1,500,000,000	501,400,500	1,504,202
1.7075	1,500,000,000	2,561,250,000	7,683,750
0.219777	1,500,000,000	329,665,500	988,997
0.176127	1,500,000,000	264,190,500	792,572
8.3228397	1,500,000,000	12,484,259,550	37,452,779
2.48405	1,500,000,000	3,726,075,000	11,178,225
0.563513	1,500,000,000	845,269,500	2,535,809
0.193581	1,500,000,000	290,371,500	871,115
0.538728	1,500,000,000	808,092,000	2,424,276
0.647623	1,500,000,000	971,434,500	2,914,304
0.299566	1,500,000,000	449,349,000	1,348,047
2.7906599	1,500,000,000	4,185,989,850	12,557,970
0.380756	1,500,000,000	571,134,000	1,713,402
0.235373	1,500,000,000	353,059,500	1,059,179
0.191915	1,500,000,000	287,872,500	863,618

0.422179	1,500,000,000	633,268,500	1,899,806
0.431572	1,500,000,000	647,358,000	1,942,074
0.58719	1,500,000,000	880,785,000	2,642,355
0.890519	1,500,000,000	1,335,778,500	4,007,336
0.33438	1,500,000,000	501,570,000	1,504,710
0.475184	1,500,000,000	712,776,000	2,138,328
0.191009	1,500,000,000	286,513,500	859,541
2.3759401	1,500,000,000	3,563,910,150	10,691,730
0.330831	1,500,000,000	496,246,500	1,488,740
0.337006	1,500,000,000	505,509,000	1,516,527
0.374093	1,500,000,000	561,139,500	1,683,419
0.73056	1,500,000,000	1,095,840,000	3,287,520
0.484981	1,500,000,000	727,471,500	2,182,415
0.299766	1,500,000,000	449,649,000	1,348,947
31.2656994	1,500,000,000	46,898,549,100	140,695,647
1.4949	1,500,000,000	2,242,350,000	6,727,050
0.38593	1,500,000,000	578,895,000	1,736,685
0.596669	1,500,000,000	895,003,500	2,685,011
0.21189	1,500,000,000	317,835,000	953,505
0.50281	1,500,000,000	754,215,000	2,262,645
0.726064	1,500,000,000	1,089,096,000	3,267,288
0.178359	1,500,000,000	267,538,500	802,616
0.186599	1,500,000,000	279,898,500	839,696
0.987538	1,500,000,000	1,481,307,000	4,443,921
0.28412	1,500,000,000	426,180,000	1,278,540
0.653858	1,500,000,000	980,787,000	2,942,361
1.36886	1,500,000,000	2,053,290,000	6,159,870
0.874328	1,500,000,000	1,311,492,000	3,934,476
5.97826	1,500,000,000	8,967,390,000	26,902,170
1.43216	1,500,000,000	2,148,240,000	6,444,720
0.440531	1,500,000,000	660,796,500	1,982,390
0.361607	1,500,000,000	542,410,500	1,627,232
1.05389	1,500,000,000	1,580,835,000	4,742,505
0.884421	1,500,000,000	1,326,631,500	3,979,895
0.241567	1,500,000,000	362,350,500	1,087,052
0.491413	1,500,000,000	737,119,500	2,211,359
0.29748	1,500,000,000	446,220,000	1,338,660
1.79311	1,500,000,000	2,689,665,000	8,068,995
0.446248	1,500,000,000	669,372,000	2,008,116
0.327692	1,500,000,000	491,538,000	1,474,614
0.538872	1,500,000,000	808,308,000	2,424,924
0.612997	1,500,000,000	919,495,500	2,758,487
0.776896	1,500,000,000	1,165,344,000	3,496,032
0.419065	1,500,000,000	628,597,500	1,885,793
0.661999	1,500,000,000	992,998,500	2,978,996
0.415391	1,500,000,000	623,086,500	1,869,260
0.223958	1,500,000,000	335,937,000	1,007,811
2.3159599	1,500,000,000	3,473,939,850	10,421,820
2.64379	1,500,000,000	3,965,685,000	11,897,055
0.334181	1,500,000,000	501,271,500	1,503,815
