

JINJA PROPERTY TAX ANALYSIS

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Project Summary

- This project focuses on **analyzing property tax data** for Jinja City Council by integrating datasets from the Property Tax Register and Property Tax Invoices.
- The goal is to **identify discrepancies** like **missing values** and **duplicates**, **improve tax compliance**, and **enhance revenue collection** strategies.

Dataset names:

Jinja_Property_Tax_Data.xlsx (Combined Property Tax Register & Property Tax Invoices)

Property Tax Register (First 5 rows)

	PPTY_NO	CELL	WARD	DIVISION	STREET_NAME	OWNERS_NAME	TEL_NO.	PLOT	EASTINGS	NORTHINGS	PROPERTY DESCRIPTION	GROSS_VALUE	RATABLE_VALUE	Status	Unnamed: 14
0	P00001	GABULA	Jinja Central West	NaN	GABULA ROAD	ABUDALLAH HASSAN	NaN	1	00° 25' 26.61" N	033° 12' 21.99" E	Commercial	49920000.0	29203200.0	in-register	NaN
1	P00002	GABULA	Jinja Central West	Southern	GABULA ROAD	Dr. MIGERE	NaN	12(A-E)	00° 25' 26.64" N	033° 12' 22.16" E	Commercial	38896000.0	22754160.0	in-register	NaN
2	P00003	GABULA	Jinja Central West	Southern	GABULA ROAD	KAZIBA ZUMA JALAL	NaN	2	00° 25' 26.61" N	033° 12' 21.99" E	Commercial	58240000.0	34070400.0	in-register	NaN
3	P00004	GABULA	Jinja Central West	Southern	GABULA ROAD	VINIBAHAI PATELS AND SONS	NaN	10 (A-B)	00° 25' 26.64" N	033° 12' 22.16" E	Commercial	19760000.0	11559600.0	in-register	NaN
4	P00005	GABULA	Jinja Central West	Southern	GABULA ROAD	IVAN KADAM	NaN	3(A&B)	00° 25' 45.24" N	033° 12' 31.93" E	Commercial	30160000.0	17643600.0	in-register	NaN

Property Tax Invoices (First 5 rows)

NO.	INVOICE_ID	TAX_PAYER_NAME	Tax_Payer	PROPERTY_NAME	PLOT_NUMBER	STREET	BALANCE_DUE	
0	8	186903	TARIQ FOUNDATION LTD	in-register	PLOT 58 OBOJA RD	58	OBOJA ROAD	-1965600
1	9	191296	SURJIT BHART	in-register	PLOT 24 KISINJA ROAD	24	KISINJA ROAD	-1712160
2	11	180074	CHILD RESTORATION OUTREACH	in-register	PLOT 5 OBOJA ROAD	5	OBOJA ROAD	-1000000
3	31	191928	KENGROW INDUSTRIES LTD	in-register	KENGROW INDUSTRIES LTD	48	GABULA	-148361
4	37	176720	KATO PAUL	in-register	PLOT 27/29 NAIKA ROAD	27/29	NAIKA RD	-2055

Missing Values Assessment:

Property Tax Register

```
PPTY_NO      0
CELL         1
WARD        60
DIVISION      1
STREET_NAME  252
OWNERS_NAME   55
TEL_NO.      973
PLOT        6993
EASTINGS     940
NORTHINGS    941
PROPERTY DESCRIPTION  628
GROSS_VALUE  162
RATABLE_VALUE  1
Status       0
Unnamed: 14   11710
dtype: int64
```

Property Tax Invoices

```
NO.      0
INVOICE_ID  0
TAX_PAYER_NAME  0
Tax_Payer  3121
PROPERTY_NAME  0
PLOT_NUMBER  828
STREET      123
BALANCE_DUE  0
dtype: int64
```

Note: All fields need to be populated to enhance the data integrity.

Duplicates

--- Duplicate Counts Per Column ---

- PPTY_NO: 8 duplicate values in Property Tax Register
- CELL: 11588 duplicate values in Property Tax Register
- WARD: 11687 duplicate values in Property Tax Register
- DIVISION: 11708 duplicate values in Property Tax Register
- STREET_NAME: 10487 duplicate values in Property Tax Register
- OWNERS_NAME: 5382 duplicate values in Property Tax Register
- TEL_NO.: 7399 duplicate values in Property Tax Register
- PLOT: 10722 duplicate values in Property Tax Register
- EASTINGS: 4090 duplicate values in Property Tax Register
- NORTHINGS: 4531 duplicate values in Property Tax Register
- PROPERTY DESCRIPTION: 11696 duplicate values in Property Tax Register
- GROSS_VALUE: 7891 duplicate values in Property Tax Register
- RATABLE_VALUE: 7739 duplicate values in Property Tax Register
- Status: 11711 duplicate values in Property Tax Register
- Unnamed: 14: 11709 duplicate values in Property Tax Register
- INVOICE_ID: 1 duplicate values in Property Tax Invoices
- TAX_PAYER_NAME: 666 duplicate values in Property Tax Invoices
- Tax_Payer : 4855 duplicate values in Property Tax Invoices
- PROPERTY_NAME: 13 duplicate values in Property Tax Invoices
- PLOT_NUMBER: 3845 duplicate values in Property Tax Invoices
- STREET: 4393 duplicate values in Property Tax Invoices
- BALANCE_DUE: 2883 duplicate values in Property Tax Invoices

✓ Duplicate Eastings & Northings saved in 'Duplicate_Eastings_Northings.xlsx'

--- Duplicate Records ---

- ✖ Property Tax Register: 0 duplicates found
- ✖ Property Tax Invoices: 0 duplicates found

🔄 Duplicate check completed successfully!

