Investigating flood-resilient sanitation solutions for the northern division, Kabale Municipality, Uganda

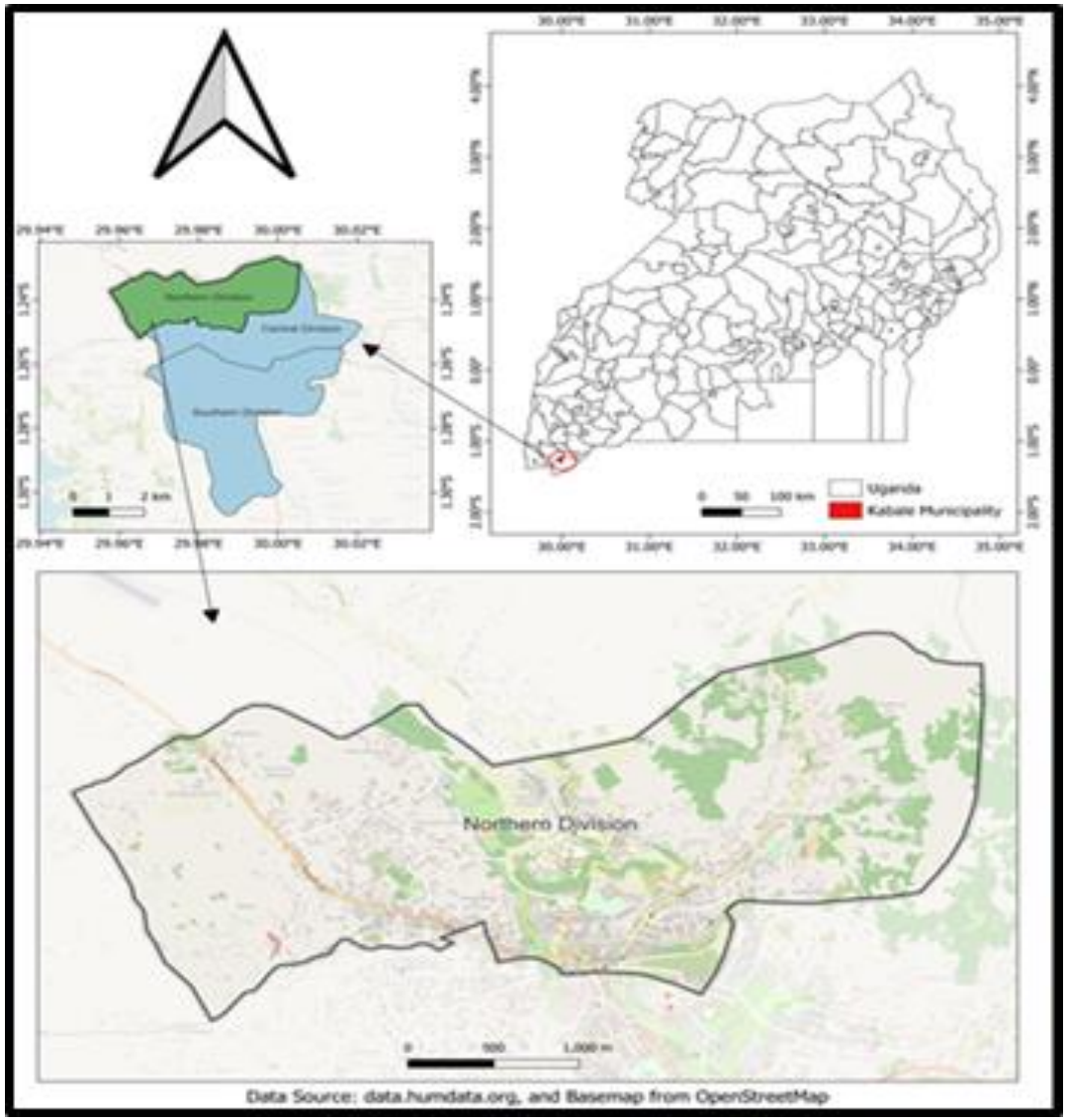
Shirish Singh & Charles Besham Mushabe
IHE Delft Institute for Water Education

Global South Academic Conclave on WASH and Climate linkages

2nd - 4th February 2024, Ahmedabad

Introduction

- Impacts of climate change on sanitation – (i) extreme heat; (ii) water scarcity and drought; (iii) Increased precipitation, flooding and extreme weather events and (iv) rising sea levels;
- South western Uganda, Kabale Municipality, Northern Division;
- Population ~ 53,200 (2020);
- Onsite sanitation (65% - traditional pit latrines - unlined; 30% ventilated improved pit latrines; 3% urine diverting dry toilets and 2% septic tanks);
- Impacted by flooding and the mostly affected are low lying areas along the Kiruruma river banks;



Problem/challenge

- A typical house in upper Bugongi area (gentle sloping land) – semi permanent structure built with local materials; traditional pit latrine (unlined) at lower elevation;
- A family of 6 (2 adults; 4 children);
- HH income ~ UGX 800,000 (USD 216) per month;
- About 0.2 m high flood is experienced 2-3 times annually;

