

# Towards Resilient Urban Futures for Secondary Cities in Africa the case for Jinja

BY ERNEST NABIHAMBA

PRINCIPAL NATURAL RESOURCES OFFICER

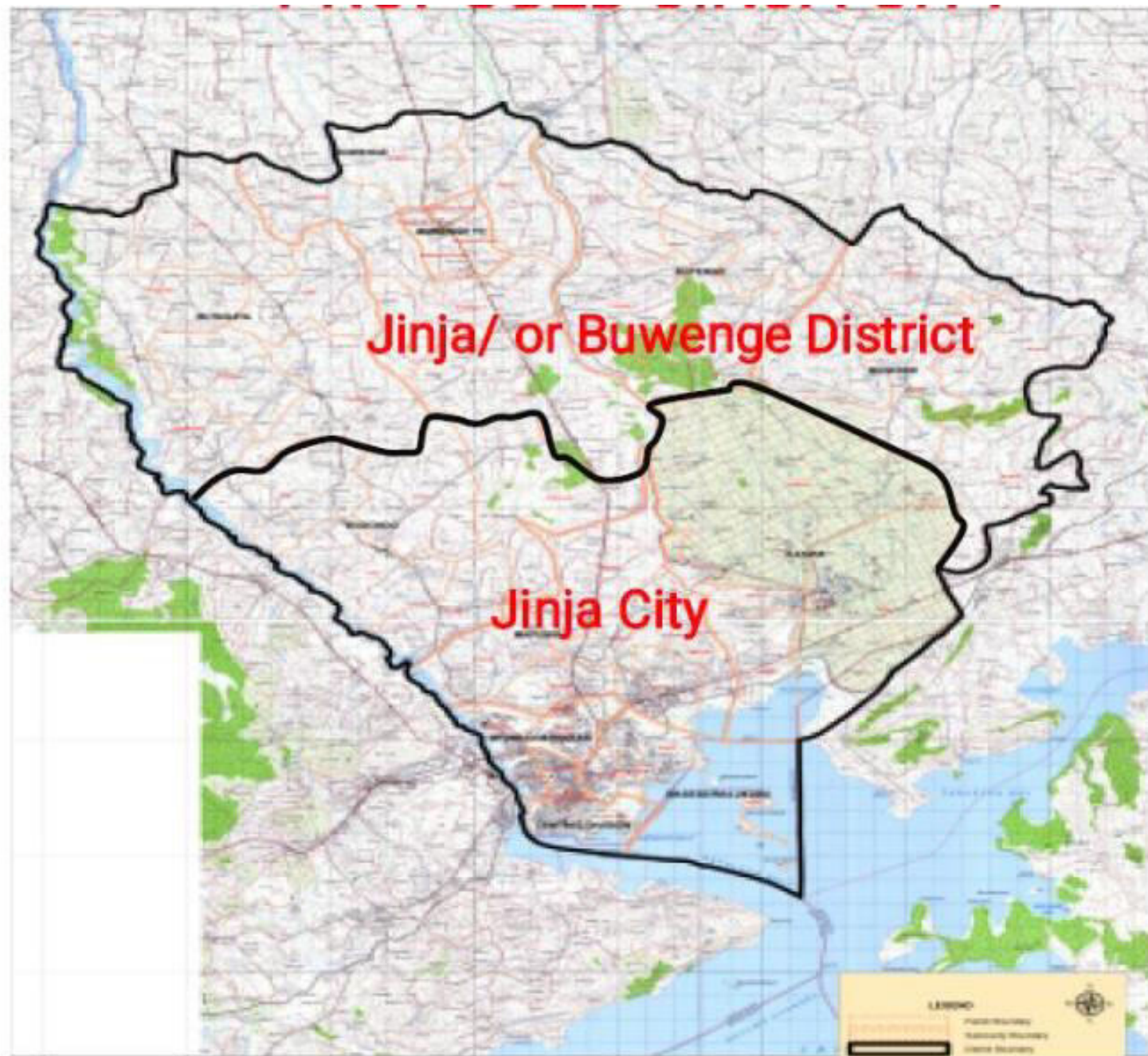
Bsc. Meng, MSc PGDE, PGDSIA PGDUDS Cert. PPM

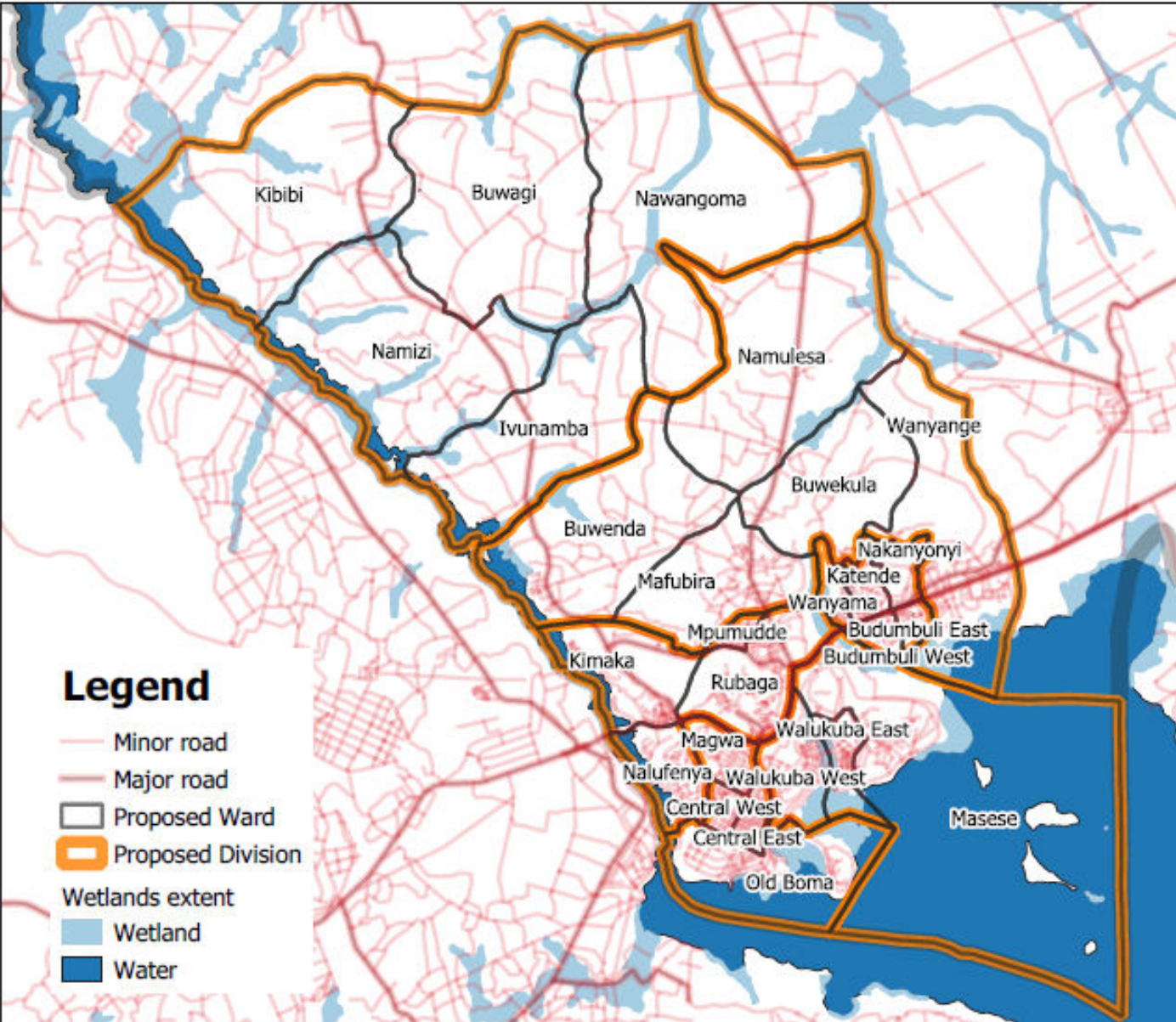
# Background:

