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LEVEL OF PARTICIPATION IN DOMESTIC SOLID WASTE MANAGEMENT AMONG RADIO LISTENERS IN DAR ES SALAAM CITY, TANZANIA

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Abstract:

Effective management of domestic solid waste (DSW) is vital for human health and environmental protection. This can be achieved by involving various stakeholders, especially the local people, where knowledge and awareness of the effective management of DSW are required. Also, a positive attitude towards the issue of management with a good perception of cleanliness is among the fundamental factors that influence effective participation in domestic solid waste management (DSWM). The main objective of this paper is to determine the level of radio usage, awareness, perception, attitude, and participation in DSWM among radio listeners in Dar es Salaam City, Tanzania. This study tested the effectiveness of development communication theory (DevCom-theory) in disseminating DSWM information through radio programs. The study employed a quantitative research design, using the survey method with a questionnaire as the research instrument for data collection. A total of 392 respondents from Temeke Municipality participated in this study. The results show positive and significant levels of radio usage, awareness, perception, attitude, and participation in DSWM. Participation in DSWM was the highest-rated variable compared to the other variables. In addition, almost all items of the tested variables revealed insignificant differences by categories of gender, education, and household income.

Keywords:

Development Communication Theory (Devcom-Theory), Domestic Solid Waste Management (DSWM), Participation, Radio Usage, Tanzania

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Introduction

Domestic solid waste (DSW) refers to useless, unwanted, and discarded materials resulting from day-to-day household activities (Solomon, 2011). Its effective management involves several processes, such as sorting, collecting, transferring, treating, and disposing all unwanted products from the households (Omolawal & Shittu, 2016). Yoada, Chirawurah, and Adongo (2014) reported that improper management of DSW causes various problems, including all types of pollution such as air pollution, water pollution, and land/soil pollution. These problems pose risks to human health and the environment in both developed and developing counties (Alam & Ahmade, 2013). This study among others aims to examine the levels of household participation in DSWM in Dar es Salaam as the biggest city in Tanzania.

Rapid population growth, inadequate governmental funding, and a low level of public awareness are reported to be among the factors contributing to poor domestic solid waste management (DSWM) in most big cities in Africa, including Dar es Salaam (National Bureaul of Statistics [NBS], 2018). In Tanzania, several studies on DSWM reported a low level of public awareness of waste management activities (Lubwama, 2017; Mgimba & Sanga, 2016), affecting proper participation in DSWM. Despite the awareness initiatives taken by the government and other stakeholders, DSWM continues to be a challenge in Dar es Salaam City. The public do not have sufficient knowledge of how to manage solid waste effectively (Dar es Salaam City Council [DCC] 2015). Also, they are not aware of the impact of improper management of solid waste, and some of them even think that the government is solely responsible for DSWM; hence, refusing to pay solid waste collection fees (Lubwama, 2017; DCC, 2015).

This study expects that the mass media, particularly the radio, makes a great contribution in influencing public participation in DSWM. In view of its wide usage in Dar es Salaam city, radio has the potential to educate the public on DSWM and in changing their perception and attitude towards the issue. In comparison to the other media, radio is the cheapest and quickest mode of communication, besides it has the widest coverage among all mass media channels in Tanzania. According to Tanzania media fund [TMF], more than 95 percent of the population in the country listened to the radio (TMF, 2015).

Research Objective

The main aim of this study is to examine the level of household participation in DSWM among radio listeners in Dar es Salaam, Tanzania. The two primary objectives that this study addresses include:

1. To test the level of radio usage, awareness, perception, attitude, and participation in DSWM among radio listeners in Dar es Salaam city, and
2. To test the differences between gender groups (male versus female), education levels (primary versus secondary and above), and household incomes (high versus low income) on participation in DSWM.

