

# Assessment of Stakeholder's Collaboration in the Management of Waste Electrical and Electronic Equipments in Dar es Salaam, Tanzania.

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## Abstract

The continuous rise of population and consumption demands of both basic and leisure electrical and electronic equipments within Dar es Salaam city led to increasing amount of Waste Electrical and Electronic Equipments (WEEE). Recently WEEE has become the environmental and public health issue needing close attention in the city. Even with urgent actions needed, yet less has been done to study and establish the stakeholder's collaboration pattern in the sector. This study applied the stakeholder's analysis (SA) and social networking analysis (SNA) techniques in studying the effectiveness of the stakeholders involved in the sector. All stakeholders involved in the management of WEEE were identified and assessed using literature review, brainstorming and stakeholders' interviews. The identification and analysis were performed with the help of Master Mind software, Microsoft word and excel version 2019, coupled with XLSTAT plug in for data analysis. The results revealed that the Vice President's office, Division of Environment (VPO-DOE) and the National Environment Management Council (NEMC) are the vital player/stakeholder in the management of WEEE within the city, as they have both high power, interest and knowhow on the system. While on the other hand the WEEE dealers (Recyclers, Electrical and Electronics Equipment (EEE) technicians and scavengers) were found to be the key stakeholders that physical perform the recycling of the WEEE. These dealers have high interest and technical knowledge on the sector but have low power hence have low influence in the dynamics of their businesses. It was found out that the stakeholders with both, high power, interest and knowledge had positive attitude towards WEEE sector while those with low levels had negative attitude. Lastly it was concluded that, efficiently promotion and adoption of stakeholder's collaboration whereby all stakeholders are engaged is a vital move required for sustainable management of generated WEEE in Dar es Salaam city.

**Key Words;** Stakeholders, Stakeholder's collaboration, Electrical and Electronics Equipments, Waste Electrical and Electronics Equipments (WWE/ E-Waste), Dar es Salaam city.

## 1. Introduction

In this study Stakeholders are referred to government or private organizations, companies or individuals who are either directly or indirectly involved in the management of Waste Electrical and Electronic Equipments. The term Waste Electronic and Electrical Equipments (WEEE or E-waste) refers to all damaged or dead Electrical and Electronic Equipments that have no value for the user [2, 9, 8, 11,14, 19].

The continuous rise of population and consumption demands of both basic and leisure electrical and electronic equipments leads to forever increase in Municipal solid wastes including the E-waste. It is estimated that more than 6 billion tonnes of municipal solid waste will be generated on daily basis by 2025, out of it more than 60 million metric tonnes would be the E-waste [5,9,12, 14]. The situation is expected to be worse in the developing countries like Tanzania where there is increase in consumption of Electrical and Electronic Equipment's (EEE) [3,4], whereby according to NEWSR (2019), the consumption increases by ten percent (10%) from 15% to 25% annually, hence increasing waste [14].

Waste Electrical and Electronic Equipments has become an important environmental and public health issue especially for the developing countries, because the waste contains hazardous chemicals and materials [14]. For this reason, adequate intervention for managing the waste becomes inevitable. All the beneficiaries/stakeholders in EEE and E-waste should be integrated and actively involved in the management process of the E-waste in order to ensure sustainable management service within cities [21,25]. Studies suggest that the problem of E-waste in developing countries can adequately be solved by multidisciplinary expertise, including environmental, social sciences, politics and ethics. Clear understanding of the factors that boost and/or hinders its management performance is a key towards sustainable management practice, because experience showed that even with high technical expertise, yet lack of collaboration between stakeholders that represent the social, ethical, political and technical problem, led to failure of E-waste management [10,13].

Several attempts have been done to analyse the solid waste management practices in order to come up with adequate solution, with the aim of attaining both the net expense and reduction in environmental effects. Studies considered standard quantitative parameters focusing on multicriteria decision making researches [10]. Very few studies have been done to assess social parameters and integration of stakeholders in management of E-waste in developing nations like Tanzania [1,20].