- **Introduction:**

- Jinja City has recently been created (1<sup>st</sup> July, 2019) which increased the areas from 61sqkm to 212km<sup>2</sup> and raising the population from 106,000 to 328,983 persons.

- Jinja is located approximately 80 km east of Uganda's Capital City, Kampala and has of 1<sup>st</sup> July 2020 been elevated to city status. The Town has been enlarged by annexing the former peri-urban areas of **Budondo**, **Mafubira** sub-counties and **Bugembe** Town council. It covers an area of approximately 212km<sup>2</sup>, and has a population of **328,983** inhabitants (projected at 4% from The UBOS census 2014 figure of 250,000 of the constituent sub-counties), It is the second largest urban establishment in Uganda and among the major industrial hubs in the Eastern African Region. It is also the capital and seat of Busoga Kingdom and, therefore, a town of cultural significance.





Subcounty	Level	Parish	Level
Budondo	Subcounty	Namizi	Parish
Budondo	Subcounty	Kibibi	Parish
Budondo	Subcounty	Buwagi	Parish
Budondo	Subcounty	Nawangoma	Parish
Budondo	Subcounty	Iyunamba	Parish
Bugembe	Town Council	Wanyama	Ward
Bugembe	Town Council	Katende	Ward
Bugembe	Town Council	Budumbuli West	Ward
Bugembe	Town Council	Nakanyonyi	Ward
Bugembe	Town Council	Budumbuli East	Ward
Central	Division	Magwa	Ward
Central	Division	Old Boma	Ward
Central	Division	Central East	Ward
Central	Division	Central West	Ward
Mafubira	Subcounty	Wanyange	Parish
Mafubira	Subcounty	Namulesa	Parish
Mafubira	Subcounty	Mafubira	Parish
Mafubira	Subcounty	Buwenda	Parish
Mafubira	Subcounty	Buwekula	Parish
Masese Walukuba	Division	Walukuba East	Ward
Masese Walukuba	Division	Masese	Ward
Masese Walukuba	Division	Walukuba West	Ward
Mpumudde	Division	Mpumudde	Ward
Mpumudde	Division	Kimaka	Ward
Mpumudde	Division	Nalufenya	Ward
Mpumudde	Division	Rubaga	Ward

Source of Data: 2014 Population & Housing Census, Uganda Bureau of Statistics, UBOS

# Jinja City Boundaries

The Actual boundaries of the current Jinja Municipality,.....64 Sq.km.

Mafubira Sub-county..... 51 Sq.km.