2.6480701	1,500,000,000	3,972,105,150	11,916,315
0.306817	1,500,000,000	460,225,500	1,380,677
1.0424	1,500,000,000	1,563,600,000	4,690,800
0.439815	1,500,000,000	659,722,500	1,979,168
0.420632	1,500,000,000	630,948,000	1,892,844

0.165008	1,500,000,000	247,512,000	742,536
0.148778	1,500,000,000	223,167,000	669,501
0.323108	1,500,000,000	484,662,000	1,453,986
0.26132	1,500,000,000	391,980,000	1,175,940
0.204494	1,500,000,000	306,741,000	920,223
0.572588	1,500,000,000	858,882,000	2,576,646
1.20008	1,500,000,000	1,800,120,000	5,400,360
1.2428	1,500,000,000	1,864,200,000	5,592,600
0.670127	1,500,000,000	1,005,190,500	3,015,572
0.409037	1,500,000,000	613,555,500	1,840,667
0.300887	1,500,000,000	451,330,500	1,353,992
0.457289	1,500,000,000	685,933,500	2,057,801
0.289223	1,500,000,000	433,834,500	1,301,504
0.14856	1,500,000,000	222,840,000	668,520
0.32907	1,500,000,000	493,605,000	1,480,815
0.194868	1,500,000,000	292,302,000	876,906
0.735905	1,500,000,000	1,103,857,500	3,311,573
0.903407	1,500,000,000	1,355,110,500	4,065,332
1.45129	1,500,000,000	2,176,935,000	6,530,805
0.0830848	1,500,000,000	124,627,200	373,882
0.255499	1,500,000,000	383,248,500	1,149,746
0.746838	1,500,000,000	1,120,257,000	3,360,771
0.220651	1,500,000,000	330,976,500	992,930
1.34632	1,500,000,000	2,019,480,000	6,058,440
1.16783	1,500,000,000	1,751,745,000	5,255,235
0.733339	1,500,000,000	1,100,008,500	3,300,026
2.89309	1,500,000,000	4,339,635,000	13,018,905
1.3482701	1,500,000,000	2,022,405,150	6,067,215
4.5917702	1,500,000,000	6,887,655,300	20,662,966
0.215397	1,500,000,000	323,095,500	969,287
0.484231	1,500,000,000	726,346,500	2,179,040
7.5657802	1,500,000,000	11,348,670,300	34,046,011
0.380903	1,500,000,000	571,354,500	1,714,064
0.315054	1,500,000,000	472,581,000	1,417,743
0.20779	1,500,000,000	311,685,000	935,055
2.7562599	1,500,000,000	4,134,389,850	12,403,170
3.5712099	1,500,000,000	5,356,814,850	16,070,445
1.4312	1,500,000,000	2,146,800,000	6,440,400
0.2674	1,500,000,000	401,100,000	1,203,300
0.311213	1,500,000,000	466,819,500	1,400,459
1.60857	1,500,000,000	2,412,855,000	7,238,565
0.855223	1,500,000,000	1,282,834,500	3,848,504
1.63403	1,500,000,000	2,451,045,000	7,353,135
0.424359	1,500,000,000	636,538,500	1,909,616
0.835467	1,500,000,000	1,253,200,500	3,759,602
0.381239	1,500,000,000	571,858,500	1,715,576
0.826445	1,500,000,000	1,239,667,500	3,719,003
0.219068	1,500,000,000	328,602,000	985,806
0.989224	1,500,000,000	1,483,836,000	4,451,508
0.810206	1,500,000,000	1,215,309,000	3,645,927
5.0089898	1,500,000,000	7,513,484,700	22,540,454
0.289801	1,500,000,000	434,701,500	1,304,105
0.281149	1,500,000,000	421,723,500	1,265,171
0.377169	1,500,000,000	565,753,500	1,697,261
0.35436	1,500,000,000	531,540,000	1,594,620

0.345556	1,500,000,000	518,334,000	1,555,002
0.213113	1,500,000,000	319,669,500	959,009
0.132527	1,500,000,000	198,790,500	596,372
0.21834	1,500,000,000	327,510,000	982,530
8.9980602	1,500,000,000	13,497,090,300	40,491,271