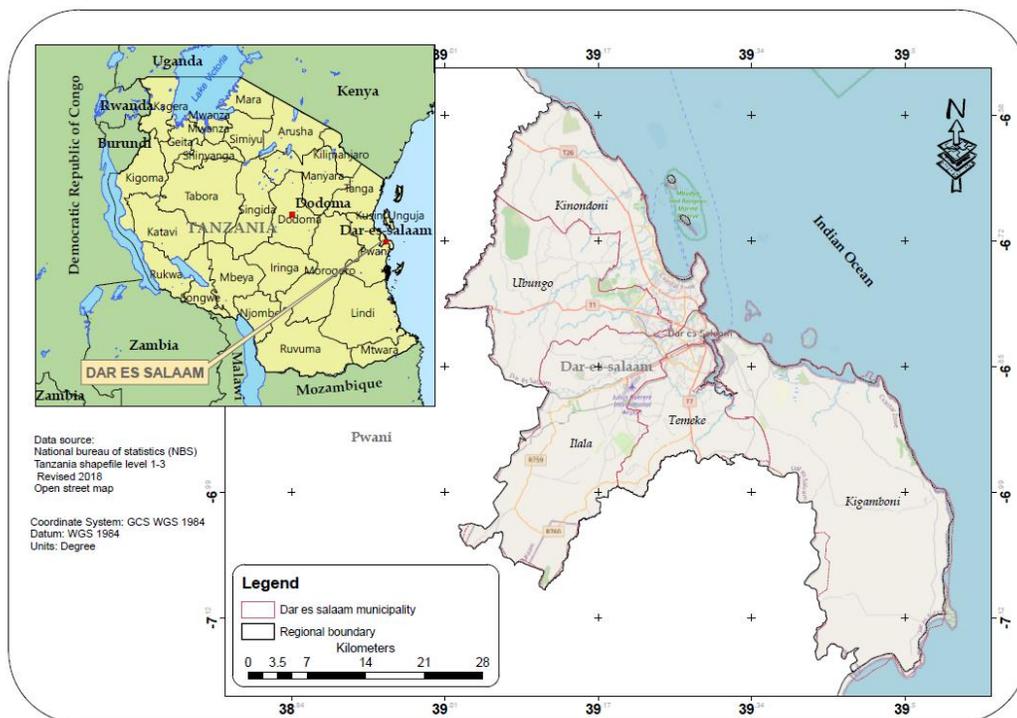
To date, less attention has been dedicated on studying the impact of stakeholders' collaborations in management of solid waste within Tanzania. The reliable overview of E-waste landscape in Tanzania, through a baseline study (a rapid assessment of E-waste) that was focused on computers and IT equipments including PCs, printers, TVs and mobile phones has been reported [14,22]. The study failed to capture the areas of focus whereby it didn't focus on the key generators of E-waste within the city and in high developed areas with high population and high EEE demands [4]. Furthermore, the study didn't provide information on the collaboration and characteristics of stakeholders involved in E-waste management, together with their interactions (relationships) and power/influence over each other.

Information presented in this article aimed to provide better understanding of the stakeholder's collaboration in management of WEEE within Dar es Salaam city, Tanzania. It evaluated their roles, power/influence and interest in management and also their relationships. It further came up with WEEE organogram within Dar es Salaam, as a sustainable approach of showing levels of power/influence, interest and dedication in the sector. The social network analysis (SNA), and stakeholder analysis (SA), Mind master (mind mapping tool) were the major methods and tools utilized in data collection and analysis of the collected results. The scores were established based on academic grading, this was done in order to show the power/interest level/scale of stakeholders in the collaboration network [7]. The

assessment of stakeholder's collaboration (SC), and framework of operation within the city will contribute significantly in stakeholder's engagement, debates and decision making to promote initiatives and discussions on empowering stakeholders' collaboration in Dar es Salaam city and alike cities globally [17,20].

## 2. Case Study Area

This study was conducted in Dar es Salaam, Tanzania (Figure 1). Dar es Salaam city was chosen as the case study because it is the largest city and economic hub of Tanzania located along the coast of Indian Ocean. The city is the importation center for EEE whether arrived by flight of ships, not only importation but also it has industries manufacturing electrical equipments that eventually contributes to E-waste [14,13,16].



**Figure 1:** Location of the case study  
(Modified from Ramani Huria shapefiles, 2012)

The city has an estimated total area of 1,393km<sup>2</sup> and is estimated to have an economic growth rate of 7%, with annual population growth rate of 5.6% [15]. Increase in population and economic growth triggers the consumption demand of EEE, as a result leads to increased generation of WEEE [4,13,21].

Even though the city has a fast-growing population and economy that leads to massive generation of solid waste including the E-waste, yet less efforts is made to ensure adequate stakeholders' collaboration hence leading to improper dumping along roads and disposal to landfill, instead of recycling the valuable resources [6,13,18,21,23,24]. The presented results will set a baseline for decision makers to involve all the stakeholders in the management network of E-waste within the city [26].

## 3. Methodology

Several tools and methods were used for data collection and analysis from both the primary and secondary sources. The secondary data were collected through review of government reports, while the primary data were collected through; key informant interviews

(interviews with identified stakeholders). The E-waste stakeholder's identification was done through review of published government documents [14], interviews and brainstorming with the help of mind master (mind mapping tool). The interviews were done with the help of interview guiding questions to all institutions/people (stakeholders) in the chain of WEEE within the city of Dar es Salaam.

The essence of doing stakeholder identification and mapping was to recognize all the direct and indirect individuals, organization/institutions and companies directly or indirectly connected with the WEEE management within the city. In this section all stakeholders including the; decision making bodies and authorities (government and non-government), business (sellers and distributors of EEE), recycling companies (private companies), EEE technicians, scavengers and other regulatory bodies/organizations were identified and mapped. These identified stakeholders were the ones interviewed.

The aim of conducting interviews to WEEE stakeholders was to obtain information that would facilitate classification of the performance and relation networks between them. Furthermore, the interviews aided in obtaining the current WEEE management practices, gaps and needs in Dar es Salaam city, Tanzania. Interviews also played a major role of topping up the list of stakeholders involved in WEEE management within the city. This study was carried out between early January and late March 2021 (Approximately two and half months). The time spent was for both field data collection and office organization of data (data cleaning) and analysis.

