



Sustainability evaluation of regional water utilities in Tanzania: Non-Revenue water perspective

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Date: 19th March, 2019

1st Maji week annual scientific conference, Ministry of Water, 18 - 19 March 2019, Dodoma

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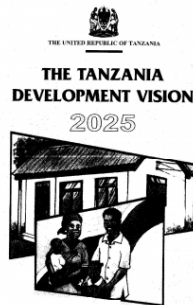
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Introduction

As a nation, with regard to water, Tanzania is pursuing:

- Sustainable Development Goals 2030: Goal no. 6.1; by 2030, achieve universal and equitable access to safe and affordable drinking water for all
- Africa Water Vision 2025: equitable water and sustainable use...
- Tanzania Development Vision 2025: universal access to safe water.



The Africa Water Vision for 2025

Envisions:
"An Africa where there is an equitable and sustainable use and management of water resources for poverty alleviation, socio-economic development, regional cooperation, and the environment"

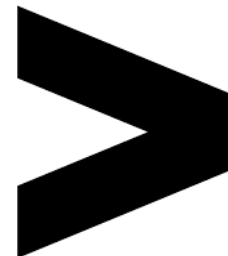
Source: UN/Water Africa 2004



Water utilities in the country are challenged with **limited sustainability** in water supply service provision, rendering customers dissatisfaction.



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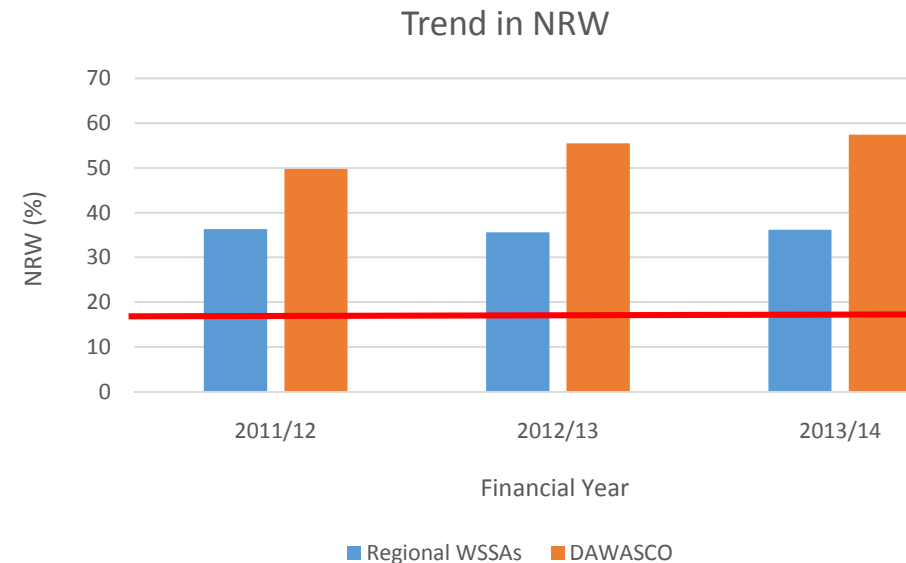


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Problem statement

Regional water supply utilities :

- Water produced is estimated to increase from 234 – 248 Million m³ in 2014/2015 F/Y.
- Overall **NRW** reduction was from 44 – 43 % in 2013/2014 to 2015/2016 respectively
- NRW service level benchmark is 20 %



Physical and commercial water losses together with unbilled authorized consumption (e.g. for flushing mains or fire-fighting) make up the amount of NRW in a water supply system.

NRW is not controlled, sustainability level of water supply services reduced.

study was conducted for the purpose of evaluating sustainability in view of reducing NRW in 23 regional water utilities of Tanzania

methodology

ata collection: Quantitative and qualitative data collected through structured questionnaires disseminated to all 23 WSSAs

collected data based on following attributes/factors of NRW:

- Adequacy of metering and metering management;
- Meter reading and billing data management;
- Control for unauthorized consumption;
- Leakage control;
- Quality of infrastructure; and
- Governance.

All factors were statistically significant ($P < 0.05$), indicating correctness and contribution of the factors towards sustainability of regional water utilities.

methodology...contd.