Budondo Sub-county..... 89 Sq.km

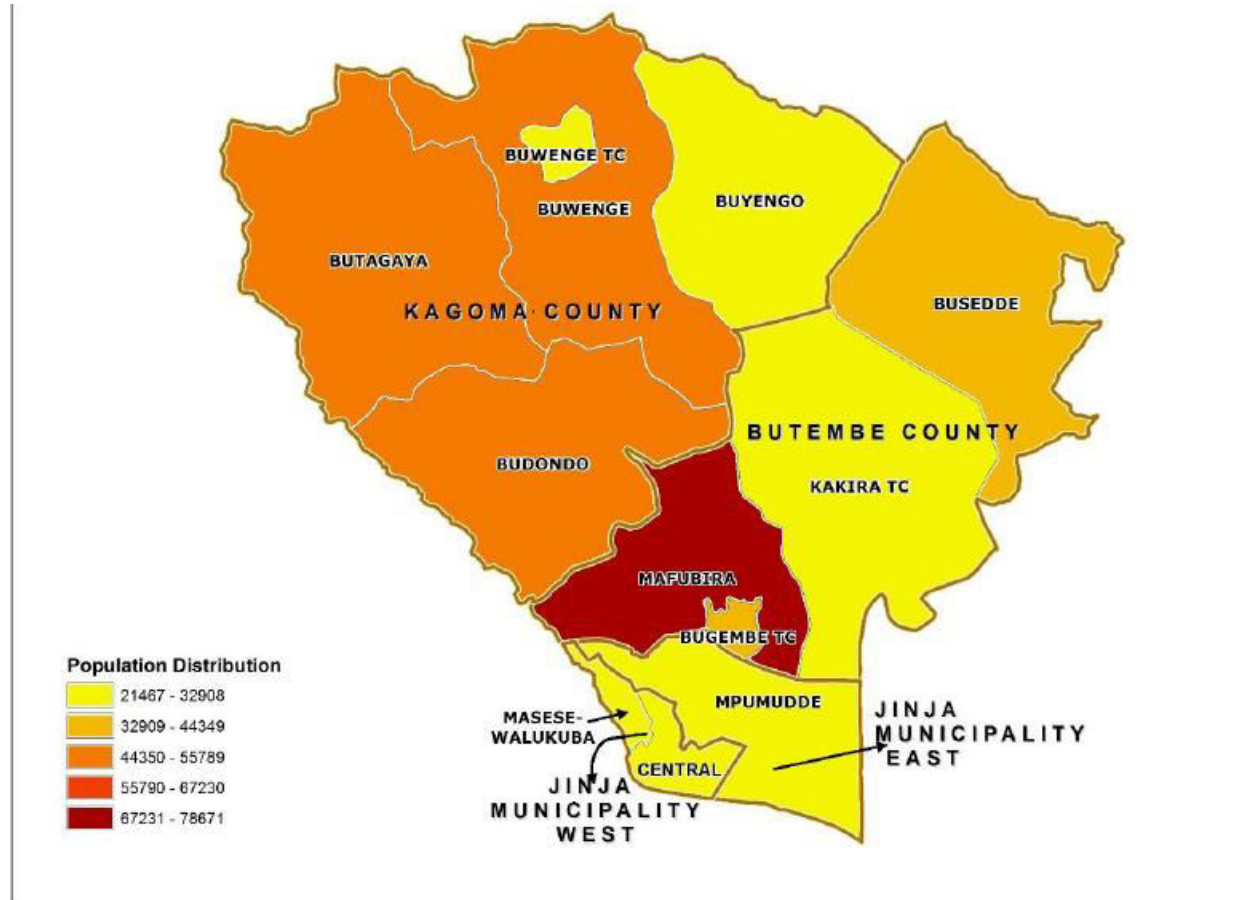
Bugembe Town council.....8 Sq.km

Total area..... 212 Sq.km

# Jinja city population estimate

	Population	2014	Projected to 2022 at 3%
1	Jinja Municipality	76,188	99,408
2	Bugembe Town Council	41,707	54,418
3	Mafubira S/C	78,671	102,648
5	Budondo SC	50,508	65,901
		247074	322,376