Stakeholders collaboration was done with the help of Stakeholder Analysis (SA) and Social Network Analysis (SNA) models, which are considered as useful tactics for studying environmental and public governance of Municipal Solid Waste including the WEEE [19,20,26]. Moreover, the models assist in assigning power/ influence and interest while displaying the level of relation (social network) between stakeholders in the WEEE management [26].

### 3.1 Stakeholders Identification

Stakeholders identification was a time-consuming activity that required full brain concentration, because skipping or ignoring a stakeholder either intentionally or un-intentionally due to low power or indirect link with WEEE management might negatively affect the system and make the WEEE management within the city harder to achieve [18,19,20,26]. With the use of master mind map (mind mapping software), the stakeholder's relationships were identified, in order to know existing and missing collaborations between them. The existence of working relationship between private and public institutions were also identified and assessed, because the public-private partnership is considered as the adequate management approach for sustainable E-waste management [19,25,26].

The gaps, needs and options for management of WEEE in Dar es Salaam city, were identified and assessed by identifying and assessing stakeholders' needs, desires/wishes, interest, power/influence and opinions. This was done with the help of interviews and government reports review [14].

All stakeholders in Dar es Salaam city were identified and characterized on how they are engaged in the management of WEEE. Stakeholders views were collected using interview guiding questions, that were prepared to respond to required information (Table 1).

**Table 1: Information collected during stakeholders' interviews**

S/N	Required Information	Scores
1	<b>Professional Knowledge/Skills:</b> This describes the awareness level of the stakeholders regarding WEEE tasks,	4 groups answer on a 0–3 scale, 0-No knowledge/Unskilled

duties/obligations. Responses were validated by the available information from literature and from other stakeholders.	1-Low knowledge/Fairly skilled 2-General knowledge/ general skills 3-Complete Knowledge/High skilled
2 <b>Influence/Power in WEEE management:</b> This depicts the sovereign involvement of force in permissions, availability and access to control the WEEE management was evaluated and recorded.	4 groups answer on a 0–3 scale, 0-No power 1-Low power 2- Medium power 3-High power
3 <b>Interest in WEEE management:</b> This showed the level of self-involvement by the stakeholder in the WEEE management. The information corrected was validated by literature information and response from other stakeholders.	4 groups answer on a 0–3 scale, 0-No interest 1-Low interest 2- Limited interest 3-High interest
4 <b>Collaborations/Relationships:</b> This displayed the interaction level between the respondent and other stakeholders in sector. Specific stakeholders’ relationship was recorded.	4 groups answer on a 0–3 scale, 0-No interaction/collaboration 1-Rare interaction 2- Fairly interaction 3-Strong collaboration/relationship
5 <b>Knowledge of other stakeholders:</b> Information on other known stakeholders in the WEEE management sector were recorded.	4 groups answer on a 0–3 scale, 0-Not aware 1-Low awareness 2- General awareness 3-Comprehensive awareness

The power and Interest rating of identified stakeholders was done by Strength, Weakness, Opportunities and Threats (SWOT) scores assignment, whereby the most powerful was assigned a score of 3 and the least without any power was assigned a score of 0, the score range was between 0 to 3 (Table 2).

**Table 2: Ranking criterial for Power and Interest of WEEE stakeholders**

Rank	Score	Numerical meaning	Interpretation	Score criteria
Nil	0	Nil = 0	No Power/Interest	0% (Absent)
Low	1	0<Low≤40%	Low Power/Interest	0<X≤40% (C grade)
Medium	2	40%<Medium≤80%	Medium Power/Interest	40%<X≤80% (B and B <sup>+</sup> )
High	3	80%<High	High Power/Interest	X≥80% (A)

### 3.1.1 Government Ministries

There are several ministries identified to be involved in the WEEE management. The ministry of the Vice President's Office, Division of Environment (VPO-DOE) was identified as responsible organ for overseeing all activities relating to management of WEEE. The ministry is also responsible for developing environmental policies, laws, regulation and guideline governing environmental management regulatory framework in Tanzania.

Ministry of industry and trade, is responsible for registering and monitoring all industries established in Tanzania, it also oversees the business trends. For WEEE management, this ministry is responsible for registering the recycling industries/companies and assess them in taking off the business. This ministry oversees regulatory institutions like Business Registration and Licensing Agency (BRELA).

Ministry of Investment is the responsible organ for promoting and creating enabling environment for Recycling companies and individuals in WEEE business. This is a new ministry under the prime minister's office, established as a strategic ministry for ensuring conducive investment environment for investors in WEEE management business.

Ministry of Health, Community development, Gender, Elderly and Children, is the ministry responsible for ensuring that the working environment and the chemicals in the WEEE does not cause any adverse effects to human and the surrounding environment.

Ministry of Communication and Information Technology, is the ministry responsible for registering the EEE technicians, these technicians operate as refurbish of WEEE. The ministry is also responsible for registering and monitoring the telecommunication network companies.

### **3.1.2 Regulatory and Local Authorities**

Several authorities were identified in this category/group. National Environment Management Council (NEMC), is an environmental regulatory agency under VPO-DOE, the agency is responsible to undertake environmental enforcement, compliance, review and monitor environmental impact statements, research and awareness raising on the WEEE sector.