Significance of the Study

This study offers theoretical, practical, and policy implications. Theoretically, this research hopes to fill the gaps in empirical studies that utilize the development communication theory (DevCom- theory). At present, very few research works have attempted to use DevCom-theory as a guiding theoretical framework in the communication field. This study has adopted DevCom-theory to examine the role of radio in promoting public participation in DSWM; thus, contributing to the body of knowledge with regards to literature coverage.

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Moreover, a few of the environmental studies conducted in Tanzania applied this theory in the context of evaluating the role of mass media in promoting effective participation in DSWM. In addition, most solid waste management studies used the integrated solid waste management (ISWM) theory. However, this study adopted DevComm-theory within the scope of communication research as to add to the existing literature by examining the levels of radio usage, awareness, perception, and attitude as the factors influencing household participation in DSWM.

In terms practical and policy implication, this study hopes to acknowledge the contributions of various gender, education and income differences pertaining to participation in DSWM. It is found that everyone regardless of gender, education background and income gap is participating the DSWM. This leads to the policy of the Municipality and the radio stations to broadcast and disseminate the information on ways of DSWM to all especially at the prime time when everyone is expected to listen to the radio. Perhaps, it can be inserted within the news as advertisement and infotainment in the radio programs to inculcate the culture of cleanliness and to be part of their routine lives.

Literature Review

Development Communication Theory

The study is guided by the development communication theory (DevCom-theory) developed by Dennis McQuail in 1987. This theory states that in developing countries, mass media makes great contributions to affecting social, political, and economic development (Ahmed, 2018).

When the government strives to bring changes, mass media including radio and television have roles in creating awareness, being watchdogs, educating the public for change, and influencing audiences' attitudes in causing behavioral change towards development (Jinadasa, Rajapaksha, & Pannilage, 2016). In the context of this study, effective DSWM depends on positive contributions of the radio, by not just assisting the government on DSWM policy making but also reporting the environmental issues related to DSWM. This study proposes that the media, specifically radio, plays its role well and helps disseminate information on DSWM issues. Therefore, this study employed DevComm-theory to assess the media role on DSWM issues in Tanzania.

Participation in Domestic Solid Waste Management (DSWM)

DSWM is applied to all unwanted materials produced from household activities, including food preparation, cleaning, packaging, newsprint, and garden waste (Kasala, 2014). The management of DSW is categorized into two phases, where the effective monitoring and control require the full participation of different actors, including households (Alam, 2014; Azodo & Ismaila, 2016; Solomon, 2011).

Participation in DSWM is a process that involves several actors: local citizens, media, non-governmental organizations [NGOs], and other affiliated institutions (Mlozi, 2011). Effective and proper participation of households in the waste management process ensures positive implications on the environmental quality and sustainability (Azodo & Ismaila, 2016).

In Tanzania, household participation in DSWM continues to be a challenge due to the lack of awareness of proper ways in storing, collecting, and separating waste products. Mgimba and

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Sanga (2016) found that most households use improper dustbins and old sacks to store their house items waste. Thus, this study tested the level of household participation in DSWM among radio listeners.

Radio Usage to Obtaining DSWM Information

Radio, as one of the communication tools in mass media, is designed to transfer information to a large number of people. According to Meulemann and Hagenah (2009), the radio is the medium that is primarily designed to be used for processing information and disseminating its contents to the public in an audio form. Generally, all mass media including radio play multiple roles such as informing, educating, entertaining, and critiquing (Jharotia, 2018).

In environmental issues including DSWM, the radio is considered a powerful medium that is capable to promote awareness and sometimes functions to support the public in influencing government actions for environmental policy issues and management (Olayiwola, 2014).

Also, Saikia (2017) discussed the roles of mass media in promoting environmental issues. These roles are for helping the community overcome the media negative implications and influencing public participation in several projects that contribute to the national development. Therefore, this study tested the level of radio usage to obtain information on DSWM among its listeners.