Data analysis:

- The collected data were analyzed using the Fuzzy set and Statistical Package for Social Science (SPSS) version 23.
- The Fuzzy set model was used to transform attributes that were later analyzed by SPSS to calculate statistical parameters and sustainability index of each utility

$$MF_i = \mu_s(a_i) = \frac{\sum_{j=1}^m x_{ij} w_j}{\sum_{j=1}^m w_j}; w_j = \log \left[\frac{n}{\sum_{i=1}^n x_{ij} \times n_i} \right] \geq 0$$

The multidimensional sustainability index of each utility can be computed by aggregating the values of the membership functions (MF) across either the n utilities or the m attributes.

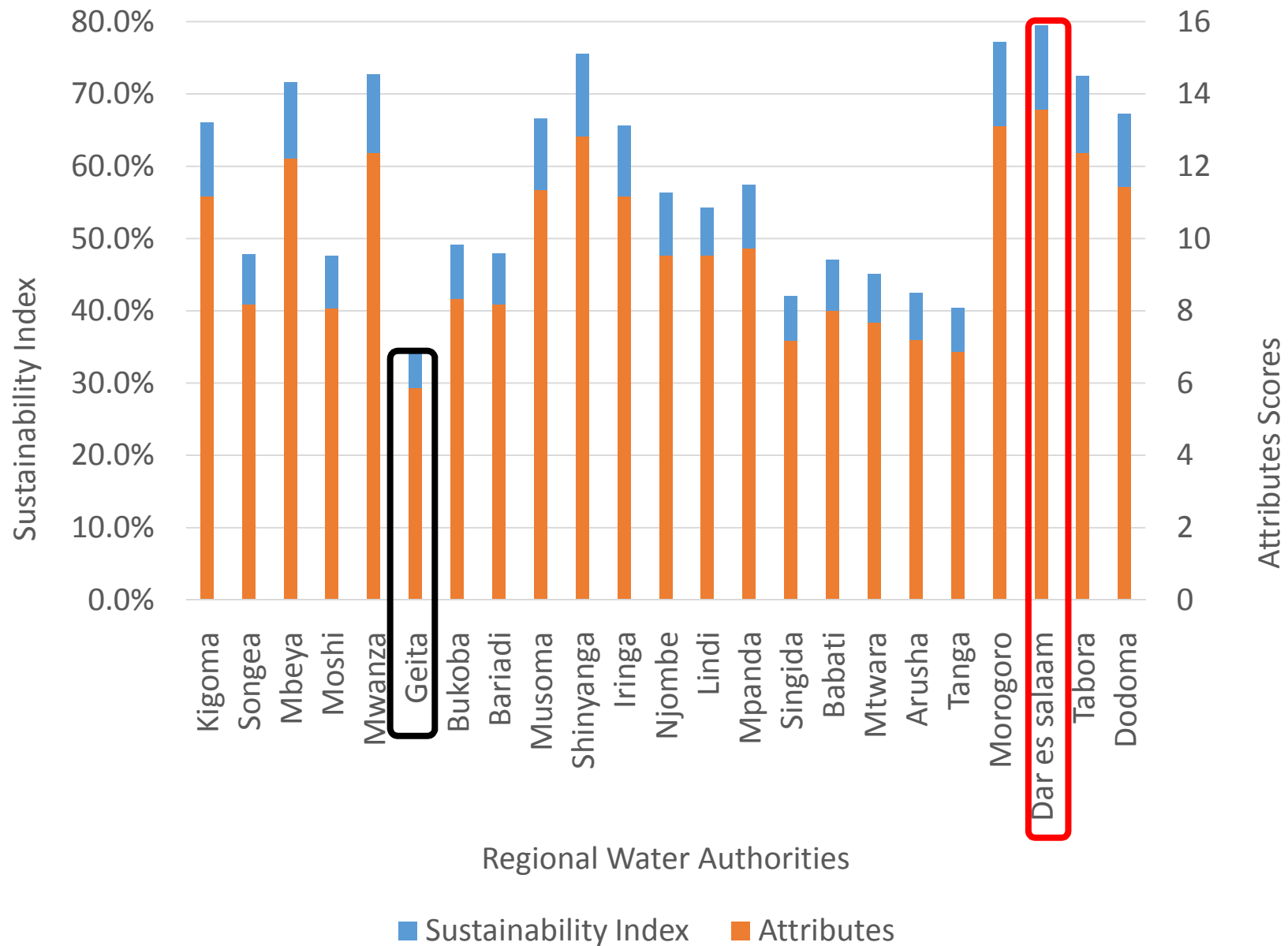
The multidimensional sustainability index of the set of each variable in the utility is computed by aggregating the values of the membership functions (MF) across the m attributes