Tanzania Communications Regulatory Authority (TCRA), is a government organization responsible for promoting the effective competition and economic efficiency, it also establishes standards of the regulated goods and services while protecting the interests of consumers of EEE. This government organ is the one responsible for regulating the communication facilities.

Tanzania Revenue Authority (TRA), is the government organ that operates under the Ministry of Finance in making sure that all the companies and individuals involved in the EEE and WEEE business pay tax to the government.

Tanzania Bureau of Standards (TBS), is the government organ established to monitor the quality of all EEE imported, locally manufactured and the refurbished ones. The organ also is responsible for creating/setting new standards for WEEE recycled products.

Business Registration and Licensing Agency (BRELA), is responsible for regulating WEEE business by administering business and industrial licensing laws. It is also responsible to administer intellectual property laws and encourage and facilitate local and foreign EEE and WEEE business investment, while stimulating scientific and technological inventiveness and innovation and encourage technology transfer within WEEE sector.

City and Municipal Authority (CMA), this is the responsible authority for collection and transport of WEEE from generation point to disposal point. All the solid waste collection and transportation companies are registered or given tenders by either city or

municipal authority. The authority also owns and controls the Pugu landfill, where the portion of WEEE is disposed. Not only that but also, all the businesses registered and not registered involved in the EEE and WEEE sector are under custody of the city or municipal council/authority.

### **3.1.3 WEEE dealers (Private & NGOs)**

There are several private companies and individuals involved in the WEEE recycling business (dealers) within Dar es Salaam city. Tanzania Recyclers Association (TARA) is the NGO that directly supports the WEEE recycling and management. This organization is responsible for realizing and promoting environmental resilience, decent jobs and economic growth through WEEE recycling business.

Private companies, there are several private companies involved in the collection, transportation and recycling of WEEE within Dar es Salaam city. Registered companies include; Chilambo General trade company limited, Steal Com Ltd., New steel Tabosh G. Co. Ltd., Graviton Co. Ltd., Nyamatagata small scale miner Cooperative Ltd., Zana workshop and Digital Agencies Ltd.

WEEE technicians, these are the local experts either regally registered or not registered operating as technical personals in refurbishing EEE in Dar es Salaam, they are also known as repair personnel.

Scavengers, these are low life locals who conduct the collection, transport and selling of the WEEE. They sort the WEEE from other wastes dumped at either dumping site of open environments, and sell the sorted product to private companies.

### **3.1.4 Sellers and Distributers of EEE**

There are many sellers and distributors of EEE within Dar es Salaam city, but the focus of the study was on the local manufacturers and the importers of EEE. The study focused on them as they sell products that eventually turn to waste after expire or broken. These stakeholders can produce or sully either desired quality (durable) or low quality (non-durable) EEE. The non-durable EEE leads to increasing generation of WEEE [13].

### **3.1.5 Consumers of EEE**

There are several users of EEE with Dar es Salaam city, the ones that have been analyzed in this study are; Domestic users, banks, Tanzania Electric Supply Company (TANESCO), and Telecommunication companies. Consumers of EEE generates WEEE, that if not well managed ends up in the environment and eventually polluting the soil and water receptors. The pollution is said to have significant health issues to human [8, 11,14, 19].

## **3.2 Data processing and analysis**

Data collected from interviews were transcribed using Microsoft word version 2019, then the transcribed data were entered in the Excel sheet (spreadsheet) within Microsoft excel version 2019 facilitated by XLSTAT data analysis plug-in. An analysis table called stakeholder table was created with inserted equations reflecting the notations for scores ranging from 0 to 3, with zero being the least of all and 3 being the top score (recall Table 1 and 2). Accuracy of data was checked by triangulation of the lamp data, example in order to understand the influence of a certain stakeholder, results from all stakeholder who responded on the case were grouped and calculated

for percentage level in order to be sure while assigning the score level. For all data with ambiguity, either contradicting with all the rest of the responses or where the respondent wasn't sure of the answer provided, the data was validated by literature information where appropriate otherwise the data were ignored. This process was termed as data cleaning, the essence for this activity was to attain maximum credibility of the information collected. The data cleaning process was done, in majorly two ways, the one discussed and the other one was by contacting another staff within the same organization where mis-information was obtained to get clarity of the matter. Where data was cleared, they were administered and where they were not cleared, they were ignored/not administered.

Scores assignment were consistent throughout the work, the Power, Interest matrices were plotted in scatter plots using Microsoft excel, then they were customized in word to add more features, like separator boxes and colors. On the other hand, the relationship (Social map) was established using the Master Mind software. Different lines and directions in the stakeholder's social network map were assigned different meaning, whereby full lines imply strong relationship (2 and 3 scores), while on the other hand the dotted lines indicated weak relationship (0 and 1 scores). Lastly the organogram on WEEE management within Dar es Salaam city was established, based on the strength in Powered/influence, interest and communication/relations between stakeholders. The most powerful with full interest in the WEEE management stayed at the top, and the arrangement decreases with decreasing power down the organogram.