Awareness about DSWM

Awareness is an individual's understanding or knowledge of certain issues; for this study, awareness is concerned with DSWM. Banga (2013) and Koser (2017) indicated that the participation of households in DSWM depends on several factors, such as the level of awareness, income, education, age, occupation, and gender.

Mutungwe, Tsvere, Munikwa, Dondo, and Pedzisai (2014) reported a higher level of awareness among students and service providers compared to the local people who had little knowledge about the waste management process and its effects. They suggested that the provision of waste management education for the local people would help them to be aware of management issues as well as its positive implications of waste management activities.

The success of awareness campaigns on solid waste management requires the participation of not only the media but also the different actors in ensuring that people are aware of how they can effectively manage their DSW (Alam, 2014). Therefore, this study tested the level of awareness about DSWM issues among radio listeners.

Perception of DSWM

Perception is concerned with an individual's thoughts, beliefs, or views towards a particular issue, event, product, service, or action. In DSWM, the participation of actors may be influenced by their perception of the issue (Shanthi & Kannaiah, 2015). Perception is one of the fundamental factors to consider when dealing with waste problems in slums and populated areas.

Solomon (2011) stressed that in managing domestic solid waste, understanding household perception of the issue is crucial because it contributes to the planning of management strategies that are effective and appropriate to the surrounding environmental contexts.

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Otoniel, Marquez-benavides, and Ojeda-benitez (2015) suggested that the general recognition of household perception is vital not only for managing solid waste but also for planning environmental education programs. This is because individuals' actions are mostly occupied with their perception of cost and benefit. Hence, this study tested the level of perception of DSWM among Dar es Salaam radio listeners.

Attitude towards DSWM

Attitude is all about the feelings that an individual has (likes or dislikes, favorable or unfavorable) towards a certain issue, object, or action. The attitude of an individual towards DSWM can be positive or negative, which will affect his/her performance or participation in the issue (Shanthi & Kannaiah, 2015; Tan & Wok, 2018). For this study, a positive attitude influences participation, leading to efficiency in DSWM.

Solomon (2011) stated that understanding households' feelings towards DSWM contributes towards effective management of DWSM, as it helps the service providers and policymakers to employ the appropriate means to satisfy their customers and to influence their participation.

Additionally, Mutungwe et al. (2014) stressed that changing people's negative attitude requires support from the media and other actors (government, NGOs, private and public institutions) that need to participate in waste management clean up campaigns; hence, this study tested the level of attitude towards DSWM among Dar es Salaam radio listeners.

Gender and Participation in DSWM

Gender may influence the division of tasks regarding solid waste management (Addai & Danso-Abbeam, 2014). Several studies reported that women have higher concerns about environmental issues, especially those related to household, in comparison to men who seem to be more concerned with other community issues (Handayani et al., 2018; Shabani, 2015; Wok & Munira, 2017). In various societies, women are obligated to take care of cleanliness, health issues, and waste handling activities in their households without receiving any payment (Handayani et al., 2018). As for the rich families and those who can afford it, they normally transfer these responsibilities to their helpers.

Gone Adventuring Circular (2019) study on gender analysis in solid waste revealed that in Indonesia and Vietnam, the majority of women identified themselves as recyclers and proper disposers of waste while men recognized themselves as litterers. Muchangos and Vaughter (2019) found that males tended to deal with waste only when there was a connection to their daily activities or if there was a profit to be derived from it. In Malaysia, many domestic tasks, including waste management activities, are undertaken by women. Culturally, women are categorized as homemakers (Wok & Munira, 2017).

In Tanzania, women tend to participate in DSWM activities such as cleaning the house, recycling, disposing the waste, and paying waste collection fees as part of their traditional roles, whereas men defend their family, search for food, and participate in other community activities (Addai & Danso-Abbeam, 2014). Hence, this study postulated that:

H_1: Females have higher participation in DSWM compared to males.