Duplicates Worth noting include

- EASTINGS: 4090
- NORTHINGS: 4531
- INVOICE_ID: 1

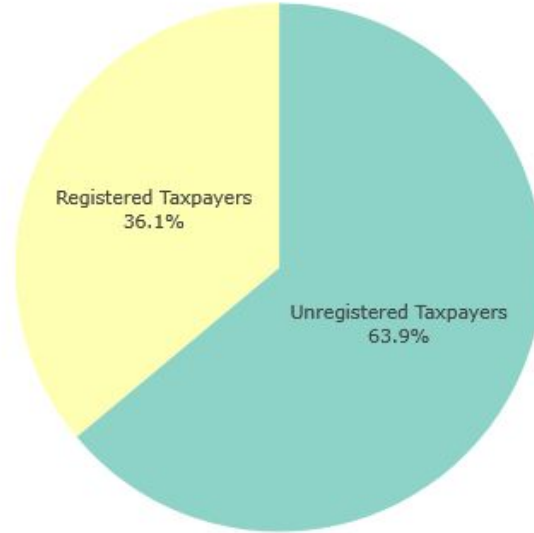
Data Matching & Gap Analysis

```
Property Register Columns: Index(['PPTY_NO', 'CELL', 'WARD', 'DIVISION', 'STREET_NAME', 'OWNERS_NAME',  
    'TEL_NO.', 'PLOT', 'EASTINGS', 'NORTHINGS', 'PROPERTY_DESCRIPTION',  
    'GROSS_VALUE', 'RATABLE_VALUE', 'STATUS', 'UNNAMED:_14'],  
    dtype='object')
```

```
Property Invoices Columns: Index(['NO.', 'INVOICE_ID', 'TAX_PAYER_NAME', 'TAX_PAYER', 'PROPERTY_NAME',  
    'PLOT_NUMBER', 'STREET', 'BALANCE_DUE'],  
    dtype='object')
```

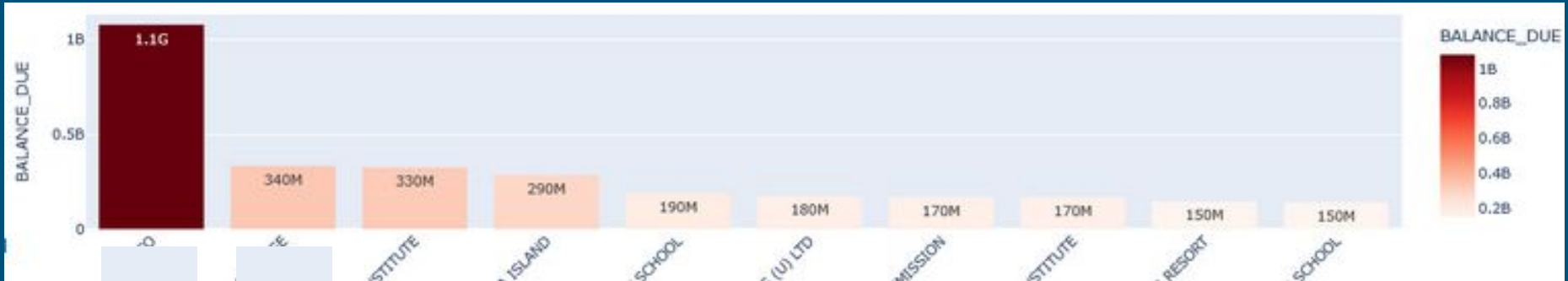
- 🔍 Found 3105 taxpayers in invoices but missing in the register.
- 📌 Found 8874 registered property owners without invoices.
- 💰 Top 4459 defaulters identified.
- ⚠️ Warning: EASTING or NORTHING column is missing in the property register!
- ✅ Data Matching & Gap Analysis saved in 'Property_Tax_Gap_Analysis.xlsx'. 🚀

Registered vs Unregistered Taxpayers



Pie Chart: Registered Vs Unregistered.

Bar Chart: Tax arrears top contributors by property name.



Revenue Analysis

Found **2900** under-assessed properties. Data saved in **'Under_Assessed_Properties.xlsx'**.

Recommendation	Impact on Under-Assessment & Tax Collection
1. Inter-System Reconciliation Dashboard	Flags mismatches between taxpayer and billing records early, ensuring all registered properties are correctly invoiced.
2. Assign Unique Property IDs (UPICs)	Creates a consistent reference for each property across systems, preventing missing or duplicate records.
3. ICT-led Data Harmonization Task Force	Aligns registration and valuation data, fixes cross-system inconsistencies, and maintains ongoing data quality.
4. Data Cleansing & Verification Drive	Corrects invalid entries, fills gaps in location and ownership data, and uncovers hidden revenue.

Revenue Analysis

Recommendations - Continued

5. Enforce Data Standards in Valuation Contracts

Ensures new valuation data is system-ready, standardized, and directly usable for billing.

6. Integrate Taxpayer & Invoicing Systems

Enables seamless, real-time synchronization between who owns and what is owed, reducing manual errors.