### 3.3 Ethical Considerations

Before interviewing the respondents, they were fully informed on the purpose of the research and they were free to agree or disagree to participate. This was done in order to avoid inconveniences and collection of false information.

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## 4. Results and Discussions

### 4.1 Stakeholders Power and Interest

The power versus interest of the stakeholders involved in the WEEE management in Dar es Salaam city was assessed using the Power – Interest matrix. Results showed that the government authorities and ministries have high influence over the sector than the WEEE dealers, even though they have high interest in the sector (Figure 1).

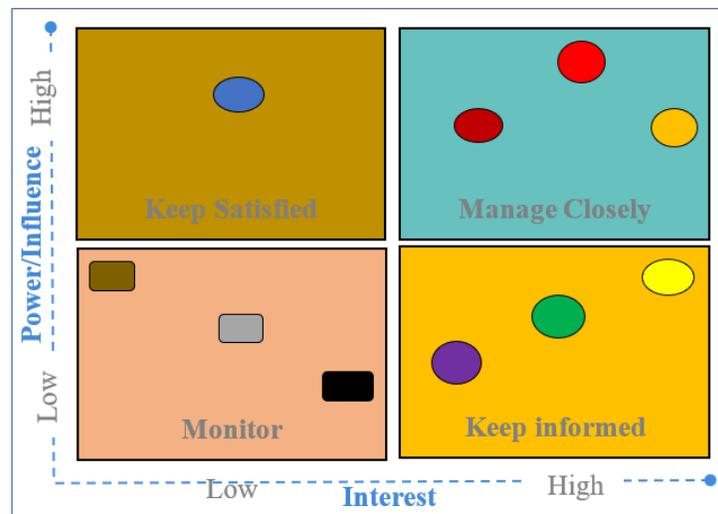


Figure 1: Power- Interest matrix of Stakeholder's Analysis

Key

S/N	Color Code	Stakeholder group	Specific stakeholder	Power (0-3)	Interest (0-3)
1		Government Ministries	Vice President's Office- Division of Environment	3	3
			Ministry of Industry and Trade	2	2
			Ministry of Communication, Information and Technology	2	2
2		Regulatory Agencies	National Environment Management Council (NEMC)	3	3
3		Local government authorities	City and Municipal Authorities	3	3
4		Regulatory Agencies	Tanzania Bureau of Standards (TBS)	2	1
			Business Registration and Licensing Agency (BRELA)	2	0
5		Government Ministry	Ministry of Investment	0	2
			Ministry of Health, Community Development, Gender, Elderly and Children	0	2
			Ministry of Labour and Employment	1	2
6		Regulatory Agency	National Bureau of Statistics (NBS)	0	2
			Tanzania Communication Regulatory Authority (TCRA)	1	3
7		WEEE dealers	Tanzania Recyclers Association (TARA)	0	3
			Private Companies	1	3
			WEEE Technicians	0	2
8		Regulatory Agency	WEEE Scavengers	0	1
			Tanzania Revenue Authority (TRA)	1	0
9		Sellers and Distributors of EEE	Local Manufacturers of EEE	0	0
			Importers of EEE	0	0
			Domestic Users	0	1
10		Consumer of EEE	Tanzania Electric Supply Company (TANESCO)	0	1
			Banks	0	1

The ministry of the Vice President's Office- Division of Environment (VPO-DOE), Ministry of Industry and Trade (MoIT) and the Ministry of Communication, Information and Technology (MoCIT) have both high power/influence and interest in the WEEE management system than rest of the stakeholders within Dar es Salaam city. Although both three have high power, the VPO-DOE, has the supreme power of certifying the WEEE recycling companies, but also it is the only trustee ministry dedicated in WEEE management within the city, so it has both interest and supreme power to control the management activity, hence it is the vital stakeholder in the WEEE management. The MoIT has power over the business of EEE and the recycling business, as it has mandate over all business and industries, but also it has high interest on recycling business, the WEEE being inclusive. The MoCIT has high interest and power over the WEEE as it is the responsible ministry that registers the EEE technicians that refurbish the WEEE. The ministry registers the technicians and monitor them through TCRA, the technicians play a vital role in reduction of WEEE. So, it has both interest and power, because without registering, supporting and promoting these technicians the volume of WEEE would increase within the city, because the refurbished/repared EEE would be dumped. Even though, the technicians are supported by TCRA, yet a significant amount of WEEE is collected together with other solid waste and dumped to Pugu dumpsite [14].

National Environmental Management Council (NEMC) is the only trusted agency in Tanzania that has been given supreme power by the VPO-DOE to management and oversee the environmental conservation in Dar es Salaam and Tanzania at large. The agency has very high power/influence and interest over the WEEE, as it is the one that performs field works on behalf of the VPO-DOE, the mandate was granted to them under the Environmental Management Act, 2004, hence it is considered as a key stakeholder in the sector. The council has the mandate of promoting environmental compliance and enforcement to any facilities polluting the environment including the recyclers companies. But it has power over the waste treatment systems like landfills by monitoring them to make sure that don't pollute the environment. This council has very high interest on the WEEE not only because it is its obligation but also because it wants to see the volume of WEEE is significantly reduced within the city in a sustainable manner. On the same quadrant of high power and interest the Local government authorities resides whereby the City and Municipal Authorities have power over all the activities including the EEE and WEEE management business, so they have high power/influence and high interest to see the businesses prosper so they can have clean environment as well as the annual business registration fees (business certification fees) and the service levy from business personals. The landfill is owned and operated by this stakeholder so it has very high power over the WEEE management, this being the case the stakeholder is also refereed as a key stakeholder in the sector. All stakeholders in the high power and high interest should always be managed closely because their decisions have significant impacts on the WEEE management.