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Education Level and Participation in DSWM

Education is widely believed to be one of the significant factors influencing individual participation in environmental activities. Mwanza et al. (2019) found that educational level positively influences recycling activities, where household members with a higher educational level are more likely to learn about solid management activities from the social media, thus leading to participation in DSWM. Also, Handayani et al. (2018) reported that education is the key to the efficiency of household waste management activities.

Muchangos and Vaughter (2019) suggested that sustainable DSWM processes require all stakeholders to have waste management knowledge. Alhassan et al. (2020) reported that individuals with a higher educational level are more likely to be more knowledgeable and are more aware of DSWM issues; hence, they are more responsible and are ready to participate in effective waste management. However, in Ghana, Banga (2013) discovered that household members with low education were more likely to participate in waste management, especially in waste separation activities, as they took it as their source of income.

Several previous studies reported that a higher education level tended to have a more positive impact on waste management behavior (Addai & Danso-Abbeam, 2014; Ojok et al., 2013; Shabani 2015). On a similar note, this study predicts that the difference in educational level among household members may affect their participation in DSWM. Specifically, it is hypothesized that:

> **H_2:** Households with at least a secondary level of education tend to have a higher participation in DSWM compared to households with a primary level of education and below.

Household Income and Participation in DSWM

Household income refers to the collective incomes of the heads of the household from all sources. Boateng and Amoako (2016) and Handayani et al. (2018) reported that income level is one of the factors affecting waste management behavior, including a community's willingness to pay for the waste fees. Their findings confirm the general agreement that in environmental economics, there exists a positive association between income and improvements in the environmental quality (Boateng & Amoako, 2016).

An increase in income results in an increase in the solid waste generation (Handayani et al., 2018; Sivakumar & Sugirtharan, 2010). It is a common observation that with an increase in economic growth, the waste generation grows in tandem. However, Alhassan et al. (2018) reported that households with higher incomes are less likely to participate in waste management activities such as cleaning and waste separation compared to the poorer households. This is reasonable because rich households are at the higher affordable residential areas, where higher living standards and less time availability make the households less likely to adopt waste management practices.

On the other hand, a negative correlation denotes that the more money a person earns, the more likely that he/she opts to eat out and to be more aware of environmental concerns, thus producing less waste per capita (Irwan et al., 2013). Akil et al. (2015) reported that the majority of households with high income chose high-value improvements in the DSWM program, where the households were willing to pay any price to improve the quality of waste management in areas such as collection frequency, methods for waste disposal, and modern instruments for transportation.

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Alhassan et al. (2020) noted that the majority of households with a low income had improper management of solid waste as they tended to dispose of their waste illegally in the open dumping ground, open space, and lagoon. In Tanzania, Kasala (2014) found that people with low income tended to live in inaccessible areas (unplanned areas) with no alternative for waste disposal other than dumping their waste in open spaces and in the vicinity of rivers or burning them at their backyards. At the same time, they did not have enough money to buy and use proper instruments for waste collection and disposal (Lubwama, 2017). Hence, this study predicts that there are differences between household incomes in participation in DSWM. Specifically, it is hypothesized that:

> **H_3:** Households with income of 300,001 Tsh and above have higher participation in DSWM compared to households with income of 300,000 Tsh and below.

Conceptual Framework

Based on the development communication theory and literature review, the conceptual framework for the study is visualized (Figure 1).