7. Transition to a Centralized TMIS

Unifies property management, valuation, invoicing, and payments in one platform—boosting efficiency and compliance.

8. Establish a Data Governance Framework

Defines data ownership, access rights, and validation rules—ensuring reliable, auditable property tax records.

Bar Chart – Total Tax Invoiced vs. Tax Collected

Key Observations

1. Major Defaulters:

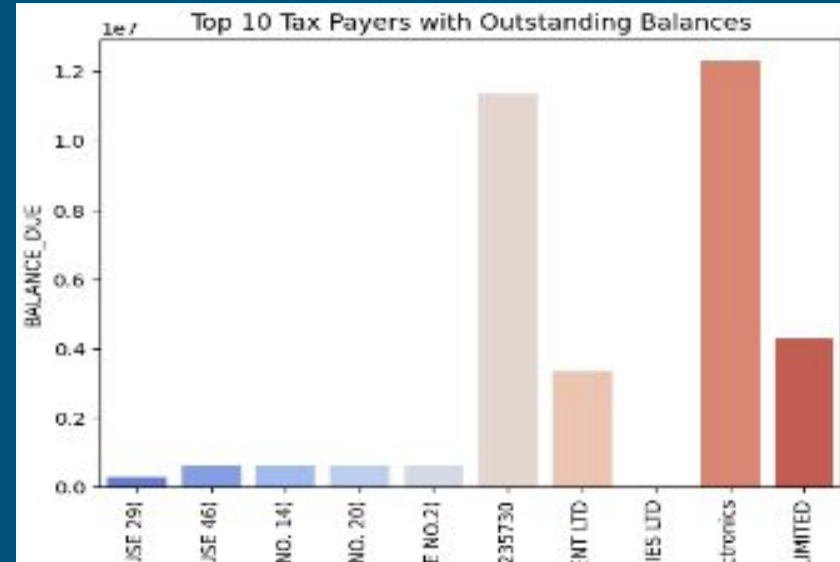
- [redacted] and [redacted] stand out as the **top two defaulters**, each owing close to or over **UGX 1 billion (10 million x 100)**.
- These two alone account for a huge proportion of the total outstanding tax revenue.

2. Anonymous / Incomplete Records:

- Some bars show incomplete or anonymized names like:
 - 075986899537223750 – possibly a phone number mistakenly entered as the name.
 - Entries like "HOUSE NO. 20" or "BLOCK 10, HOUSE 46" suggest **insufficient taxpayer registration**, which can hinder follow-up and enforcement.

3. Institutional Defaulters:

- [redacted] and [redacted] also appear as significant defaulters, indicating **corporate or institutional-level non-compliance**



Bar Chart – Anomalies & Insights

Irregularities Noted

- Some records lack proper naming conventions (e.g., just house numbers or phone numbers).
- This points to:
 - **Weak data validation** during taxpayer registration.
 - **Gaps in enforcement** for clearly traceable large institutions.
 - **A need for address or identity verification** to enhance collections.

Actionable Insights

- **Targeted Recovery:** Jinja can focus on the **top 5 defaulters** for a significant recovery boost.
- **Data Clean-up Required:** Rectify and complete records like phone numbers or "House No." entries.
- **Corporate Engagement:** Engage companies like   and  through official notices and possible legal measures.

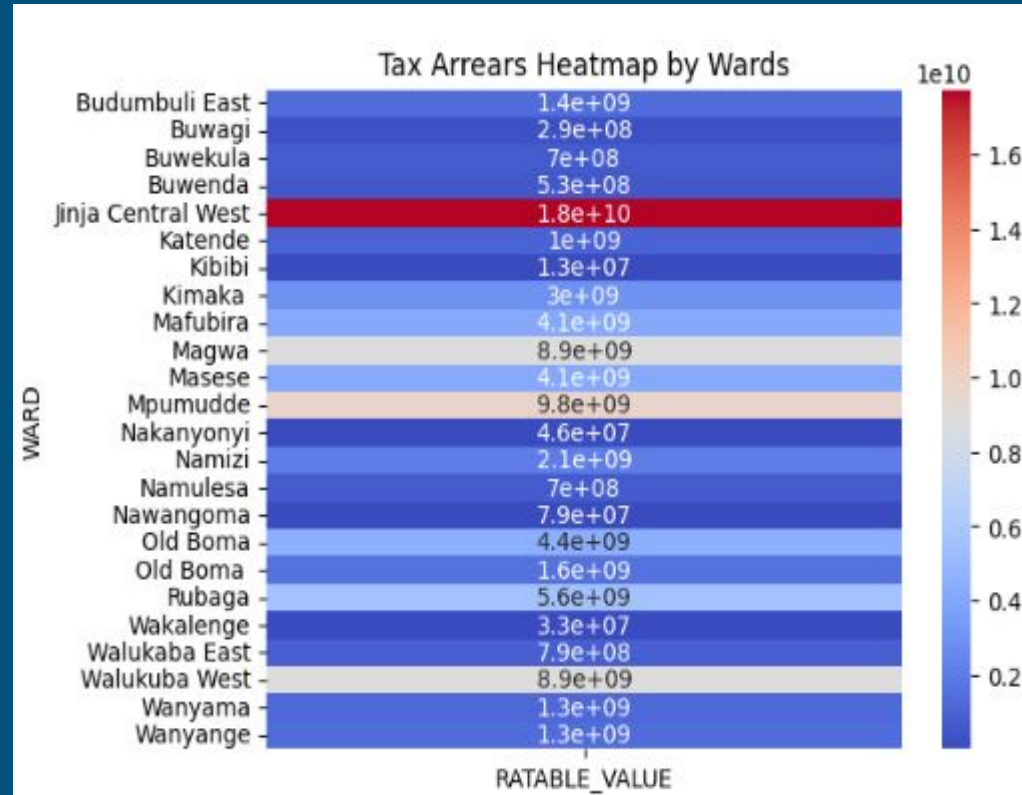
Tax Arrears Heatmap by Ward (Descending Order)

Ward and Ratable Value (UGX)

Jinja Central West-UGX 18,000,000,000.