4.0402298	1,500,000,000	6,060,344,700	18,181,034
3.57917	1,500,000,000	5,368,755,000	16,106,265
5.2313399	1,500,000,000	7,847,009,850	23,541,030
0.412665	1,500,000,000	618,997,500	1,856,993
0.419351	1,500,000,000	629,026,500	1,887,080
0.420665	1,500,000,000	630,997,500	1,892,993
0.409837	1,500,000,000	614,755,500	1,844,267
0.204538	1,500,000,000	306,807,000	920,421
1.75429	1,500,000,000	2,631,435,000	7,894,305
0.849825	1,500,000,000	1,274,737,500	3,824,213
0.238708	1,500,000,000	358,062,000	1,074,186
0.200286	1,500,000,000	300,429,000	901,287
1.54577	1,500,000,000	2,318,655,000	6,955,965
0.207225	1,500,000,000	310,837,500	932,513
0.150325	1,500,000,000	225,487,500	676,463
0.172214	1,500,000,000	258,321,000	774,963
0.959024	1,500,000,000	1,438,536,000	4,315,608
0.22309	1,500,000,000	334,635,000	1,003,905
0.244699	1,500,000,000	367,048,500	1,101,146
0.659801	1,500,000,000	989,701,500	2,969,105
0.966203	1,500,000,000	1,449,304,500	4,347,914
0.808233	1,500,000,000	1,212,349,500	3,637,049
0.170363	1,500,000,000	255,544,500	766,634
1.05264	1,500,000,000	1,578,960,000	4,736,880
0.323631	1,500,000,000	485,446,500	1,456,340
0.173201	1,500,000,000	259,801,500	779,405
0.825031	1,500,000,000	1,237,546,500	3,712,640
0.528017	1,500,000,000	792,025,500	2,376,077
0.186634	1,500,000,000	279,951,000	839,853
0.663709	1,500,000,000	995,563,500	2,986,691
0.828707	1,500,000,000	1,243,060,500	3,729,182
0.165099	1,500,000,000	247,648,500	742,946
0.286455	1,500,000,000	429,682,500	1,289,048
0.200974	1,500,000,000	301,461,000	904,383
0.447999	1,500,000,000	671,998,500	2,015,996
1.10302	1,500,000,000	1,654,530,000	4,963,590
0.374851	1,500,000,000	562,276,500	1,686,830
0.320455	1,500,000,000	480,682,500	1,442,048
0.130475	1,500,000,000	195,712,500	587,138
0.175638	1,500,000,000	263,457,000	790,371
0.239952	1,500,000,000	359,928,000	1,079,784
0.866042	1,500,000,000	1,299,063,000	3,897,189
0.3169	1,500,000,000	475,350,000	1,426,050
0.169	1,500,000,000	253,500,000	760,500
0.276859	1,500,000,000	415,288,500	1,245,866
0.549606	1,500,000,000	824,409,000	2,473,227
0.37342	1,500,000,000	560,130,000	1,680,390
2.44416	1,500,000,000	3,666,240,000	10,998,720
5.4867802	1,500,000,000	8,230,170,300	24,690,511
0.307532	1,500,000,000	461,298,000	1,383,894

5.1322799	1,500,000,000	7,698,419,850	23,095,260
9.9561996	1,500,000,000	14,934,299,400	44,802,898
0.428856	1,500,000,000	643,284,000	1,929,852
0.255032	1,500,000,000	382,548,000	1,147,644
0.265904	1,500,000,000	398,856,000	1,196,568
8.5492201	1,500,000,000	12,823,830,150	38,471,490
0.365679	1,500,000,000	548,518,500	1,645,556
0.613652	1,500,000,000	920,478,000	2,761,434
0.141456	1,500,000,000	212,184,000	636,552
0.833672	1,500,000,000	1,250,508,000	3,751,524
0.182058	1,500,000,000	273,087,000	819,261
0.257649	1,500,000,000	386,473,500	1,159,421
1.69497	1,500,000,000	2,542,455,000	7,627,365
0.333283	1,500,000,000	499,924,500	1,499,774
8.0170298	1,500,000,000	12,025,544,700	36,076,634