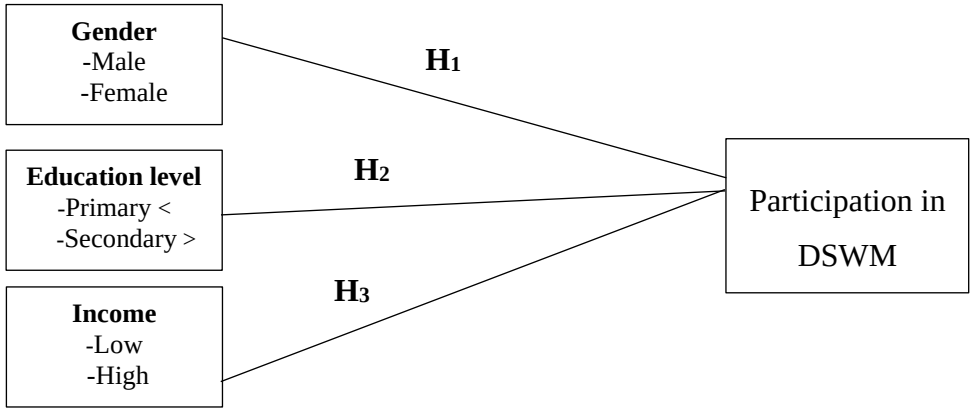

Figure 1: Conceptual Framework for Demographic Differences on Participation

Hypotheses of the Study

Based on the conceptual framework above, it can be hypothesized that:

H_1: Females have a higher participation in DSWM compared to males.
H_2: Households with at least a secondary level of education tend to have a higher participation in DSWM compared to households with a primary level of education and below.
H_3**:** Households with high income (300,001 Tsh and above) have a higher participation in DSWM compared to households with low income (300,000 Tsh and below).

Research Methodology

Research Design

This study employed a quantitative research design using the survey method. This method is crucial in assisting the data collection process when collecting a large sample size within a

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short time span. The study used a self-administered questionnaire as the research instrument. Data collection was done from September 21, 2019 until November 21, 2019.

Population and Sampling Procedure

The population of this study consisted of households located in the Temeke municipality, with an estimated total population of 314,264 people (NBS & Office of Chief Government Statistician (OCGS), 2013). A sample size of 392 households was obtained through the stratified random sampling procedure, where the population was divided into four zones (West, East, Central, and South) by considering their geographical boundaries, and a few housing estates were selected from each zone. Permissions were sought to gain entry into the housing estates from the specific authorities.

Research Instrument and Measurement of Variable

This study used an interview schedule where the questionnaire was read to the respondents to answer the questions which include radio usage, awareness, perception, attitude, and participation in DSWM. Each variable contained 10 items, adapted from different sources. The items measuring **radio usage** were adapted from Noor and Alias (2005). An example of the items used to measure radio usage is "I use the radio to obtain information on health programs, i.e., cholera, malaria, typhoid."

The items measuring **awareness** were adapted from Ajith (2014). An example of the items used to measure the respondent's awareness of DSWM is "I am aware that burning domestic waste leads to air pollution." **Perception** items were adapted from Kim and Han (2010), and an example of such items is "I think each household should participate in one of the solid waste minimization programs, e.g., recycling, reusing or reducing." The items measuring **attitude** were adapted from Mohiuddin et al. (2018), with one example of the items being "I believe that using more environmentally sustainable products helps reduce the wastefulness of natural resources." Lastly, all items measuring **participation in DSWM** were adapted from Tan and Wok (2018). An example of the items is "I pay for waste collection fees."

Validity and Reliability

Before conducting the actual study, the questionnaire was subjected to a pilot study to measure the flow and contents of the questions, the problems faced by the respondents, and the estimated time taken to complete the questionnaire. Meanwhile, reliability tests were carried out on the variables of this study. Each variable was tested against Cronbach's alpha benchmark of .70 to assess the reliability of the items.

Table 1 shows the results of the reliability tests for both the pilot and actual studies. The results show that the items are reliable, with Cronbach's alpha values ranging from .832 to .948 for the pilot study and from .734 to .946 for the actual study. Therefore, the results for both the pilot and actual studies indicate internal cohesiveness and consistency of the items and thus all variables conatin items that are reliablly measured.