Magwa-UGX 8,900,000,000,Wanyama-UGX
1,300,000,000,Rubaga-UGX
5,600,000,000,MpumuddeUGX 980,000,000,
Mafubira-UGX 4,100,000,000,Maseese-UGX
4,100,000,000,Kimaka-UGX
3,000,000,000,Buwagi-UGX 2,900,000,000,Namizi-UGX
2,100,000,000,Old Boma-UGX 1,600,000,000, Old
Boma-UGX 4,400,000,000,Budumbuli East-UGX
1,400,000,000,Walukuba West-UGX
890,000,000,Walukuba East-UGX 790,000,000

Nawangoma-UGX 790,000,000,Nankanyonyi-UGX
460,000,000,Katende-UGX
1,000,000,000,Wakalenge-UGX
330,000,000,Kibibi-UGX 130,000,000, Buwekula-UGX
700,000,000,Buwenda-UGX
530,000,000,Namulesa-UGX 700,000,000,



Top Tax Arrears Contributors by Ward

Top 5 Wards with Highest Tax Arrears (Ratable Value)

Rank	Ward	Ratable Value (UGX)	Notes
1	Jinja Central West	1.8×10^{10} (18B)	Highest arrears, urgent follow-up
2	Rubaga	5.6×10^9 (5.6B)	Very high, warrants targeted enforcement
3	Magwa	8.9×10^9 (8.9B)	Significant, but not as red-hot as Jinja Central West
4	Mpumudde	9.8×10^9 (9.8B)	Slightly below Magwa, strong focus needed
5	Mafubira	4.1×10^9 (4.1B)	Moderate to high

Explanation

These may represent areas with:

- Low-value properties
- Fewer taxable parcels
- Possibly better compliance
- Or poor data collection/reporting



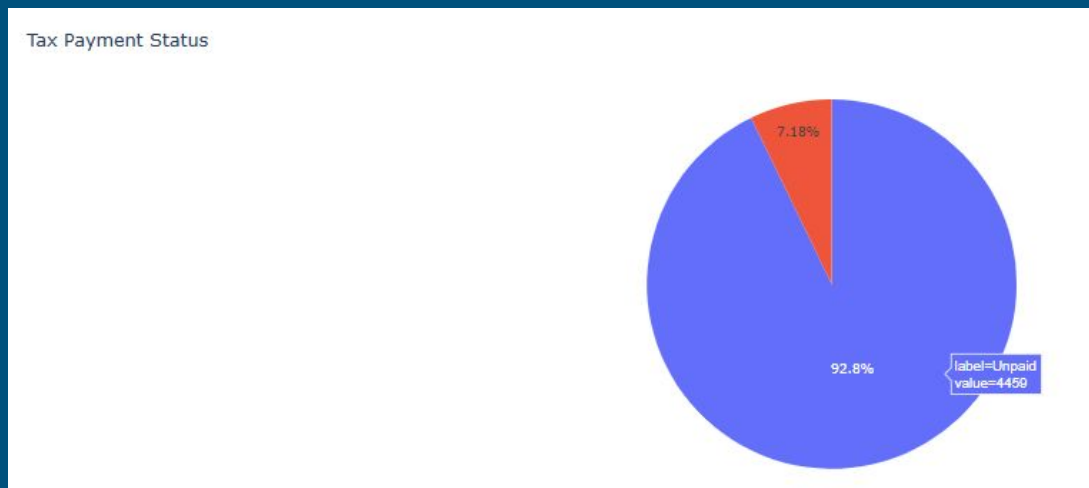
Use Case: Strategy Design



Prioritization Matrix

Action	Wards
Immediate Recovery	Jinja Central West, Rubaga, Magwa
Field Verification	Nakanyonyi, Kibibi, Katende, Buweri
Enforcement Lite	Mpumudde, Mafubira, Old Boma
Data Quality Check	Wakalenge, Namulesa, Nawangoma

Pie Chart: Tax Payment Status



This pie chart titled "**Tax Payment Status**" from the Jinja Town Council dataset shows a stark overview of **property tax compliance**.

Interpretation

- 92.8% of the taxpayers have **not paid** their property taxes.
- Only 7.18%, have **paid** their dues.

What This Tells Us

- There's a **massive compliance gap**. The city is likely **losing a significant portion of potential revenue**, which can affect service delivery, infrastructure, and development projects.
- The small "Paid" segment in red visually highlights the **urgency of intervention**.



Quick Recommendations

1. **Conduct Outreach Campaigns:**

- Educate property owners about the importance of timely tax payment and benefits.
- Use SMS, radio, and door-to-door sensitization.