- One night after torrential rain, the house was submerged and latrine collapsed; faeces oozing into flood waters;
- Six months to construct a new house and pit latrine on the elevated area (toilet is 1 m away from kitchen and 0.5 m from the house) – unpleasant odour; planning for septic tank;
- UGX 600,000 (USD 162) spent to construct the new toilet;

Objectives

- Main Objective
  - To investigate and develop appropriate flood-resilient sanitation solutions for peri-urban areas in Uganda

- Specific Objectives –
  - To assess the prevalence of flooding and its consequences on sanitation systems;
  - To develop adaptive solutions for on-site sanitation systems to flooding;

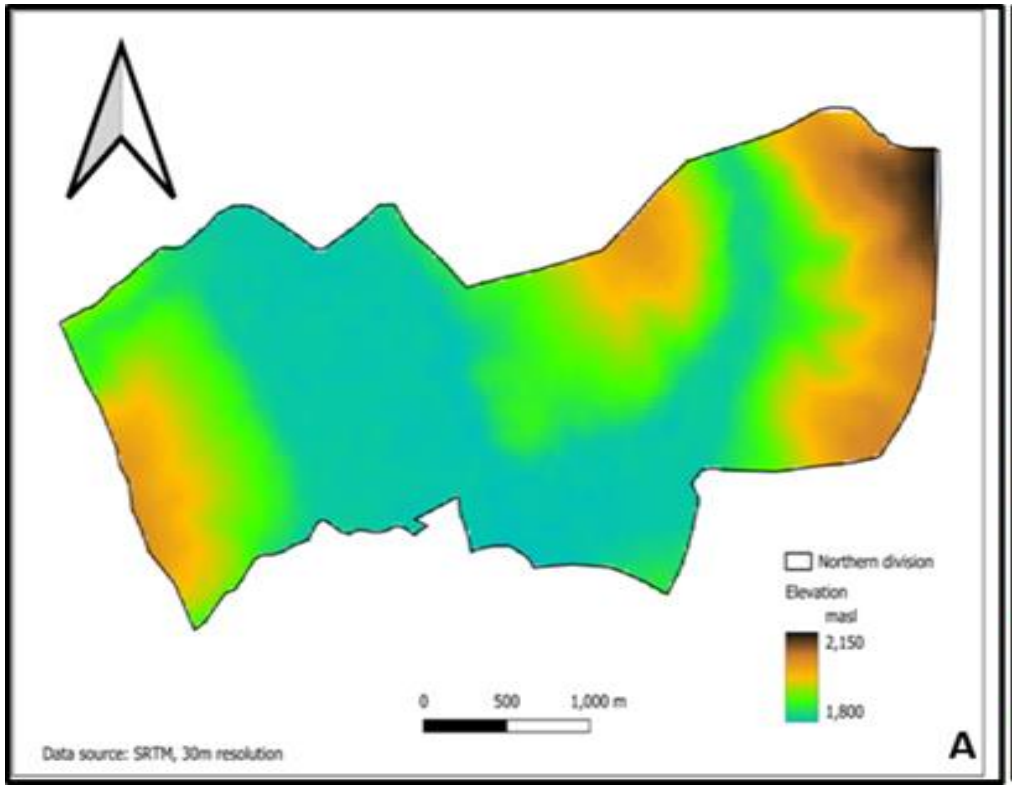




Methodology

- Data collection
  - Secondary data - Literature reviews;
  - Primary data – (i) Random household survey (sample size 94 calculated based on 95% confidence level and 10% margin of error) and (ii) Purposive sampling – 8 Key Informant Interviews (KIIs) with relevant stakeholders and 4 Focus Group Discussions (FGDs);
  - Observations – typology of sanitation systems; impact of flooding;
- Analysis
  - Quantitative data – analysed using excel and presented as tables; charts; graphs;
  - Qualitative data – descriptive and thematic analysis;
- Multi Criteria Analysis (MCA) – contextual criteria/indications developed in consultation with relevant stakeholders;

Findings – prevalence of flooding



- ~1,656 mm rainfall mostly during MAM and SON months (150-250 mm/month);
- Significant flooding – Kiruruma river banks (150-200 m from the banks) – 2-3 incidences per year (65% HHs);
- Up to a height of 1.5 m for a duration of 1.5 to 2 weeks;

Findings – consequences and impact

- 69% partial failure of OSS (infrastructure undermined but usable);
- 26% complete failure (infrastructure completely destroyed and unusable);
- 80% lacked access to sanitation (lack of funds to repair/reconstruct);
- Major expenses for OSSs is repair and maintenance (87%) followed by 15% for acquiring substitute sanitation systems (plastic containers);