0.275337	1,500,000,000	413,005,500	1,239,017
0.343446	1,500,000,000	515,169,000	1,545,507
0.299759	1,500,000,000	449,638,500	1,348,916
0.351301	1,500,000,000	526,951,500	1,580,855
0.714337	1,500,000,000	1,071,505,500	3,214,517
0.994164	1,500,000,000	1,491,246,000	4,473,738
0.978891	1,500,000,000	1,468,336,500	4,405,010
2.2465701	1,500,000,000	3,369,855,150	10,109,565
0.882921	1,500,000,000	1,324,381,500	3,973,145
0.567671	1,500,000,000	851,506,500	2,554,520
0.156928	1,500,000,000	235,392,000	706,176
0.0867664	1,500,000,000	130,149,600	390,449
0.480112	1,500,000,000	720,168,000	2,160,504
1.01208	1,500,000,000	1,518,120,000	4,554,360
0.30359	1,500,000,000	455,385,000	1,366,155
0.270338	1,500,000,000	405,507,000	1,216,521
0.204881	1,500,000,000	307,321,500	921,965
0.200898	1,500,000,000	301,347,000	904,041
0.188089	1,500,000,000	282,133,500	846,401
0.396388	1,500,000,000	594,582,000	1,783,746
0.63803	1,500,000,000	957,045,000	2,871,135
1.1419899	1,500,000,000	1,712,984,850	5,138,955
0.297656	1,500,000,000	446,484,000	1,339,452
0.464817	1,500,000,000	697,225,500	2,091,677
4.2369099	1,500,000,000	6,355,364,850	19,066,095
0.75454	1,500,000,000	1,131,810,000	3,395,430
2.1338799	1,500,000,000	3,200,819,850	9,602,460
0.615957	1,500,000,000	923,935,500	2,771,807
0.65288	1,500,000,000	979,320,000	2,937,960
2.23892	1,500,000,000	3,358,380,000	10,075,140
0.419597	1,500,000,000	629,395,500	1,888,187
47.4958992	1,500,000,000	71,243,848,800	213,731,546
0.447008	1,500,000,000	670,512,000	2,011,536
1.85276	1,500,000,000	2,779,140,000	8,337,420
2.61291	1,500,000,000	3,919,365,000	11,758,095
33.3199997	1,500,000,000	49,979,999,550	149,939,999
2.3564	1,500,000,000	3,534,600,000	10,603,800
6.9388299	1,500,000,000	10,408,244,850	31,224,735
0.669153	1,500,000,000	1,003,729,500	3,011,189
1.49709	1,500,000,000	2,245,635,000	6,736,905

0.237467	1,500,000,000	356,200,500	1,068,602
0.638241	1,500,000,000	957,361,500	2,872,085
1.08555	1,500,000,000	1,628,325,000	4,884,975
0.10187	1,500,000,000	152,805,000	458,415
0.582311	1,500,000,000	873,466,500	2,620,400
1.31505	1,500,000,000	1,972,575,000	5,917,725
0.146311	1,500,000,000	219,466,500	658,400
1.65885	1,500,000,000	2,488,275,000	7,464,825
0.135129	1,500,000,000	202,693,500	608,081
0.189349	1,500,000,000	284,023,500	852,071
1.28211	1,500,000,000	1,923,165,000	5,769,495
0.696265	1,500,000,000	1,044,397,500	3,133,193
3.6129	1,500,000,000	5,419,350,000	16,258,050
0.247471	1,500,000,000	371,206,500	1,113,620
0.418912	1,500,000,000	628,368,000	1,885,104
0.798223	1,500,000,000	1,197,334,500	3,592,004
0.841555	1,500,000,000	1,262,332,500	3,786,998
0.288727	1,500,000,000	433,090,500	1,299,272
0.81625	1,500,000,000	1,224,375,000	3,673,125
0.704293	1,500,000,000	1,056,439,500	3,169,319
0.242569	1,500,000,000	363,853,500	1,091,561
5.5160198	1,500,000,000	8,274,029,700	24,822,089
1.01972	1,500,000,000	1,529,580,000	4,588,740
0.223572	1,500,000,000	335,358,000	1,006,074
			2,217,131,731