2. **Strengthen Enforcement:**

- Introduce gentle enforcement like reminders and warning letters, escalating to penalties.

3. **Digital Payment System:**

- Introduce an easy-to-use digital platform to reduce excuses linked to inconvenience.

4. **Reward Compliance:**

- Offer recognition or small incentives to consistent payers to encourage a positive tax culture.

5. **Targeted Follow-up:**

- Prioritize collections from high-value properties and repeat defaulters.

Bar Chart: Tax Distribution by Division

Tax Distribution by Division



! Interpretation:

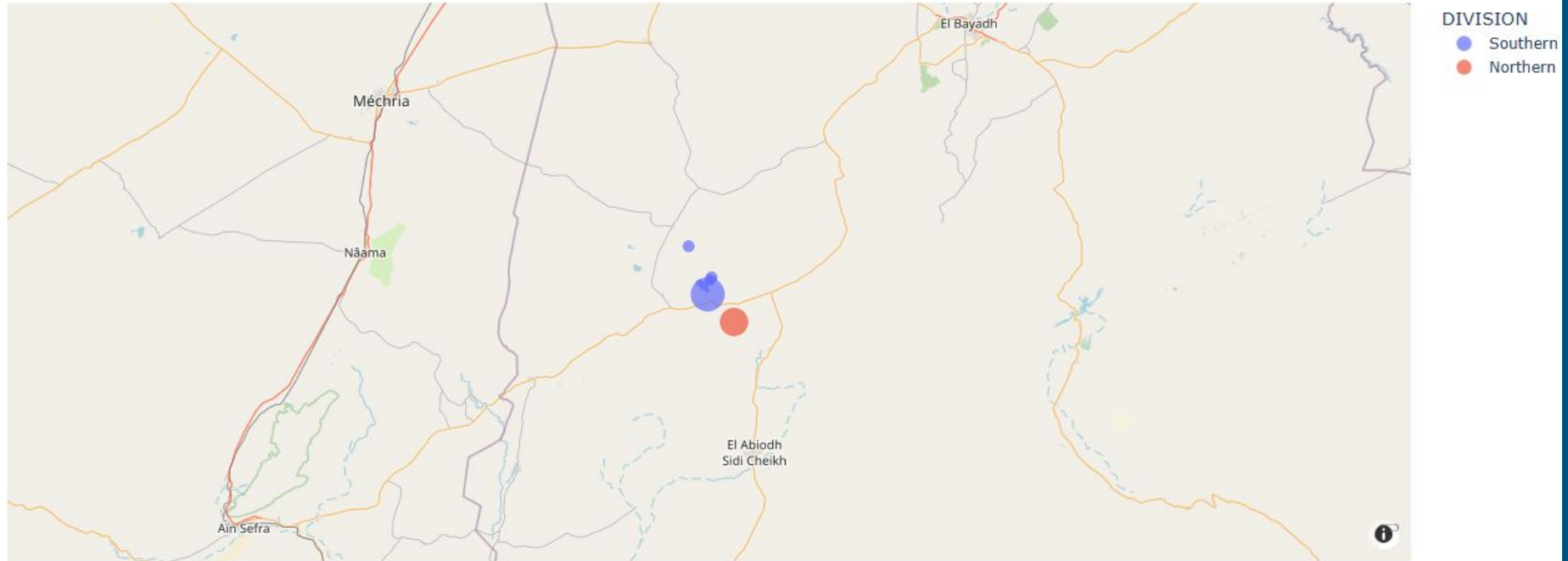
- **Southern Division** dominates with the **highest total tax contribution**, represented by the **tall green bar**.
- The **Northern Division** appears **twice**, possibly indicating:
 - Duplicate naming or inconsistent casing (e.g., "Northern" vs "northern")
 - This leads to fragmented data representation.

! Irregularity:

- The Northern division's values are **split**, which could affect analysis accuracy and shows a **need for data cleaning (standardizing names)**.
- Imbalanced tax contribution suggests **either high-value properties are clustered in the Southern Division or other divisions have low assessment/enforcement**.

Geo Spatial Tap Distribution Map(DV)