# Population of Jinja 2014

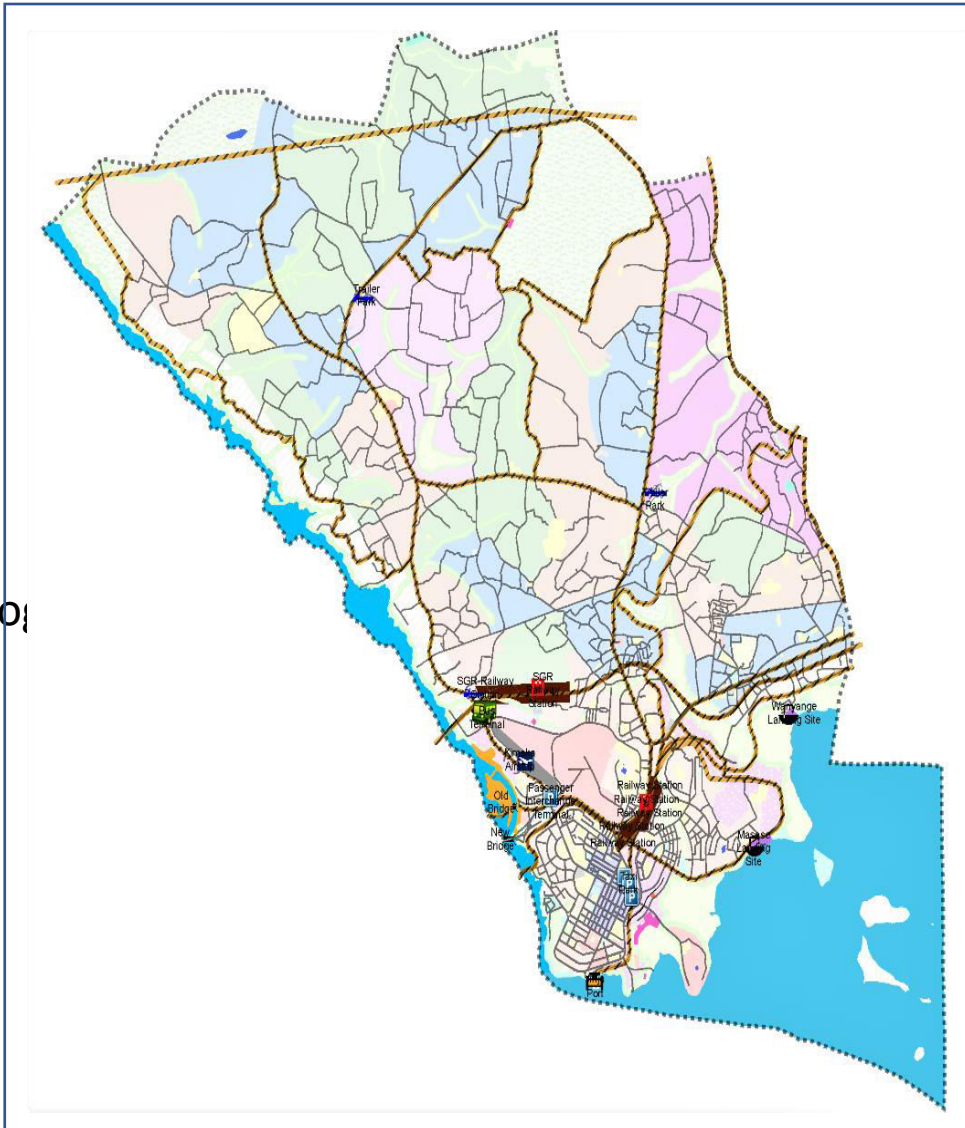


# Natural Resources

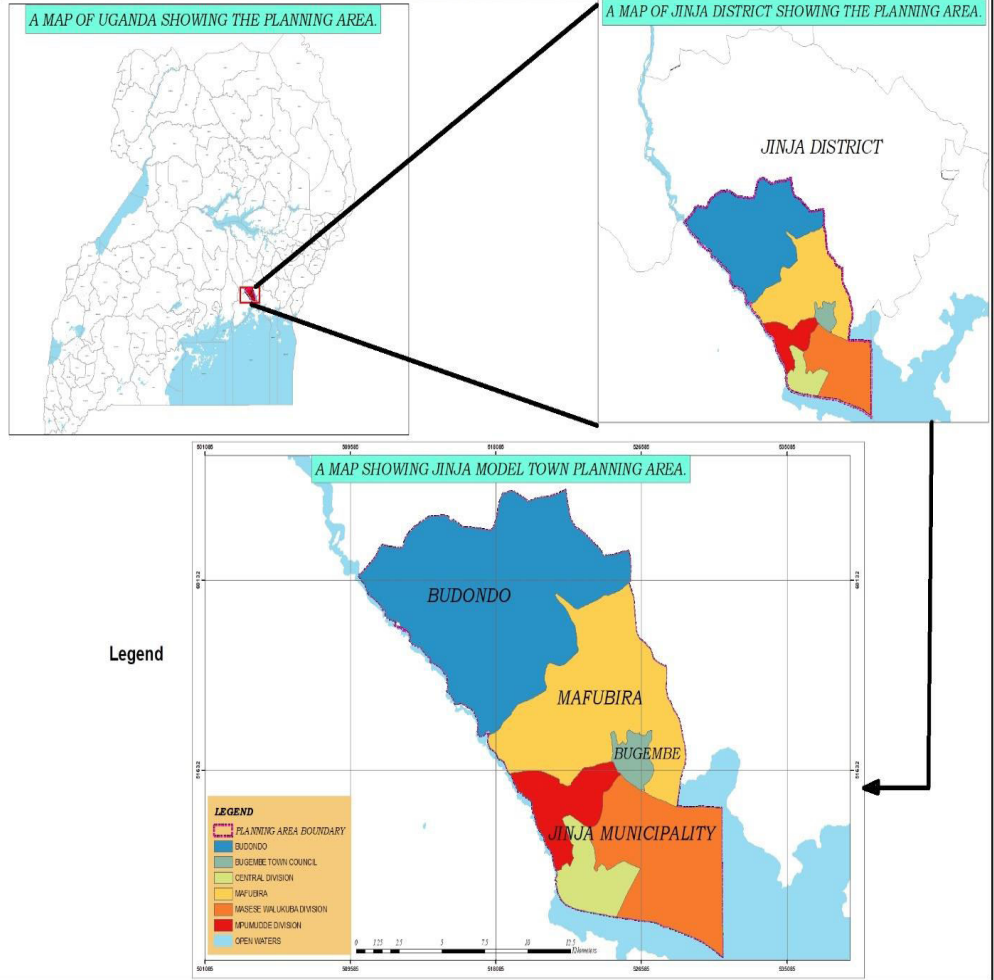
- Over 30kms of water expanse of Lake Victoria the source of the Nile, River , a 15km stretch of the Victoria Nile,
- around 20km<sup>2</sup> of wetland, average height ASL is 1300.
- there are hills of Masese, Butiki, Igenge, Wanyange and Mpumudde which need to be protected from unplanned settlements and heavy mining of laterite (Draft Jinja city physical development plan)
- The major wetlands include, Kirinya, Walukuba, Masese, Budumburi, Kikenyi, Kyekide, Makenke-Kaita Bawala, etc.
- Makenke, Kyekidde, Budumbhuli, Kikenyi, Mpumudde, Malaria drain are streams draining the area.
- Key biodiversity areas in Jinja city include Lake Victoria, River Nile, Wetlands (Kirinya, Masese, Walukuba, Budumbuli wetlands), Kimaka forest, Hill slopes (Butiki, Wanyange, Igenge hill slopes)



# JINJA CITY, UGANDA



## A LOCATIONAL MAP SHOWING JINJA MODEL TOWN PLANNING AREA.



# Key biodiversity areas

Key biodiversity areas	Appropriate nature-based actions	Reason
<ul style="list-style-type: none"> <li>▪ Kirinya wetland</li> </ul>	restoration and protection	It is a wetland ecotone interfacing water treatment plant with Lake Victoria. It carries out tertiary treatment of waste water from the municipal waste water treatment facility. It received waste from tanneries, vegetable oil manufacturing plants and storm water from the city it is deep (6m). It is heavily encroached on and recently broke of floating mass which was transported up to Nalubaale Dam.
<ul style="list-style-type: none"> <li>▪ Walukuba wetland</li> </ul>	restoration	Recipient of effluent from factories and the town, Farmers and industries have encroached on it heavily.
<ul style="list-style-type: none"> <li>▪ Masese wetland</li> </ul>	protection	Interface of industries with the Lake Victoria close to water intake
<ul style="list-style-type: none"> <li>▪ Budumbuli wetland</li> </ul>	Restoration	Heavily encroached on by farmers industries' and settlements

# Key biodiversity areas

Key biodiversity areas	Appropriate nature-based actions	Reason
▪ Kikenyi wetland	Restoration	Heavily encroached on by industries/settlements/farming activities
▪ River Nile banks	Protection and management, restoration	Heavy settlements, industries and farming activities, tourist value
▪ Lake Victoria	Management	Complex uses, landing, factories, settlements and agricultural impacts
▪ Hill slopes (Butiki, Igenge Wanyange)	restoration	Quarrying and settlements impacts

# How natural resources relate to climate change, weather and climate change:

- Wetlands and forests contribute to microclimate profile since they contribute to evapotranspiration and conventional rains and lowering earth's temperature.
- Riverbanks and lakeshores maintain the integrity of the lake by preventing soil erosion and filtering pollutants which would lead to siltation and flooding.
- Forests/trees are particularly carbon sinks reducing carbon dioxide in the environment which contributes to mitigating climate change.

# **livelihood outcomes or securities that relate Jinja's ecosystems**

- Food - hinterlands contribute food, lakes and rivers provide fish for consumption.
- Income - this is acquired from fishing from lake Victoria and river Nile, sand mining from wetlands, craft material extraction, water transport (landing) and tourism
- Water and sanitation – wetlands filters water and protect the water bodies from pollution
- Energy – wetlands prevent flooding and erosion into waterfalls that would interrupt energy production.

# key climate-related risks in the area arising from increased GHG profile

- With the high GHG emissions in Jinja it means that effect on climate change is significant.
  1. Increase in temperatures,
  2. change in microclimate,
  3. Irregular rainfall patterns.
  4. Flooding,
  5. The impact is also spread to the surrounding where there is massive cutting of trees to provide both firewood and charcoal.
  6. Rising lake levels
  7. Floating islands(wetlands cut off from the shoreline) impinging on power dams
  8. Flooding of the shoreline zones. Flooding on the shores of Lake Victoria for example in Masese
  9. Fire outbreaks
  10. Heat wave
  11. Disease spreading for example cholera, dysentery
  12. Dry spell (drought)
  13. Food shortages

# SOURCES OF GREEN HOUSE GAS EMISSION IN THE CITY

Table 1: Jinja energy balance (energy consumption by fuel and sector)

GJ	Residential	Commercial	Industrial	Local government	Transport	TOTAL
Bagasse	0	0	257,535	0	0	257,535
Batteries	237	0	0	0	0	237
Biogas	0	0	0	0	0	0
Biomass	0	0	492,071	0	0	492,071
Candles	54	0	0	0	0	54
Charcoal	506,557	84,815	666,395	0	0	1,257,767
Coal	0	0	30,189	0	0	30,189
Diesel	0	0	0	1,728	603,977	605,705
Electricity	28,581	62,739	754,321	121	0	845,763
Firewood	88,588	242,126	1,263,645	0	0	1,594,358
HFO	0	0	64,143	0	0	64,143
Kerosene	40,468	47	0	0	0	40,515
LPG	2,882	17,686	0	0	0	20,568
Petrol	0	0	116	314	930,930	931,360
Solar	168	9	0	0	0	176
<b>TOTAL</b>	<b>667,535</b>	<b>407,422</b>	<b>3,528,416</b>	<b>2,164</b>	<b>1,534,907</b>	<b>6,140,442</b>