Tanzania Bureau of Standards (TBS) and Business Registration and Licensing Agency (BRELA), have very high power/influence over the WEEE because they are the ones that register and monitor all business and organization involved in the WEEE management, without them the dealers are considered illegally operating within the city. Unfortunately, they have very low interest on the WEEE management, their only interest is obtaining the registration fees and standards. They have madidate of closing the business and they usually close when the dealer fails to register and/or fails to meet the required set standards. Hence, they require attention to be satisfied, and the only way of satisfying them is through paying all the required fees and standards.

The Ministry of Investment (MoI), Ministry of Health, Community Development, Gender, Elderly and Children (MoH), Ministry of Labour and Employment (MoLE). Are the ministries that have high interest on WEEE but they don't have any control over it. The MoI have interest of more investments on the sector, but they don't have power to push investors join the business. The MoH have interest on occupation health and safety of the people working at the WEEE recycling areas but it doesn't have power to influence either establishment of more business or not. Also, the MoLE have high interest of seeing more people are employed in WEEE management sector, unfortunately it lacks power to influence establishment of more WEEE management businesses/companies.

Tanzania Communication Regulatory Authority (TCRA) and National Bureau of Statistics (NBS) have high interest on the WEEE management but they have low power to influence its dynamics. The TCRA, has been assigned the role of registering the EEE technicians, hence it gained interest on the sector, but it doesn't have power to influence either establishing or closing up of the businesses. The NBS on the other hand stands as a national data stock, it has interest on information on WEEE management within the city but it doesn't have any power to influence any decision in the business than offering results to be used by the powerful stakeholders. Furthermore, the WEEE dealers including the; Tanzania Recyclers Association (TARA), Private Companies, WEEE Technicians and WEEE Scavengers have very high interest in the WEEE management business, unfortunately they have very low power/influence on decision making. TARA is coordinating WEEE recyclers, with interest of publicizing and assisting them, unfortunately, it has very low power/influence on determination of the destination of the supported. The high interest level of WEEE dealers places the group in key stakeholders' category of WEEE management within Dar es Salaam city. This key stakeholder group has low power to influence anything than receiving orders and directives from the powerful government authorities like VPO-DOE and NEMC. The EEE technicians have dedicated their lives to live by repairing the EEE but they don't have power to decide their fate as they depend on the

powerful government authorities to decide for them what to be done and policies to be followed. The last group in this section is the Scavengers, these are among the highly interested individuals in the WEEE sector, they take trouble of sorting the waste from landfills and other environment and transport them to recyclers, yet they are the most ignored stakeholders as they are considered less powerful of all stakeholders. This group should always be kept informed so that they are aware of the policies, opportunities and regulations involved in the WEEE management.

Tanzania Revenue Authority (TRA), Sellers and Distributors of EEE (local manufacturers and importers of EEE) and Consumer of EEE (domestic consumers, TANESCO, and banks) have both low power and low interest in the WEEE management. For TRA after paying tax they have nothing to do with the recyclers or business involved in the recycling of WEEE, all they care is tax. The distributors of EEE don't even care where the EEE will end up after being dead/expired all they care is they have sold their commodities that's all. The users of EEE have neither interest nor power on the WEEE all they care is using the EEE, after they have expired, they either keep them at home or dump them together with other solid waste, or sell them at public auctions. This group needs a close eye, they have to be monitored closely.

#### **4.2 Stakeholders collaboration and relation**

The Social Network Map (Figure 2), exhibited that all WEEE stakeholders have either direct or indirect relationship with VPO-DOE and NEMC either directly or indirectly even when they don't have any collaboration. Stakeholder ministries work with the VPO-DOE, in strong collaboration/relation except for MoI and MoH, because the two ministries have less power on the sector, they just have interest, hence they barely communicate with the VPO-DOE office, and when they community it is the VPO-DOE that have influential power over them. The analysis also revealed that all the stakeholders are also directed or indirectly related to private companies/recyclers as they are core players in WEEE business. It is suggested that, the adequate WEEE management approach should consider the recycling and re-use that is facilitated by the Recyclers/private companies [26]. BRELA and TBS have power to influence changes to Recyclers, hence the dynamic of relationship between them is on one side. The recyclers are obligated to do what they are instructed by these two organs. On the other hand, there is very strong relation between recyclers/private companies and TRA, as they need each other. The private companies/recyclers communicate with TRA either on quarterly (after every four months) or annual basis for tax estimates and payments, and when they don't show up TRA reminds them so they are always in connection. Figure 2, shows relationships patterns, direction of influence.