Tax Distribution Map

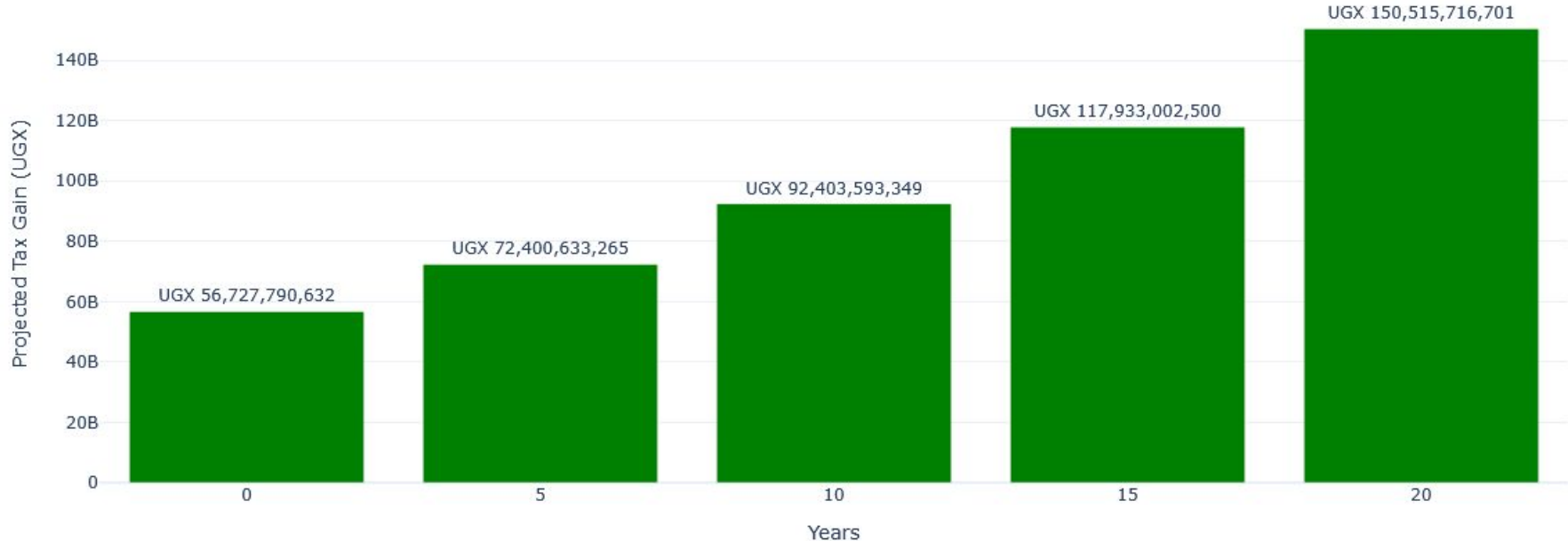


Tax Projections - Hypothesis

- **Total Tax Lost** = $\sum (\text{Ratable Value} - \text{Invoiced Amount})$ where Invoiced Amount < Ratable Value
Total Tax Lost = $\sum (\text{Ratable Value} - \text{Invoiced Amount})$ where Invoiced Amount < Ratable Value
This will give the total amount of revenue that should have been collected if invoices matched the correct ratable values. **t = Number of years (5, 10, 15, 20)**
- **Projected Tax Loss** = **Total Tax Lost Today** $\times (1 + \text{Error Growth Rate})^t$
Projected Tax Loss = **Total Tax Lost Today** $\times (1 + \text{Error Growth Rate})^t$
Where: Error Growth Rate is an estimated annual increase in invoicing errors or non-compliance, We assume errors compound over time as more properties are added.
- **Future Revenue** = **Current Revenue** $\times (1 + \text{Growth Rate})^t$
Future Revenue = **Current Revenue** $\times (1 + \text{Growth Rate})^t$
Where: Current Revenue = Sum of all ratable values where payment status is PAID.

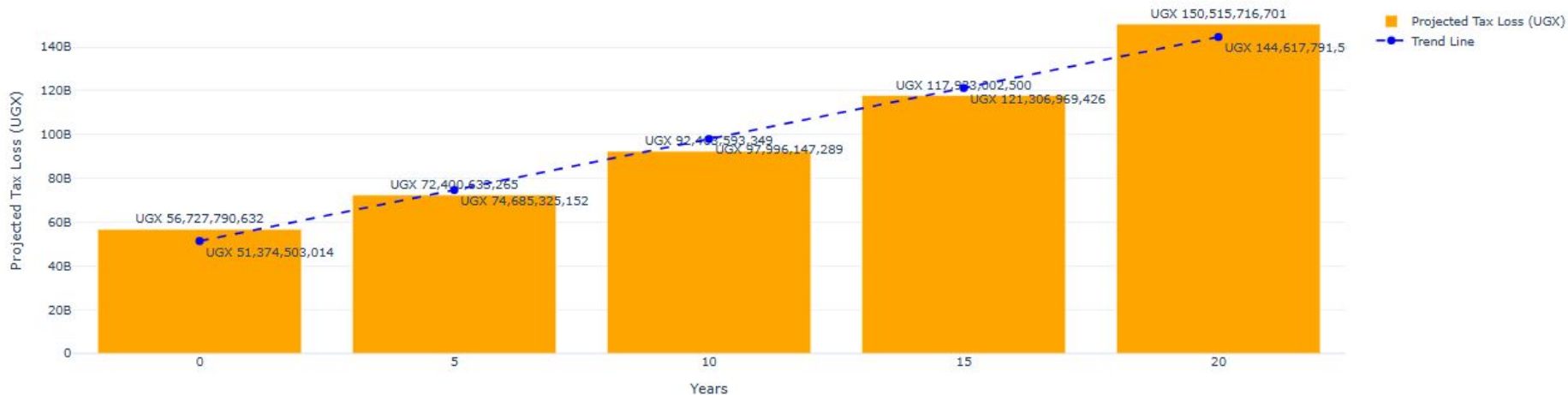
Tax Gain - With Clean Data & Strategizing

Projected Tax Gain Over 20 Years (if Data is Cleaned)