Results and Discussion

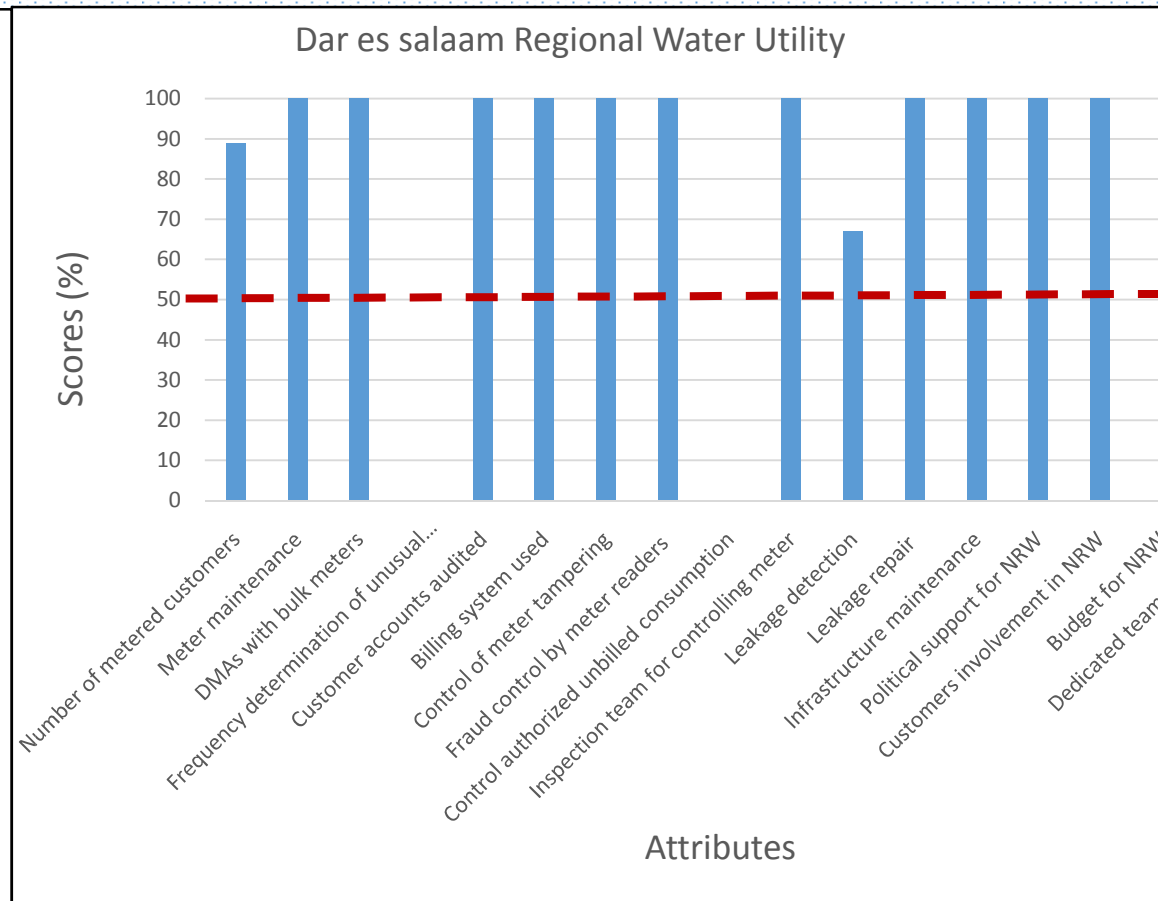
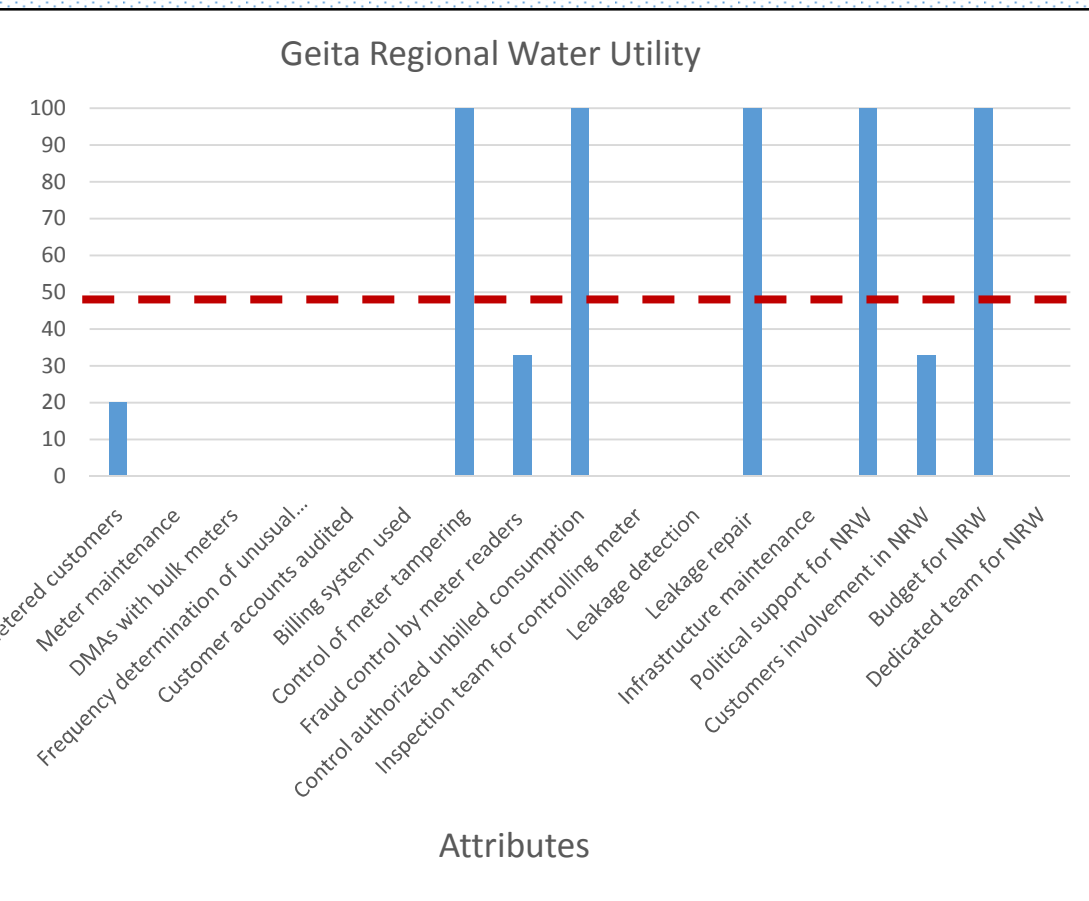
Sustainability status	Sustainability rate	Sustainability Index value	Utility scores (%)
Sustainable	Excellent	0.81 - 1	0
	Good	0.71 – 0.80	26.1
	Low	0.51 – 0.70	30.4
Unsustainable	Unsustainable	0.31 – 0.50	43.5
	Poor	0 – 0.3	0

Collectively, 56.5% of regional water utilities are sustainable
Average Sustainability index is 57.7%