- Increased mosquito bleeding – 71%;
- Contamination of water sources and outbreak of waterborne diseases – 57%;
- Psychological distress, anxiety, and other mental health issues – 43% (inadequate access to sanitation; insufficient funds to repair or build sanitation facility);
- Disruption of sanitation services – 33%;

Solutions

72% - construction of elevated pit latrines

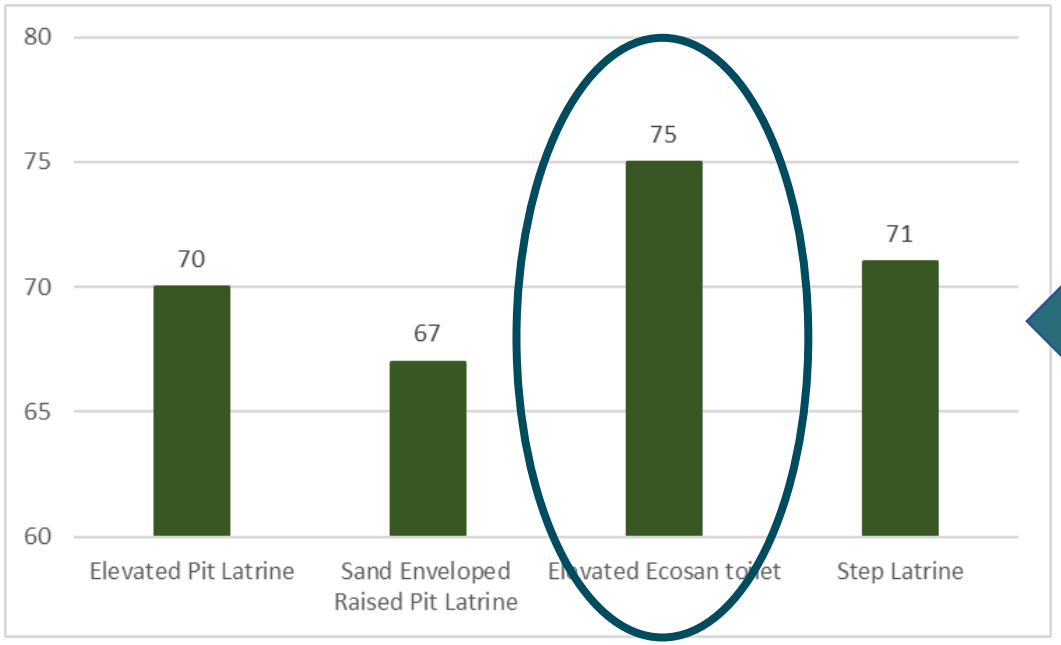
55% - establishment of diversion channels

35% - construction of step latrine

1% - constructing elevated ecosan latrine

Adaptive solutions

- Criteria/aspects
  - Technical aspects – 5 sub-criteria (0.45);
  - Social acceptance – 2 sub-criteria (0.25);
  - Stakeholder participation – 2 sub-criteria (0.2);
  - Cost of technology – 3 sub-criteria (0.1);



Criteria Aspects and Indicators		Rating indicators for the alternative technologies			
Aspects	**Indicators**	**Elevated Pit Latrine**	**Sand Enveloped Raised Pit Latrine**	**Elevated Ecosan toilet**	**Step Latrine**
Technical	Percentage of local materials and resources used for the technology	4	4	4	5
	Size of land occupied in square meters	3	3	3	1
	The system's ability to resist and sustain a floodwater height of 0.5m to 1.2m	4	3	5	5
	Level of difficulty or simplicity in the implementation of the technology	2	1	5	3
	Local capacity to manage, operate, and maintain the technology	3	3	4	3
Social Acceptance	Percentage of residents involved	5	5	5	5
	Percentage of community members able to use the technology	5	5	3	5
Stakeholder Participation	Percentage of local population involved in the decision- making	2	2	2	2
	Percentage of people trained and sensitized in flood and sanitation issues	2	2	2	2
Cost of technology	Investment Cost affordability and accessibility	4	4	5	4
	Percentage of the initial Capex to be spent after half of the lifespan	3	3	5	3
	Percentage of annual Household income spent on routine maintenance	3	3	5	3

Conclusion and recommendations

- Flooding is experienced 2-3 times annually and intensified by inadequate drainage system and poor maintenance;
- Flooding poses a twofold challenge for OSSs –
  (i) Technical – system failure or malfunction and compromising hygiene and environmental safety;
  (ii) Social – increased public health risks; displacement; economic pressure;
- Elevated ecosan is the most appropriate on-site sanitation technology followed by step latrines;
- Kabale Municipal Council (KMC) should provide clear design and implementation/monitoring mechanism along with public awareness and stakeholder engagement for effective implementation of the aforementioned solution;
- To minimise the impact of flood, KMC should prioritize development, implementation and maintenance of a comprehensive drainage system;
- National Environment Management Authority should reinstate buffer zones along River Kiruruma to restore the natural drainage system;

Thank You

Global South Academic Conclave on WASH and Climate Linkages