A PPGIS-BASED FRAMEWORK FOR MUNICPAL SOLID WASTE MANAGEMENT

by
Arinaitwe Irene
PhD IS Makerere University

Supervisors

Associate Professor Maiga Gilbert

Agnes Nakakawa (PhD)

Introduction

- Municipal solid waste generation rates have tremendously increased. World Bank (2018) estimates show that global municipal solid waste generation rates stand at 1.3 billion metric tons and are expected to rise to approximately 2.2 billion tons by 2025 world wide.

(Rapid urbanization, high population growth, industrialization rates..)

- Waste collection, transportation and disposal are the most challenging tasks *(Guerrero et al., 2013*)

Introduction

Waste collection and disposal challenge

- In Africa, only 12% of waste is taken to the landfill and 78% is illegally dumped.
- In Uganda and Kampala in particular only 30-40% of the waste taken to the landfill in 2008 and 40-50% of the generated waste is taken to the landfill (NEMA, 2010; KCCA, 2016).

Introduction

- Public participation has been proposed as one of the means for attaining sustainable municipal solid waste management systems(Eriksson et al., 2017, UNDP, 2009; World Bank, 2018) .
- Most of the existing MSWM efforts such as Lifecycle Assessment, reverse logistics management, Multicriteria decision analysis disregard the importance of public participation(Garnet et al, 2017)

Berry et al (2109) shows that public participation in environmental decision making is one of the neglected SDG.

Participatory Geographic Information system(PPGIS)-proposed solution

Potential of PPGIS for MSWM

- PPGIS –An e-participation tool based on GIS and also caters for non-GIS experts
- PPGIS in MSWM issues have locational attribute (Ganapati, 2011)
- PPGIS solicit effective information for planning (Kahila-Tani et al., 2015)
- MSWM executive, operational, environmental, social and managerial decisions such as the siting of waste processing and disposal units, allocation of waste flow to processing facilities and landfills require PPGIS (Ghiani et al., 2014)

Map based Participation

Study aim

- This article identifies the critical conditions for meaningful use of public participation GIS (PPGIS) tools to support the MSWM planning processes

- Factors for successful of PPGIS are categorized based on Enhanced adaptive structuration theory (EAST-2) (Jankowski and Nyerges, 2003) Convening (input) constructs

Study design

Target population	Solid waste officers, environmental officers, physical planners, field/landfill officers, managers and directors of waste collection contracted officers and landfill operators • The respondents were from Mukono, Entebbe and Kampala capital city Authority
Sample size	The principle of saturation point in qualitative studies was based on to select 25 participants
Sampling method	Purposive sampling was used. Selection criteria for subjects that participated in the interviews were: • The availability or willingness of a respondent to allocate time to respond to Interview questions through a face-to-face dialog with the researcher • Having knowledge on waste management and also being involved in planning for MSWM

Study design

Data collection instrument	A semi-structured interview guide to keep the researcher consistent with the flow of the questions • Face to face interviews were conducted (between the researcher and each respondent)
Data analysis	Thematic analysis was used to analysis [44] • Transcriptions were used to identify, name and categorize phrases and words in order to develop the initial codes • From the initial codes, themes were developed which were iteratively revisited to develop the final themes • Final themes were refined and named with EAST-2 view and matched with the convening constructs