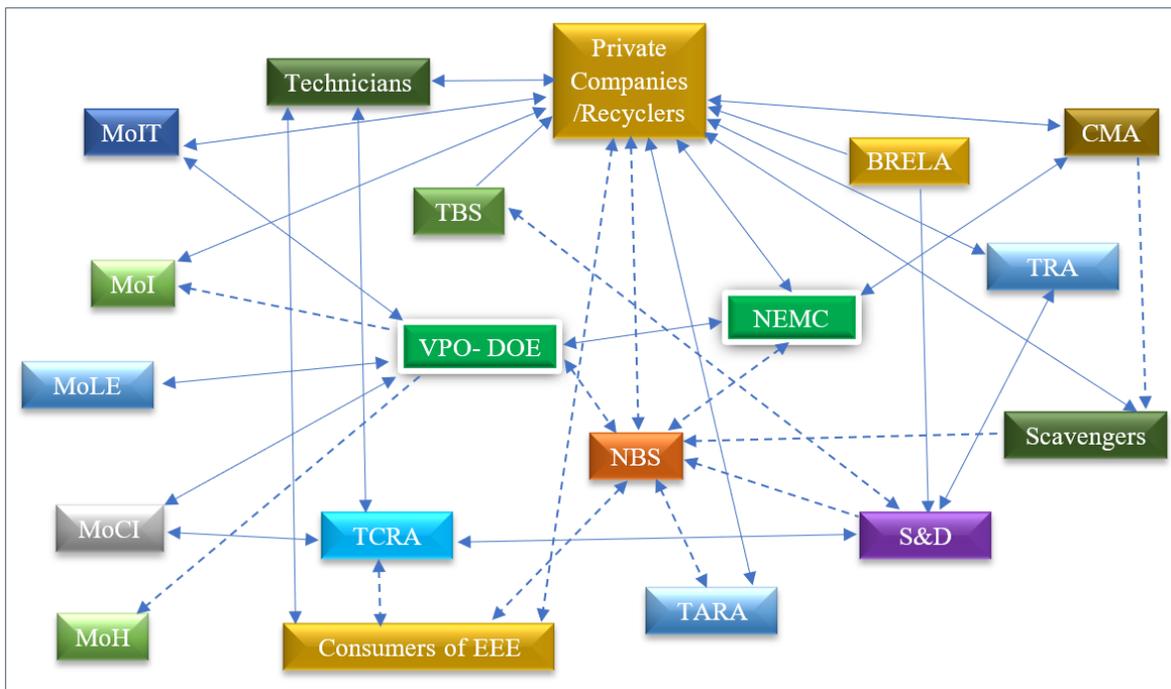
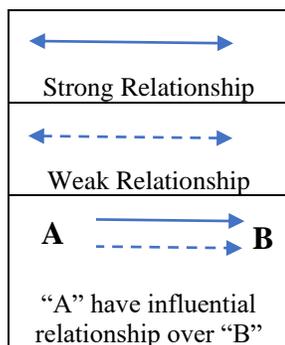


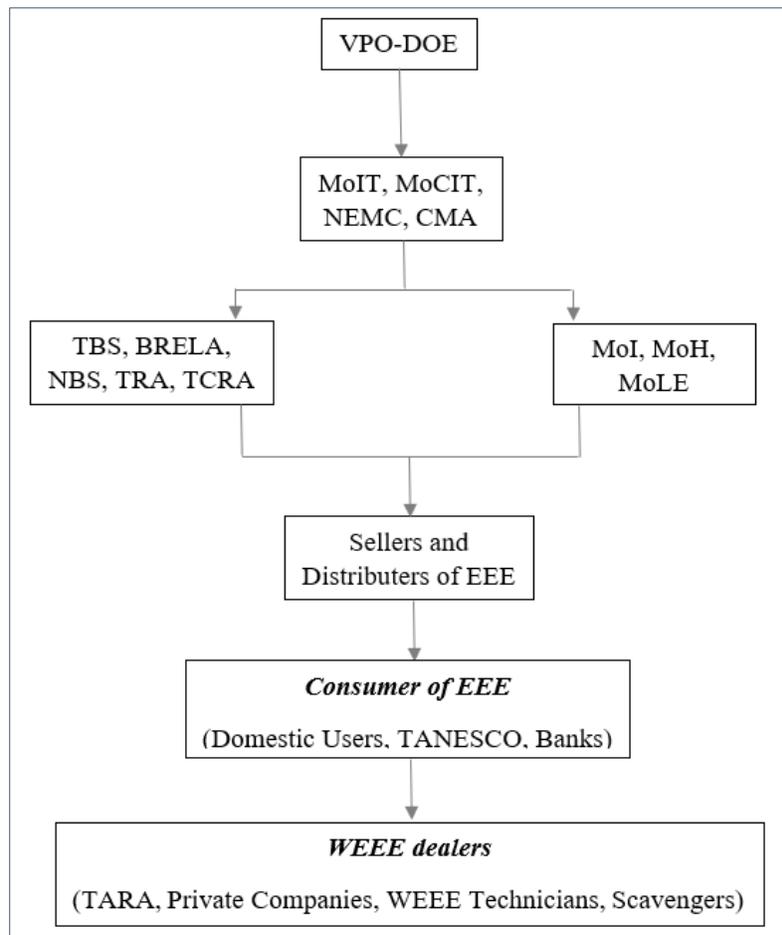
Figure 2: WEEE Stakeholder Social Network Map