# Energy Consumption

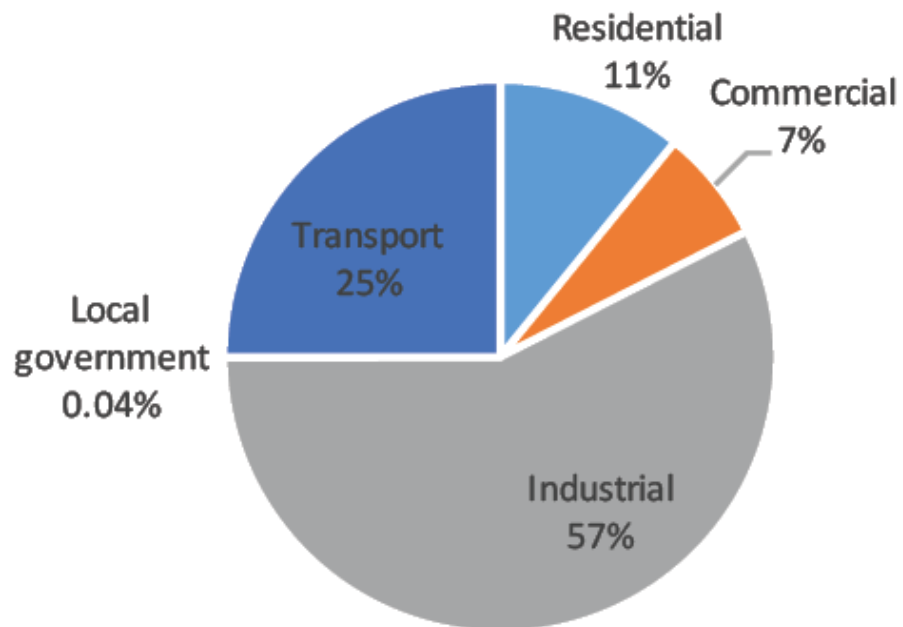


Figure 1: Jinja energy consumption by sector



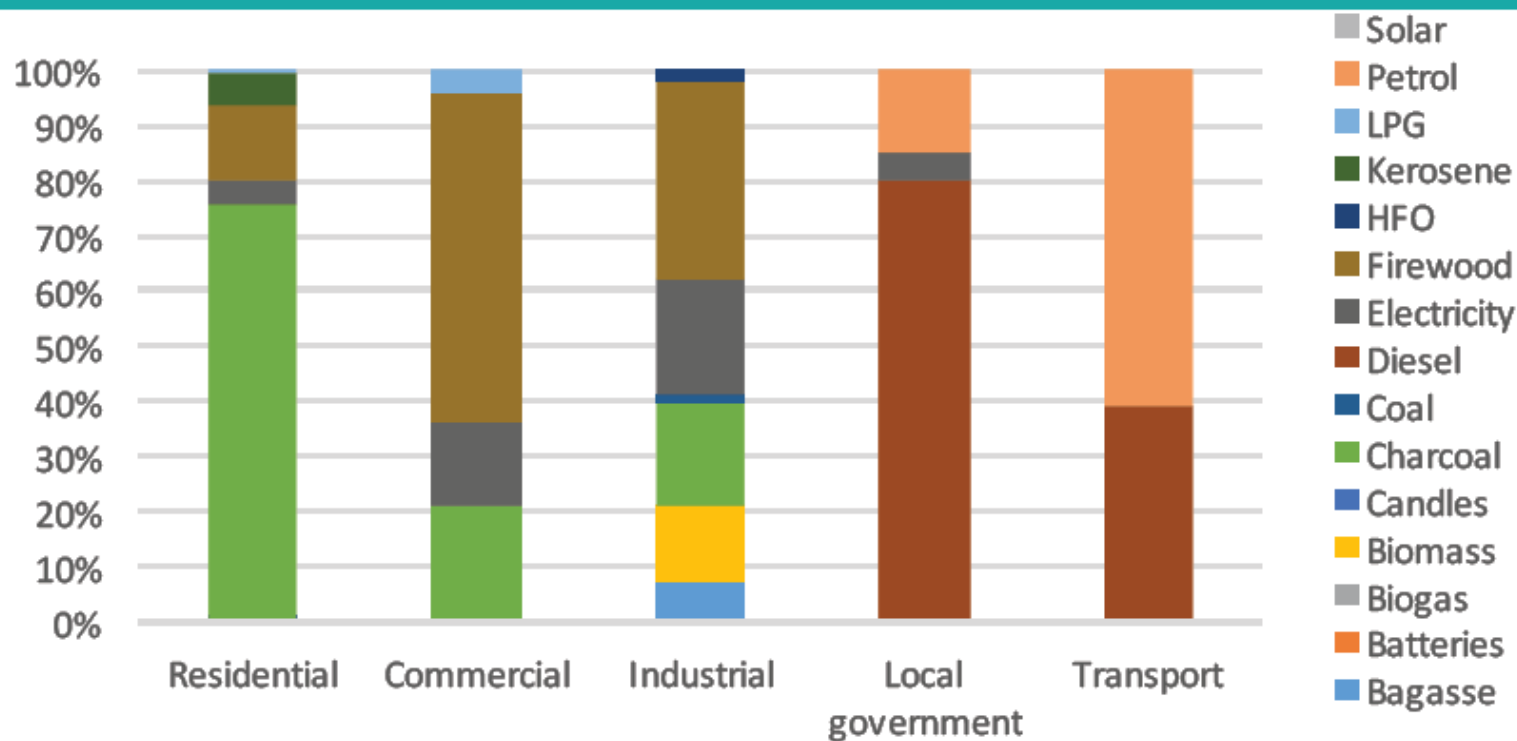
# Jinja profile on GHG Emission

In Jinja, more than half (%57) of all energy is consumed by the industrial sector, followed by a quarter (%25) in the transport sector, a roughly a tenth each in the residential sector (%11) and the commercial sector (%7) (Figure 1). Due to its location as a historically significant transport hub, and access to nearby large hydropower (Owen Falls Dam – now known as Nalubaale Dam, Kiira Dam and recently Bujagali Dam), Jinja was the industrial capital of Uganda (which title has since shifted to Kampala). As a result, it comes as no surprise that the largest proportion of energy is consumed in the industrial sector, with transport as the second major energy-consuming sector.

The major energy sources used in Jinja are firewood (%26) and charcoal (%20) (Figure 2). Transport fuels, diesel (%10) and petrol (%15), together with electricity (%14) and biomass (%8) make up most of the remainder. Small amounts of bagasse (%4), kerosene, HFO and coal (%1 each) are consumed, with very small amounts of energy coming from biogas, solar, LPG and batteries.