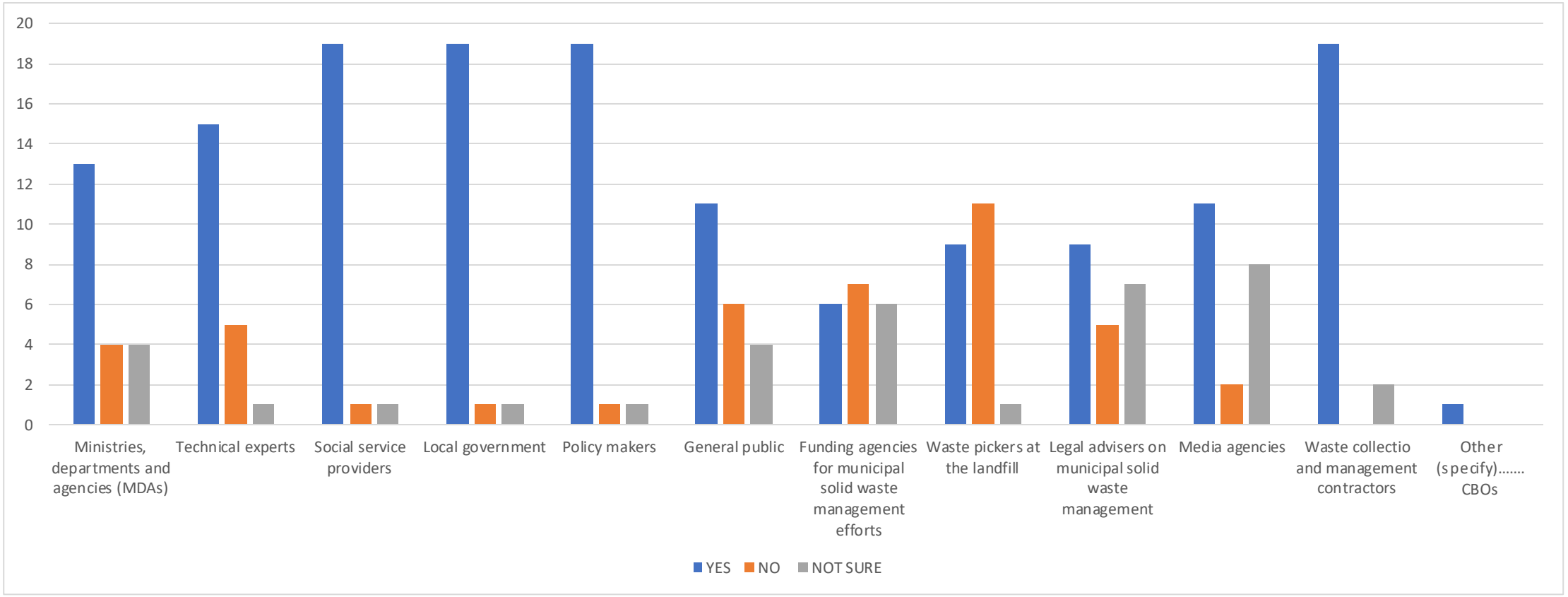
Demographics of the participants

Sex	freq	%age
Female	4	19.05
Male	17	80.95

Highest level of Education	freq	%age
Certificate	2	9.52
Diploma	2	9.52
Graduate	15	71.43
Post-graduate	2	9.52

Job Tittle	freq	%age
Assistant Physical planner	1	4.76
Director	3	14.29
Environmental officer	1	4.76
Field officer	2	9.52
Health Inspector	3	14.29
Landfill officer	1	4.76
Operations manager	4	19.05
Solid waste officer	4	19.05
Town clerk	1	4.76
Physical planner	1	4.76

Key Stakeholders in MSWM



Individual participant influences

- **participant's knowledge and awareness** of the existing MSWM practices

"Some stakeholders are at times not ware of existing MSWM practices and initiatives and some lack knowledge of MSWM principles"

- **public attitude** towards municipal solid waste management initiatives and projects

"Most people think that handling municipal waste is not their responsibility so they are not concerned" (Field officer 1).

sensitization campaigns local term (baraza)

Social-Institutional Influences

- Availability of resources

  “It is time consuming and costly to involve the stakeholders” (solid waste officer 3).

- Legislation and guidelines

  “Guidelines and legislations to demonstrate the relevancy of stakeholders at each stage in planning and the premises of participation”

- Political will

  “Politicians spread the gospel of free MSWM services and call on the citizens to embrace some of the initiatives like paying for waste collection”

- Institutional practices and norms

  “It is a common practice with institutions not to involve stakeholders; however, there is a change where majority stakeholders are being brought on board” (solid waste officer 1).

  “public participation hinders development so most institutions are not ready to involve the public and other stakeholders”

Technological influences

- limited application of ICTs especially GIS in MSWM practices although ICTs are necessary component of any sound municipal solid waste system.

  "ICTs such as GIS are rarely used. The entire process is still manual"

Cited as

- 1. Arinaitwe I., Maiga G., Nakakawa A. (2019) Towards a Public Participatory GIS-Based Framework for Municipal Solid Waste Management. In: Mendy G., Ouya S., Dioum I., Thiaré O. (eds) e-Infrastructure and e-Services for Developing Countries. AFRICOMM 2018. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, vol 275. Springer, Cham

Acknowledgements

Embassy of Sweden
Kampala

WE BUILD FOR THE FUTURE
MAKERERE UNIVERSITY