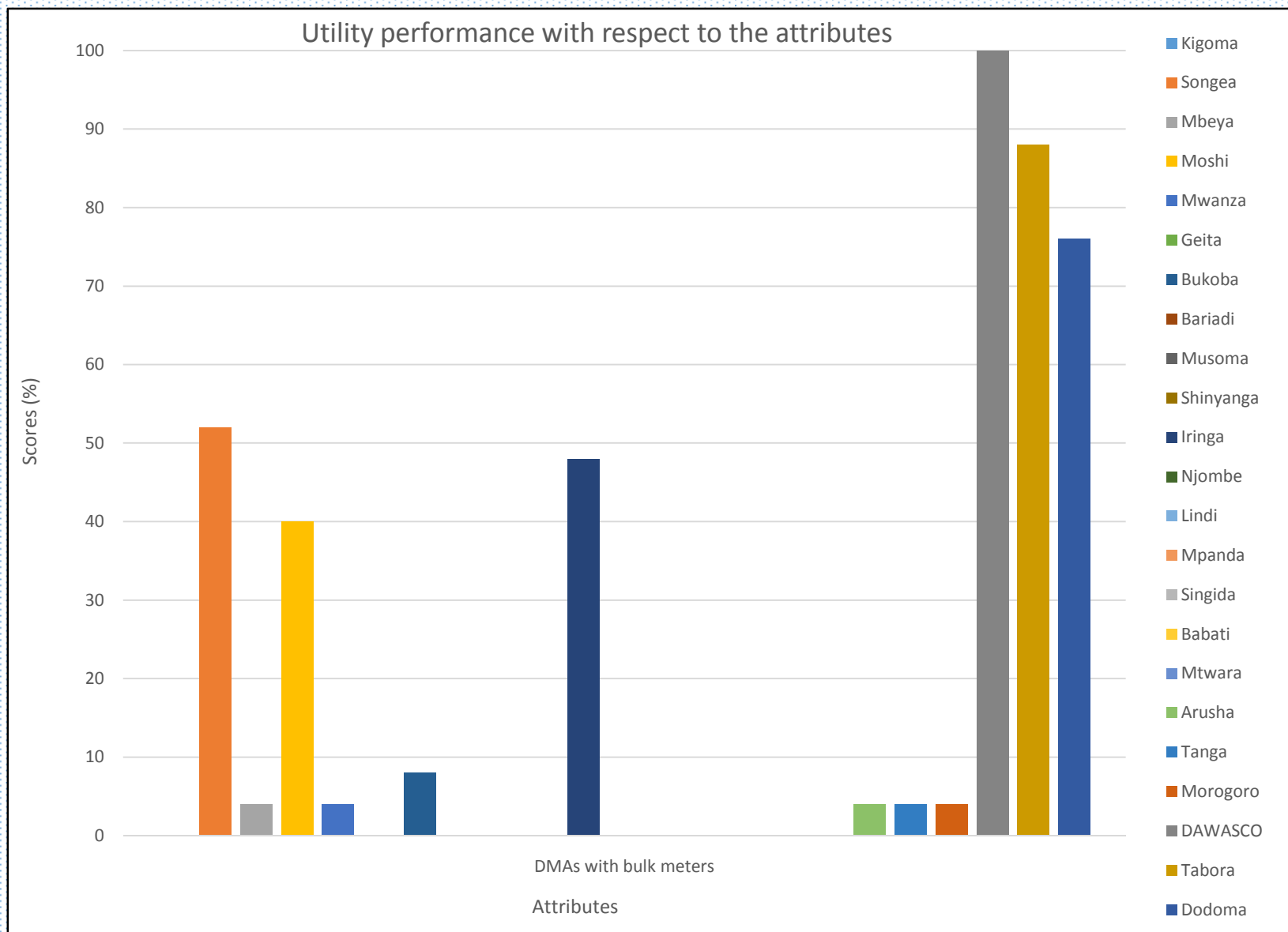
Results and Discussion...contd.