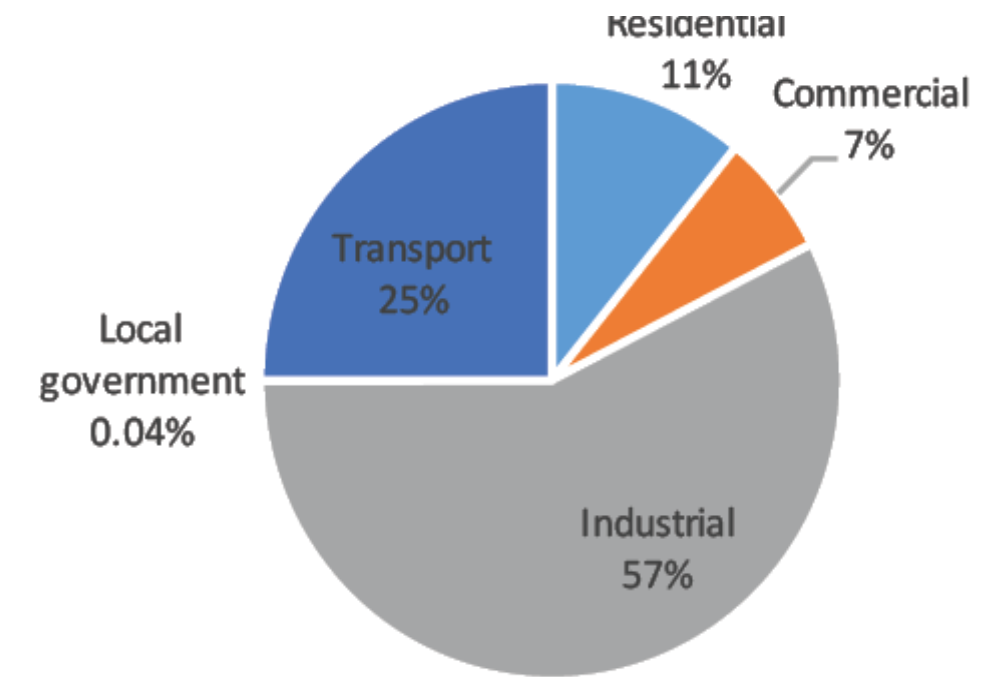
# Jinja fuel Industrial Sector

Figure 3: Jinja fuel use by sector



# GHG Emissions

- Given the above pattern of Energy Consumption certainly GHG Emission in Jinja is highest in the industrial sector (57%) followed by the transport sector 25% (*GHG can be computed*)



Energy consumption by sector

# key impacts of climate change –related risks Jinja City

- Loss of lives during flooding
- Loss of property during flooding
- Loss of biodiversity
- High medical costs and other related costs due to outbreak of diseases
- Soil erosion due to loss of vegetation cover resulting into drainage blockages
- Loss of livelihood
- Increased food prices -high cost of living
- Population segments of the population are affected by climate risks?
  - Adults increased dependence rates
  - elderly
  - youth
  - Children

# **Institutional strategies/policy responses in place to curb down climate change and its impacts?**

- Promoting integrated solid waste management
- Promotion of use of renewable energy like solar energy
- Conservation of energy through use of energy saving infrastructure like energy saving stoves
- Increasing green coverage through projects like greening the city
- Protection of fragile systems like wetlands through enforcement
- Encouraging sustainability like walking, cycling
- Encouraging use of public transport
- Improvement of packing in the city
- Integration of climate change prevention or mitigation in all infrastructure development projects

# Local community coping mechanisms to adopt and mitigate against climate change

- Communities and industries have resorted to energy saving stores and briquettes, use of wastes like bagasse as way of conserving energy
- Fish mongers have turned to fish farming -*very lucrative*
- Industries are now recycling wastes –Skyfat
- There is guided use of wetlands by the local community
- Schools have put effort in planting trees

# Measures for reduction of GHG for Jinja City

- Industries like BIDCO, Nile Agro Industries have tree Nurseries and generate tree seedlings which they issue to communities freely to help regenerate lost vegetation. BIDCO policy is to acquire machines that can use only Bagasse to run steam boilers.
- In the east African steel corporation they are using electricity.
- Waste to energy initiatives: Kakira Sugar Factory has a co-generation power plant generating 54MW of electricity. Their use of firewood is limited.

# Measures for reducing GHG emission for Jinja City

- All the Major factories in Jinja have partnership with the Uganda industrial Cleaner PRODUCTION Center that has been training and assessing them in compliance to CLEANER PRODUCTION AND CONSUMPTION TECHNIQUES
- Our role is to enforce government policies, laws, regulations and guidelines
- The Department does regular compliance inspection and monitoring. NEMA does the same all factories have EIA certificate and they do regular Environment Audits in collaboration with NEMA.
- We regularly hold joint world environment day activities together with factories where we promote awareness and plant trees.
- There is a master drainage plan to handle flooding issues
- Implementing waste to energy initiatives:
- The Clean Development Mechanism
- Implementing the NAMA: integrated waste management i.e. recycling waste and making biogas and electricity out of waste in partnership with the ministry of Energy and mineral Development and the private sector.



Mechanisms in place to ensure a climate resilient and low cost carbon City

- Promote use of renewable energy
  - Industries are using bagasse, g/nut waste, coffee husks and not wood chippings
  - Use of Solar energy for lighting/heating all our streetlight developments are solar street light installation
  - Promotion of the integrated waste management in collaboration with MEMD and NEMA.
  - Implementation of the Clean Development mechanism –stalled

# Mechanisms in place to ensure a climate resilient and low cost carbon City

- Developing partnerships for waste to energy. Here I wrote and won a grant of 560,000 euros to undertake a study formulate a waste management plan and invite private sector to invest in an appropriate waste to energy facility from the Netherland **government**. This also stalled due to intrigue from staff of Jinja city.
- Promote use of energy saving stoves
- Promoting use of LPG

# Mechanisms in place to ensure a climate resilient and low cost carbon City

- Promoting non motorized transport (walking and cycling) by making paved walkways whenever a road is reconstructed
  - Under this I wrote a proposal and won an award of 200,000 euros from TUMI-GIZ to implement sustainable mobility initiatives in Jinja including turning some roads into walking streets to decongest access to Jinja central market. Provide solar street lighting, pave walkways, bicycle parking and Traffic lights. Reorganizing traffic and street parking. All stakeholder embraced this project. But technical staff have due to intrigue sabotaged this project it has stalled.
  - Promoting electric vehicles, bulky transport and public transport
  - Planning compact settlements so that people can walk to work places