Projected Tax Loss Trend

Combined Projected Tax Losses with Trend Line



Additions Recommended

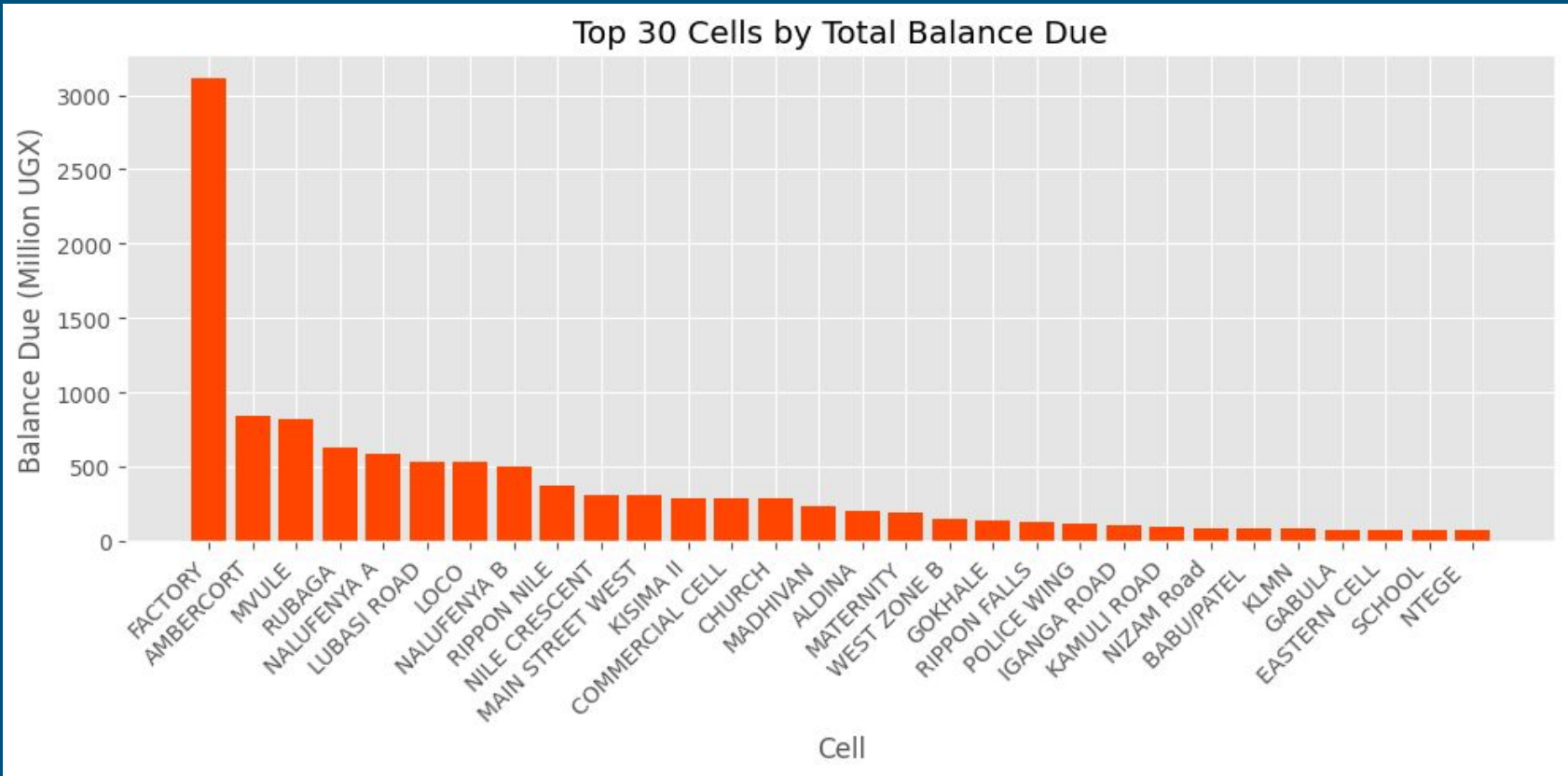
- Analyze arrears to the cell level
- Analyze the 92% further for the arrears stated above
- Visualize them

Solution:

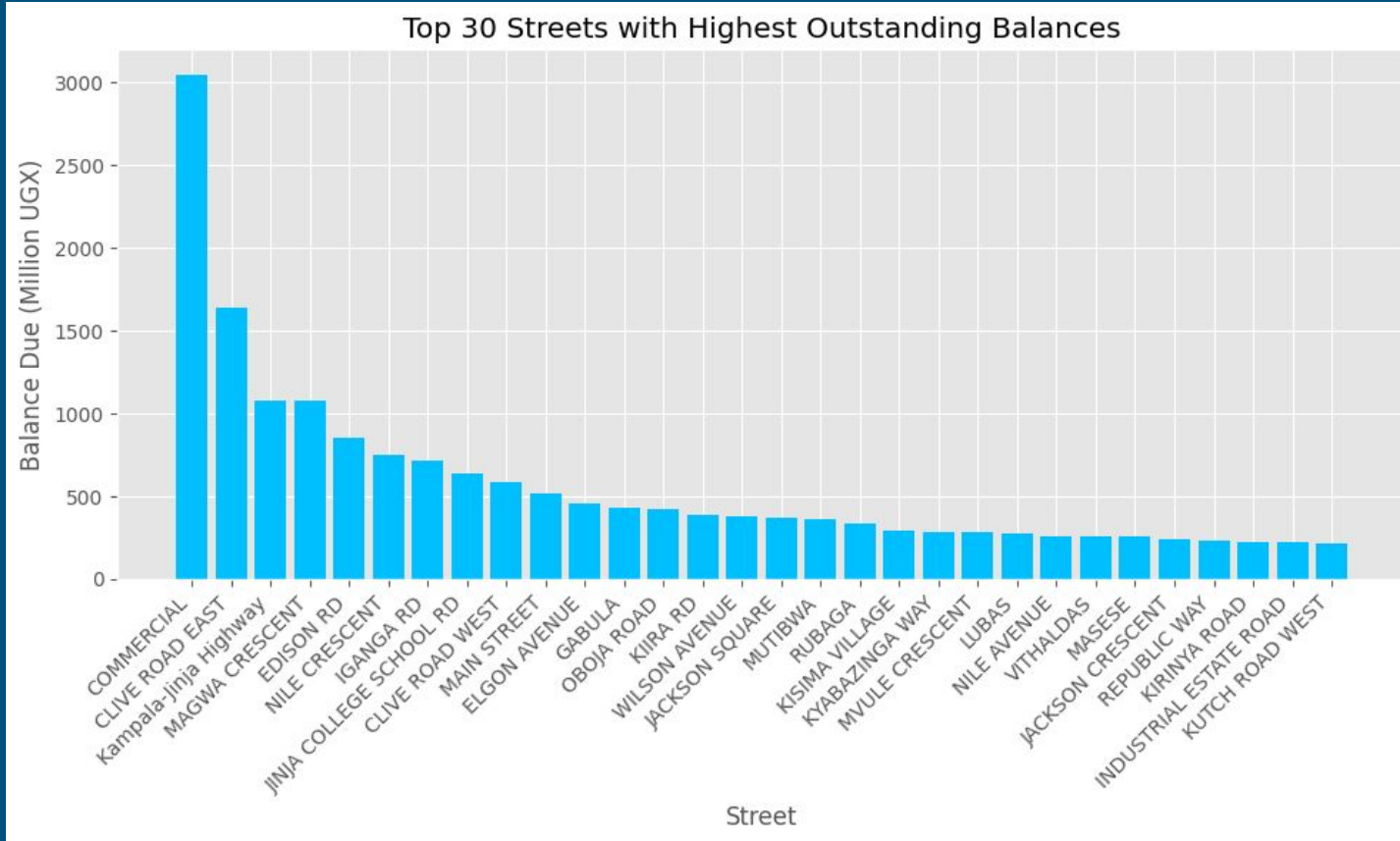
Addresses defaulters by cell, street, and the number of defaulters that have never paid.

List is saved as : **“Never_Paid_Owners.xlsx”**

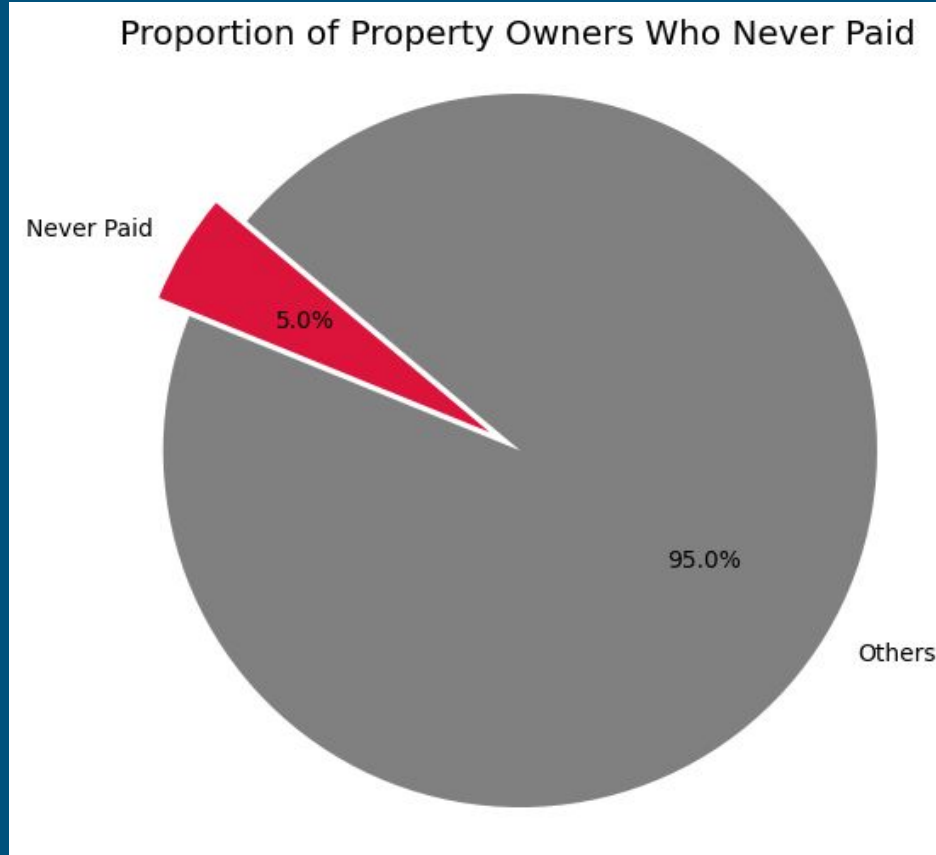
Top 30 Cells by Total Balance Due



Top 30 Streets with Highest Arrears



Partially & Fully Paid Vs Never Paid



Q&A

Thank you for listening

Meeting is open for discussion.

**For more information. Data will be
shared with HoR(venue) for Jinja
City Council**