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Table 1: Reliability of The Variables

Section	Variable	No. of Items	Reliability (Cronbach's α)	
			Pilot Study (*N* = 74)	Actual Study (*N* = 392)
2	Radio usage on DSWM	10	.948	.946
3	Awareness	10	.897	.894
4	Perception	10	.904	.852
5	Attitude	10	.843	.851
6	Participation in DSWM	10	.880	.734

Data Analysis

The collected data were analyzed using a Statistical Package for the Social Sciences (SPSS) version 23. Both descriptive analysis and inferential statistics were employed. For the descriptive statistics, frequencies, percentages, means, and standard deviations were analyzed. For the inferential statistics, independent *t*-test was used for comparison purposes. For educational level, the initial five categories were recoded to form two categories only: 1 for low education (primary education) with $n_1 = 206$ and 2 for high education (secondary education and above) with $n_2 = 186$. Similarly, for income, the initial four categories were recoded into two categories, where 1 = less than 300,000 Tsh and the remaining categories were merged into 2 = 300,001 Tsh and above.

Findings

Demographic Characteristics of Respondents

A total of 392 respondents participated in the study. Table 2 presents the breakdown of the demographic information of the respondents. This study has more female respondents (58.9%) compared to males (41.1%). More than one-third of the respondents (35.5%) were in the age range of 21–30 years old, followed by 31–40 years old (25.8%), 41–50 years old (19.9%), 51–60 years old (9.7%), and above 60 years old (7.9%). The remaining 1.3% of the respondents were below 20 years old. Regarding the respondents' education level, slightly more than half the numbers of respondents (52.6%) were primary school leavers, followed by secondary school leavers (29.8%), certificate/diploma holders (9.9%), and the fewest were degree holders (7.7%). Six in ten of the respondents (62.3%) earned less than 300,000 Tsh a month, followed by 23.5% with an income of 300,001–500,000 Tsh, and the remaining 14.2% earned higher incomes of 500,001 Tsh and above.

Table 2: Demographic Characteristics of the Respondents

Demographic Characteristics (N = 391)	Categories	Frequency	%
Gender	Male	161	41.1
	Female	231	58.9
Age Group	Below 20 years old	5	1.3
	21–30	139	35.5
	31–40	101	25.8
	41–50	78	19.9

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	51–60	38	9.7
	Above 60	31	7.9
Education level	Primary	206	52.6
	Secondary	117	29.8
	Cert/diploma	39	9.9
	Bachelor degree	21	5.4
	Master's/PhD	9	2.3
Monthly household Income	Less than 300,000 Tsh	244	62.3
	300,001–500,000 Tsh	92	23.5
	500,001–700,000 Tsh	39	9.9
	700,001 Tsh and above	17	4.3

Information on Radio Usage

Table 3 shows that the majority of the respondents (80.1%) owned a radio set, followed by those with a mobile phone (64.8%), while two-fifths of them (42.1%) owned a television set, a few of them owned laptop devices (5.1%), and the rest (1.0%) had desktop devices. More than three-quarters of the respondents (77.0%) often used a radio set as the device to access the radio station of their choice. Two-fifths of them (41.3%) used a mobile phone, while 17.6% of them used a television set, and only a few of them (0.8%) used other devices such as a laptop or a desktop.

Regarding the number of days spent listening to DSWM programs, one-third of the respondents (37.5%) admitted that they spent only one day per week listening to DSWM programs, followed by those who spent six days (23.2%) per week, while 19.4% of the respondents spent two to three days per week, 10.7% of the respondents listened to DSWM programs every day and finally, the remaining 9.2% of the respondents spent four to five days per week. More than half the number of respondents (56.6%) spent less than 15 minutes per session listening to the radio programs related to DSWM. One-quarter of them (26%) spent 16–30 minutes, followed by those spending more than one hour (12.5%) to listen to DSWM programs, while only 2.6% listened for 46–60 minutes and 2.3% listened for 31–45 minutes.

These findings show that most of the respondents had radio set devices and used them to access the radio station they wanted to listen to. However, they spent little time listening to DSWM programs.