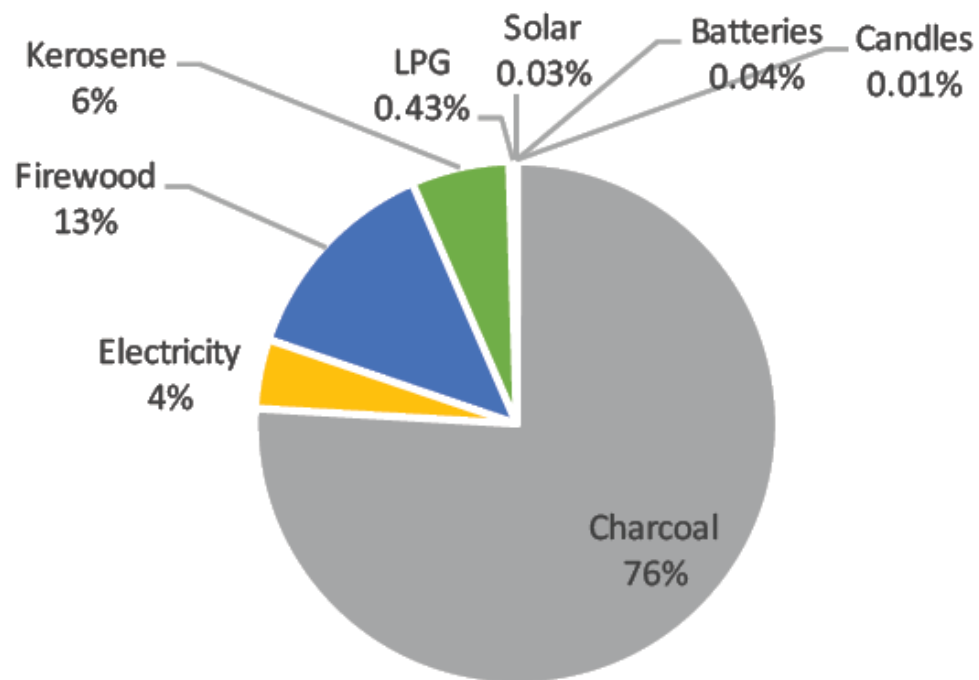
# Mechanisms in place to ensure a climate Resilient and low cost carbon City

- Integrating environment, greening and climate change in all development activities of the LG and private sector. We screen all projects and ensure environment safeguards are implemented.
- Evidence is clear on Reconstructed roads.
- We run tree nurseries to boost greening of the town-stalled due to meager funding
- Restriction on tree cutting. Town dwellers must obtain permission to cut a tree.
- Promote greening and beautification of the city 75% the roads, open spaces and green areas through green partnerships.
- Conduct community mobilization and interactions with all target audiences Planting of indigenous tree species in schools and

# SUMMARY ON SOURCES OF GHG.

- TRANSPORT SECTOR; use of fossil fuels Diesel, petrol, paraffin, LPG
- industries (using Charcoal/firewood/garden wastes for combustion)
- Commercial Sector (use of biomass for cooking)
- Households : rampant use of Biomass for cooking
- Poor Waste management: At Disposal sites
- Construction sector

Etc.



*Figure 6: Residential energy consumption by fuel*

More than three-quarters (%76) of energy consumed in the residential sector comes from charcoal. Firewood (%13) constitutes the majority of the remainder, followed by kerosene (%6) and electricity (%4). Small to negligible amounts of energy consumption demands are met through the use of LPG, solar, batteries and candles.