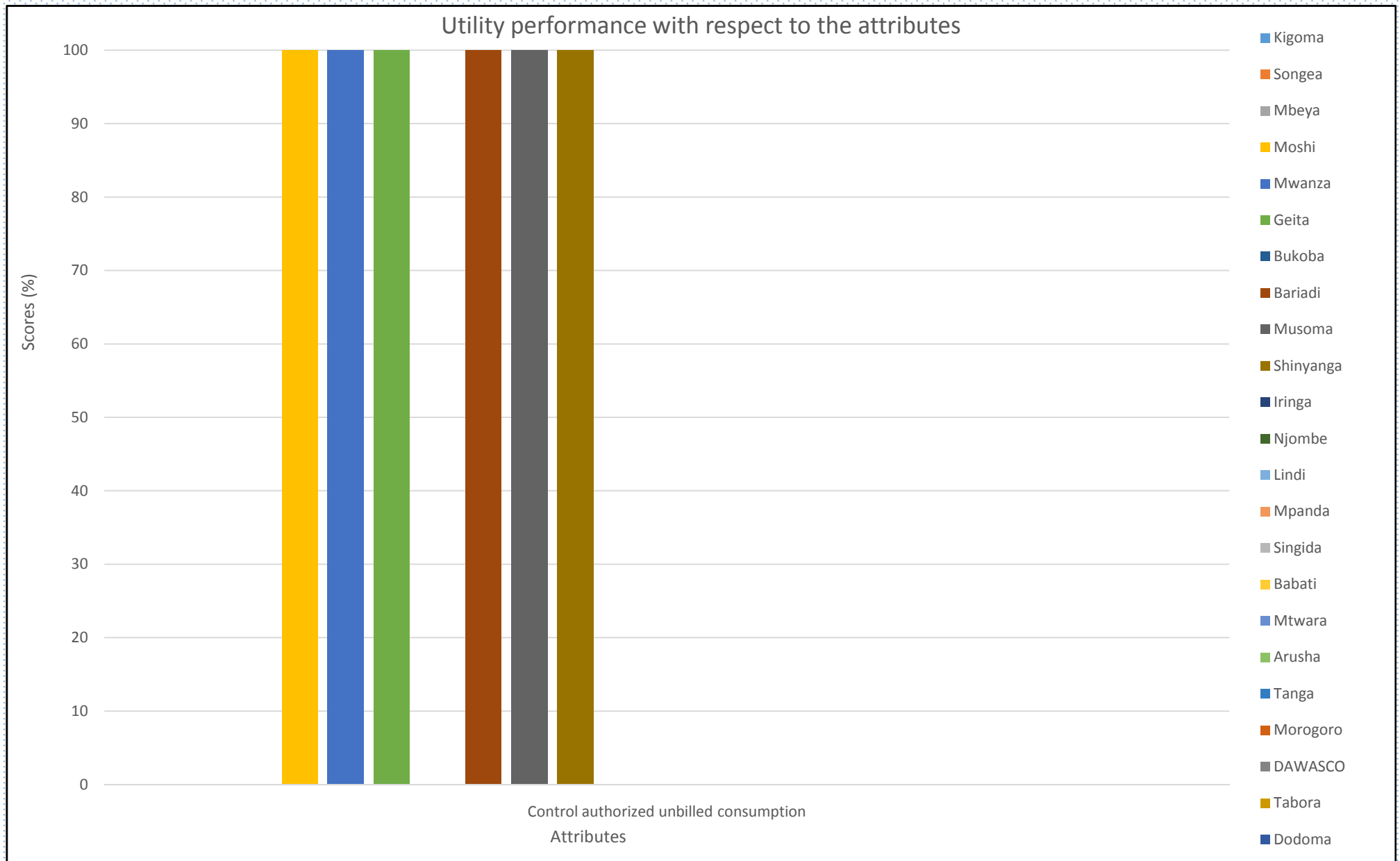
Results and Discussion...contd.



Results and Discussion...contd.



Results and Discussion...contd.



Conclusion and Recommendations

For sustainability of water supply services provided to the utilities adoption of measures to control NRW is imperative

There is no single technique rather a combination of techniques simultaneously addressing losses arising from both physical, commercial and unbilled authorized consumption.

Henceforth the study recommends application of the proposed attributes in pursuit of controlling NRW and achieving sustainability of water supply services to regional water utilities.

References

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- Abraham S.H.(2017). Sustainability assessment of community based water supply projects in Sudan using sustainability index and multivariate analysis. *Journal of water sustainability*, 7(1): 1-16. Water utility performance report 2013/2014

THANK YOU