Table 3: Information Related to Radio Usage

Information Related to Radio Usage (N = 392)	Categories	Frequency	Percent (%)
Devices owned by respondents	Radio set	314	80.1
	Mobile phone	254	64.8
	Television set	165	42.1
	Laptop	20	5.1

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	Desktop	4	1
Devices often used to access a radio station	Radio set	302	77
	Mobile phone	162	41.3
	Television set	69	17.6
	Desktop	2	0.5
	Laptop	1	0.3
Days used to listen to DSWM programs	0–1 day	147	37.5
	2–3 days	76	19.4
	4–5 days	36	9.2
	6 days	91	23.2
	Everyday	42	10.7
Minutes spent listening to radio programs related to DSWM	Less than 15 minutes	222	56.6
	16–30 minutes	102	26.0
	31–45 minutes	9	2.3
	46–60 minutes	10	2.6
	More than one hour	49	12.5

Level of Selected Variables

One-sample *t*-test with a test value of 3 is used to identify the mean level of participation in DSWM, radio use to obtain information on DSWM, awareness, perception and attitude towards DSWM. Table 4 shows that all tested variables are positive and statistically significant. The results reveal that majority of the respondents (85.7%) agreed to participate in several waste management activities (M = 4.283, SD = 0.468; t = 54.281, p = .000). As for the radio use for obtaining information on DSWM, results indicate that 65.9% of the respondents agreed that they used the radio to obtain Information on DSWM issues (M = 3.297, SD = 0.886; t = 6.630, p = .000). In addition, majority of the respondents (82.3%) were aware of DSWM issue (M = 4.113, SD = 0.567; t = 38.842, p=.000). For perception of DSWM, the results show that 84.7% of the respondents think that DSWM activities make great contributions to the effective management of solid waste (M = 4.234, SD = 0.491; t = 49.772, p = .000). The findings also revealed that 84.7% of the respondents like to perform DSWM activities (M = 4.236, SD = 0.500; t = 48.939, p = .000).

Therefore, this implies that majority of the respondents participate in DSWM activities and they are aware of the issues as they sometimes use radio to get more detailed information regarding waste management. Respondents also think that positive contributions on the issues lead to proper management of DSW. Most importantly, they like to engage in several management activities.

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Table 4: One-Sample *t*-Test for Participation, Radio Use, Awareness, Perception and Attitude towards DSWM

Variables (N = 392)	*M**	*SD*	%	*t***	*df*	*p*
Mean of Participation in DSWM	4.283	0.468	85.7	54.281	391	.000
Mean of Radio Use to obtain Information on DSWM	3.297	0.886	65.9	6.630	391	.000
Mean of Awareness about DSWM	4.113	0.567	82.3	38.842	391	.000
Mean of Perception of DSWM	4.234	0.491	84.7	49.772	391	.000
Mean of Attitude towards DSWM	4.236	0.500	84.7	48.939	391	.000

* On a 5-point Likert scale, where 1 = *strongly disagree* (1–20%), 2 = *disagree* (21–40%), 3 = *slightly agree* (41–60%), 4 = *agree* (61–80%), 5 = *strongly agree* (81–100%).
** Test value is 3

Comparison within Gender, Education Level, and Household Income on Participation

This section presents the differences in the overall mean for participation in DSWM within the different gender category, education level, and household income to answer the second objective of this study.

Participation by Gender

Table 5 shows the results of an independent *t*-test to compare male and female in terms of participation in DSWM. While the male heads of households (M = 4.314, SD = 0.446) reported having a higher participation in DSWM than the female heads of households (M = 4.261, SD = 0.482); their difference is not significant. Therefore, H_1 is not supported. The findings imply that regardless of gender category, both males and females do participate in DSWM.