# Household sources of GHG

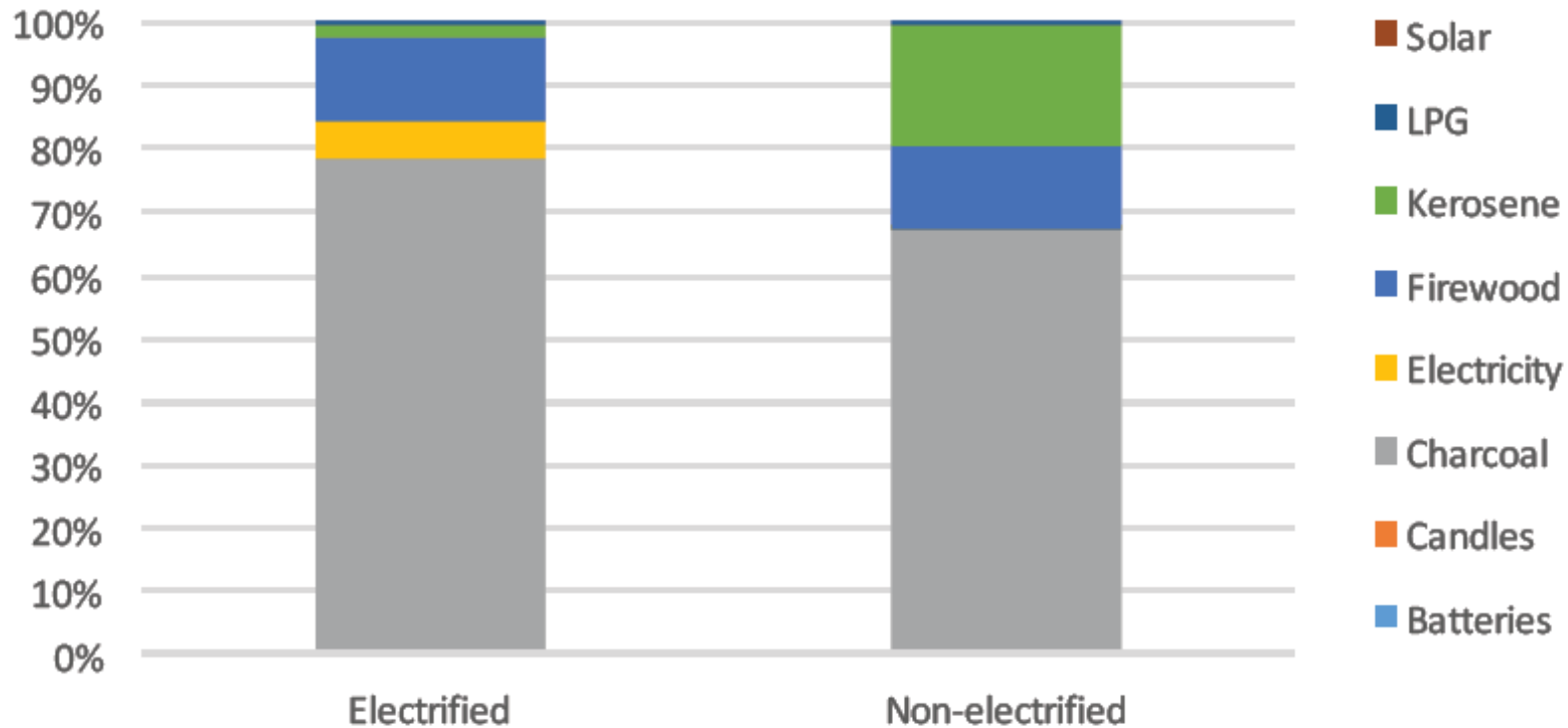


Figure 7: Residential fuel use by electrification status

# Summary on issues and planned interventions

ISSUE	Locality	Causes	Strategic Action	Activities
Climate change effects mitigation and adaptation	Entire town	Lack of environment awareness	Carryout environment awareness campaigns. Carry out city greening /beautification campaigns	<ol style="list-style-type: none"> <li>1) Carry out awareness activities on World Environment day</li> <li>2) Participate in Agricultural shows</li> <li>3) Establish 2 tree nursery gardens in southern division as well as northern division</li> <li>4) Acquire land for the nursery in northern division</li> <li>5) Lobby for installation of an automatic weather measuring station</li> </ol>
Degradation of wetlands	Kirinya wetland Kyekidde, Kikenyi/Budhumbuli Masese wetlands Walukuba wetland Makenke stream River Nile banks Lake Victoria shores	location of Factories close to wetlands and lake shores Industrial discharges Encroachment by farmers Allocation of wetland –land titles in wetlands and protected river banks	Increase awareness creation Introduce issuance of wetland user permits Carry out regular wetland inspection and compliance monitoring Have a clear demarcation on wetland boundaries	<ol style="list-style-type: none"> <li>1) Liaise with ministry of water as to get wetland boundary maps</li> <li>2) Plant a line of bamboo vegetation between beacons planted to demarcate wetland boundaries.</li> <li>3) Pursue strategies to prevent titling of wetlands for private developers</li> <li>4) Hold awareness seminars</li> </ol>



# The Clean development mechanism project.

- Jinja Municipal Council was among the 13 municipalities carrying out composting program.
- This arose from the provisions of the United nations frame work for control of climate change
- It is meant to reduce green house gas emissions (CO<sub>2</sub>, CH<sub>4</sub>) and thus benefit from carbon credits

# Composting

- With funding from the world bank a roofed composting windrows, composting tractor and refuse truck were provided. Composting commenced on second September 2009.
- Composting is an aerobic process where organic matter is digested by help of microorganisms and converted to Humus



# Composting Cont'd

- The stabilized matter compost is a soil conditioner or mild fertilizer that can be used on flower lawns, gardens and farms
- Other components of the waste are recycled, reused or land filled

# Municipal composting under the CDM

It provided the required infrastructure for municipal composting in Ugandan Municipalities:

1. A Composting Slab windrows and turning equipment such as excavator or wheel loader and monitoring gadgets; thermometer, oxygen meter, etc



# The Windrow- Composting

Composting is a natural process of decomposing organic matter into fertile soil- manure

Oxygen and moisture are essential elements in successful composting.

The windrows provide for the smooth flow of air which facilitates the aerobic composting of the waste piles

1. Waste is delivered
2. Waste is piled in rows under the roof, sorted or unsorted
3. Slurry of dung is sprinkled on top

## COMPOSTING PROCESS



Fresh Garbage



Sorted Garbage



1<sup>st</sup> and 2<sup>nd</sup> Windrow



Ready for sieving

# The Windrow-composting Continued

1. Waste is periodically sprinkled with water to keep it moist lest composting will not take place
2. You monitor temperature to ensure the pile is actively composting (50-80°C).
3. You turn the waste to the next windrow after 1-2 weeks.
4. Manually remove rejects and after 8-12 weeks you breakup the compost pile and sieve to get the final product.



Ready Compost after sieving

## The CDM Composting Facility at Masese



Sorted garbage



30–40% of the waste is polythene

## COMPOSTING PROCESS AT MASESE LANDFILL



**Step 2** Waste is sorted and compost piles are made in windrows. Moisture is added and temperature is monitored while turning the waste from one windrow to another



Step 1 Waste Received at the landfill



Step 3 periodic turning and moistening is done for 8-12 weeks. The ready manure is sieved and packed ready for use.





## The CDM<sup>+</sup> Connecting Facility at Masese





# Compost making at masese

**compost**



**Rejects**



# Compost making pictorial

**compost**



**compost**



# WORK FORCE

Category	SEX		Total
	M	F	
Site Manager	1		1
Data Clerk	1		1
Supervisor		1	1
Security guards	1		1
Gardener	1		1
Drivers	2		2
Coordinator	1		1
Sorters	6	33	36
Total			47

# Monthly Budget

- Monthly Budget was
- Personel 3,300,000
- Tools and Protective wear 1,000,000
- Feeding 900,000
- Fuel 2,300,000
- Total 7,500,000
  
- Annual budget: 86,000,000

# **Sustainability in SWM in Jinja City:**

- ❑ The solution to SWM in Jinja City is integrated solid waste management with involvement of the communities in the city.
- ❑ We have with USMID, NEMA and MEMD developed a waste management strategy for Jinja city
  - ❑ A waste sorting manual
  - ❑ The Jinja City ordinance

# What is Integrated solid waste management?

- ❑ The selection and application of suitable **techniques, technologies** and **management** programmes to achieve specific waste management objectives and goals:
- ❑ Waste Reduction, Reuse and Recycling
  - Storage, collection, transfer, and disposal facilities
  - Composting
  - Treatment
  - Monitoring





- The objective of ISWM is to deal with society's waste in an environmentally and economically sustainable way.
- Involving Different aspects of sustainability (technical, environmental/ public health, financial, etc)
- Different collection and treatment options adapted to a specific habitat scale, i.e. household, neighbourhood and city level.
- Different stakeholders, governmental or non-governmental formal or informal, profit-o non-profit oriented (CBOs/CBEs, NGOs, Medium and Small scale Enterprises)
- The Waste Management System and other urban system such as drainage, energy, agriculture, etc

# Definition: Integrated Solid Waste Management (ISWM)

- can be also defined in many ways but it is probably best to think of it as a way of using a combination of waste management techniques to treat the different types of waste in ways that are environmentally, financially and socially sustainable. ISWM should be based on the waste hierarchy and focus on using the 3 Rs while finding a suitable way of dealing with the remaining waste..

# Challenges

- 1. Inadequate resource Envelope, the Department depends on local revenue which has been hit by Covid 19
- 2. Intrigue, outright manipulation and Sabotage
- 3. Little support from central government towards the sector.