Key



Abbreviation	All letters
VPO - DOE	Vice President's Office- Division of Environment
MoIT	Ministry of Industry and Trade
NEMC	National Environment Management Council
MoCIT	Ministry of Communication, Information and Technology
CMA	City and Municipal Authorities
TBS	Tanzania Bureau of Standards
BRELA	Business Registration and Licensing Agency
MoI	Ministry of Investment
MoH	Ministry of Health, Community Development, Gender, Elderly and Children
MoLE	Ministry of Labour and Employment
NBS	National Bureau of Statistics
TCRA	Tanzania Communication Regulatory Authority
TARA	Tanzania Recyclers Association
TRA	Tanzania Revenue Authority
S&D	Sellers and Distributors of EEE

Stakeholders organogram in Dar es Salaam City (Figure 3). The assessment results revealed that the VPO-DOE is the top decision maker and controller of the WEEE management within Dar es Salaam city, while the WEEE dealers are at the bottom of the management. The organogram was created based on the power levels in the WEEE management. As the matter of fact, the bottom line is the core one even though it doesn't have power, because they are the ones that are physically recycling the WEEE.



**Figure 3: WEEE organogram in Dar es Salaam, City**

#### 4.3 Stakeholders Knowledge/skills and attitudes

The VPO-DOE, MoIT, MoCIT, NEMC, WEEE dealers and the CMA were found to be most knowledgeable on WEEE management than the rest stakeholders. VPO-DOE and NEMC are knowledgeable on the policies, regulations and guidelines involved in the WEEE management, but have less technical knowhow on the recycling technologies of the WEEE. The MoI and MoCIT are highly knowledgeable on administrative protocols, on steps that should be followed in order to establish WEEE business and the enabling environment for WEEE, but they are fairly knowledgeable on the regulations, guidelines and technical knowhow pertained in WEEE recycling and management. The CMA are highly knowledgeable on the existence of the recycling factories/companies and have basic knowledge on the recycling technologies used. They also have basic knowledge on the regulations and guidelines patterned in WEEE management. On the other hand, the WEEE dealers excluding the scavengers are most technical knowledgeable group on the recycling technologies, they have high skills in technical perspective but shorten the policies and guidelines knowhow requirements, except for the tycoon (Chilambo General Trade Co) who was fully aware of the guidelines, policies, regulations and all the administrative protocols involved in the WEEE management business.

Other regulatory agencies like, TRA, BRELA, TBS and NBS were reported to have fair to low knowhow on both the technical, guidelines and regulations requirements on WEEE management, they only know what matters to them. The TRA knows better on the taxes, BRELA fairly knows the technical aspects of the recycling system but their major focus is on registration only. TBS concentrates on meeting the set standards, it doesn't matter how you do it, but you should meet their set standards. That being the case they were

reported to have low both technical and regulations and guidelines knowhow on the sector. The NBS focuses on data collection, they have general knowledge both technical and administrative procedures required for WEEE management business, but they are not thorough informed regarding the sector.

Other stakeholders identified had very low knowledge regarding the management practices of WEEE in Dar es Salaam city. The stakeholder's attitude towards WEEE management practices were found to strongly be determined by the knowledge, power and interest in the sector. Whereby the stakeholders with high power, high knowledge and interest had positive attitudes, while the ones with low power and high interest also showed positive attitude even when some of them had low knowhow on the sector. The group stakeholder with both low power, low interest and low knowledge had bad attitude towards the WEEE management practices. They considered it as a dirty business for low life people. This is contrary to the results obtained whereby the sector was found to be business venture promises.

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## 5. Conclusions

Management of Waste Electrical and Electronic Equipments (WEEE or E-waste) in Dar es Salaam city, Tanzania requires a holistic approach of integrating all stakeholder in the management system. This study identified all stakeholders involved in the WEEE management within the city of Dar es Salaam, it further assessed their power, interests and relationships/collaborations patterns. Moreover, the knowledge and attitudes of the stakeholders involved in the WEEE were identified and assessed.

The results revealed that the Vice President's Office, Division of Environment (VOP-DOE) is the vital stakeholder with highest, power, interest and knowhow on the WEEE management within the city. However, The Environment Management Act, 2004 mandated power to the National Environment Management Council (NEMC), to oversee all activities regarding the WEEE within the city and report directly to the VPO-DOE. Furthermore, it was found out that the key player of the WEEE management is the WEEE dealers (TARA, Private companies/recyclers, EEE technicians and scavengers) even though they have low power to influence decision to the government authorities. Unfortunately, the Scavengers who are doing great job of sorting WEEE from other solid waste and deliver them to recyclers are the most ignored group.

The attitudes of the WEEE stakeholder on the WEEE management was found to depend much on the level of power, interest and knowledge possessed. The low the power, interest and knowledge influenced bad attitudes, while those with high power, interest and knowledge had positive attitude on the sector.

Hence, efficiently promotion and adoption of stakeholder's collaboration whereby all stakeholders are engaged is a vital move required for sustainable management of generated WEEE in Dar es Salaam city.

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