Table 5: Independent *t*-Test on Participation by Gender, Education, and Income

No.	Variables	Categories	*N* = 392	*M**	*SD*	*t***	*df*	*p*
1	Gender	Male	161	4.314	0.446	1.118	390	.264
		Female	231	4.261	0.482			
2	Education	Primary	206	4.272	0.453	−0.459	390	.646
		Secondary & above	186	4.294	0.484			
3	Income	Low Income	244	4.293	0.482	0.564	390	.573
		High Income	148	4.266	0.444			

Participation by Education

Table 5 shows that the heads of households with a higher educational level (M = 4.292, SD = 0.484) participated slightly more in DSWM compared to those with a lower educational level (M = 4.272, SD = 0.453). However, the difference is not significant. Therefore, H_2 is not supported. Hence, it can be concluded that education does not differentiate them from participating in DSWM, as both groups contribute to DSWM.

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Participation by Income

Households (Table 5) with low income (M = 4.293, SD = 0.482) tended to participate more in DSWM than those with high income (M = 4.266, SD = 0.444). However, the difference is not significant. Hence, H_3 is not supported. The findings imply that both high- and low-income household groups participate equally in DSWM.

Discussion

This study was conducted under the framework of DevCom-theory whereby three main hypotheses were proposed. Findings from the one-sample *t*-test analysis addressed the first objective, which is to test the levels of radio usage, awareness, perception, attitude, and participation in DSWM. The results showed positive and significant results for all variables. These findings support the results of previous studies on awareness (Alam, 2014; Mutungna et al., 2014), perception (Otonial et al., 2015; Shathia & Kannaiah, 2015; Solomon, 2011), and attitude (Solomon, 2011), leading towards participation in DSWM.

No significant difference was found between male and female heads of households on participation in DSWM; hence, H_1 is rejected. This finding is consistent with the results of Meen-Chee and Narayanan (2006), which found that people of different ethnicities in Malaysia participated in recycling activities regardless of their gender. Also, the report of gender analysis by GA Circular (2019) revealed that both men and women participated in waste management, although the participation of women was limited to informal work with frequent involvements in recycling and garbage collection, whereas almost all formal waste management processes were dominated by men in all of the countries involved in the study. However, this finding contradicts the results of Shabani (2015) and Muchangos and Vaughter (2019), which found that women had higher concerns about environmental issues, especially those related to household waste management, compared to men.

H_2, which states that households with secondary educational level and above have higher participation in DSWM compared to households with primary educational level, is not supported, thus contradicting previous results which found that households with higher educational level tended to engage more in waste management activities (Dai et al., 2017; Handayani et al., 2018; Mwanza et al., 2019; Ojok et al., 2013; Shabani, 2015). Thus, public participation in DSWM is everyone's task regardless of their educational level.

Finally, H_3, which states that households with high income have higher participation in DSWM compared to households with low income, is not supported. This finding contradicts previous studies (Handayani et al., 2018; Sivakumar & Sugirtharan, 2010). Therefore, family income does not affect household participation in waste management. However, the finding of this study is similar to that of Alhassan et al. (2018), which found that families with higher incomes were less likely to participate in waste management activities. In Tanzania, DSWM is being emphasized by all households (DCC, 2015). However, the participation of the low-income groups is usually for income-generating purposes, whereas those with higher incomes maintain their status by residing in clean areas.

Conclusion

A total of 392 households participated in the study, and they were mainly female heads of households with income of less than 300,000 Tsh but owning radio set, which they used to access several programs including DSWM programs. They reported having a high usage of the radio, positive awareness, high perception, positive attitude, and high participation in DSWM.

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Hence, the radio is able to disseminate information on DSWM, reflecting that the development communication theory holds true.

This research is not without its limitations. The respondents were confined to households residing in the Temeke municipality, where most of the residents are female with primary education, earning an income of 300,00Tsh and below and are less educated. Therefore, future research should consider households from other municipalities to cover a wider range of education and income levels.

This study applied the survey method to obtain quantitative information on DSWM. Therefore, future researchers are recommended to conduct a longitudinal study and participant observation so that detailed and rich data can be obtained, as a mixed research design approach can provide better insights into DSWM practices in the field through close observation.

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