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Review Article

Plastic Handling and Pollution, a Study on the Effect of "Polluter Pays" Principle in Lodwar Town, Turkana County, Kenya

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ABSTRACT

Aim/Background: The rapid growth of population in many developing countries has led to an increased generation of waste notably plastic and this has led to a serious environmental problem, which is of great public health concern. Unacceptable plastic waste disposal, due to insufficient human and financial capacity, is a challenge facing Kenya and other developing countries. This study investigated the effect of "polluter pay" principle on plastic handling and pollution in Lodwar town Turkana County. **Materials and Methods:** A cross-sectional-descriptive study design targeting residents of Lodwar town, municipal workers, county National Environment Management Authority officers and public health department officers at the county was adopted. Data were then analyzed with descriptive and inferential statistics with the aid of Statistical Package for Social Sciences version 26. **Results:** The findings reveal that majority (48.1%) of the residents disagreed that the municipality sets certain fee and charges to the residents for residual waste per household, per square metre living space. In addition, majority (53.9%) also disagreed that Tax system has been put in place for landfill tax for contaminated site remediation. Majority (71.9%) of the residents agreed that Deposit System has been put in place waste types (for example glass bottles, plastic bottles. However, majority (43.2%) of the residents disagreed that there is producer responsibility driven systems for packaging, electric/electronic waste. From the chi-square analysis the "Polluter Pays" Principle is statistically significantly (X^2=93.572) associated with plastic waste handling. **Conclusion:** The study concludes that "polluter pays" principle have a significant effect on plastic waste handling in Lodwar municipality. Contrary the municipality has not put in place for landfill tax for contaminated site remediation. **Recommendation:** The study recommends that County administration should put in place mechanisms to attract and leverage public private partnership as a vehicle to mobilize resources and enhance private sector participation in sustainable waste management and circular economy development activities.

Keywords: Plastic waste, Financial resources, Influence, Waste handling, Lodwar municipality.

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INTRODUCTION

The Environmental Performance Reviews have shown that government support through grants, loans, tax exemptions and other mechanisms are a key part of the overall policy mix for waste management.[1] Moreover, governments are seeking effective financial mechanisms to support the move to a circular economy. Private and public waste operators as well as private companies also provide a key component of waste management financing. In the circular economy, investments by businesses will be a key factor.[2] The increase in urban population, coupled with economic growth and improved living standards, has resulted in the generation of enormous amounts of waste already in cities in developing countries. But municipal solid waste (MSW), if not managed properly, produces negative externalities and contributes to flooding and waterlogging during extreme climatic events such as excessive rainfall.[3]

With regard to waste collection, the value of the service is in the removal of the materials from the place of generation.[4] Clients of the service tend to be willing to pay for removal of their waste. The resulting direct Service Payment relationship helps to create a favorable economic platform for the provision and progressive extension/improvement of current services. The basic costs of waste management under the 'Business as Usual' (BAU) scenario increase as waste collection coverage extends and legally compliant landfill is ensured.[5] At the same time, improved cost control and revenue collection improve financial management and enable a cost-efficient high-quality service. Waste treatment and disposal services are, however, different. Service-Payment relationships between the client and the service provider are indirect, that is, the client does not 'see' the service that they receive, with the effect that the service is often under-valued and under-provided unless policy and legislative instruments are in place to ensure service provision.[6]

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Inadequate finance for Plastic Waste Handling results in poor sanitation issues.[7] In terms of waste management, Ghanaians have different perception as compared to other countries, which is a great challenge since Ghanaians regard all forms of solid waste to be fated for the landfill site.[8] Waste management companies, which are supposed to benefit from converting useful resources in the solid waste stream into valuable products, have become waste collection companies. However, Plastic Waste Handling goes far beyond collection and disposing-off at landfill site. It deals with the control of generation, storage, collection, transfer and transport, processing and disposal conforming to the best principles of public health, economics, engineering, conservation, aesthetics and other environmental conditions. Poor sanitation is a common environmental issue in developing countries as compared to developed countries and the issue is not different from local communities Lodwar municipality, Kenya.

The financial constraints at the municipal level are mirrored by a paucity of investment capital all along the plastic recycling value chain in developing countries. Moreover, the absence of financial tools to manage volatility in recycled plastics prices, together with dramatic declines in prices for their virgin plastic competitors, has adversely affected incomes and reduced the growth, efficiency and profitability of actors all along that value chain. However, the presence of polluter pays can assist in reducing financial constraints for plastic waste handling. The 'polluter pays principle is the commonly accepted practice that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment. The polluter pays principle is part of a set of broader principles to guide sustainable development worldwide Application the principle means that polluters bear the costs of their pollution, including the cost of measures taken to prevent, control and remedy pollution and the costs it imposes on society. By applying the principle, polluters are incentivized to avoid environmental damage and are held responsible for the pollution that they cause. It is also the polluter, and not the taxpayer, who covers the cost of remediation. Therefore, this study sought to establish plastic handling and pollution, a study on the effect of "polluter pays" principle in Lodwar Town, Turkana County, Kenya, in terms of funding strategies, financial institutions and capital markets.

MATERIALS AND METHODS

Research Design

This was a cross-sectional descriptive. The design was suitable for this study because it generated the data that described the plastic waste handling and "polluter pays" principle on its disposal in Lodwar municipality, Kenya among the traders and households at a form July to December 2021 of time within the Lodwar town municipality.

Target Population of the study

The study population was the residents (households) from the urban and peri urban, relevant key informants and traders who generate plastic wastes during their daily activities. The study also targeted the county authorities in Lodwar town, Turkana central sub county who are involved in plastic waste management policy making and monitoring of the implementation plans. It is difficult to get the counties exact Figure for traders but Turkana County Traders Association had 1600 registered traders. For the household, the list of all the households was obtained from the municipality records. The municipality has been using these records for planning of the public services delivery to the residents over the years.

Sample Determination

For the household, a desired sample was selected using the formula as suggested by Fishers *et al.*[9] as below

$$n = z^2pq/d^2$$

Where:

n = the desired sample size

z = the corresponding value confidence level of 95% in the normal distribution table. This means that the 95% of the sample scores represented the true value of the households with Lodwar town.

p= the proportion in the target population who have knowledge and practices in waste management. A Figure of 0.5 was used since there is no study showing the proportion of household with knowledge and practices on waste management.

$$q= 1 - p$$

d = the sampling error. It was set at 0.05. This was also called the margin error or level of precision. In this study, a level of plus and minus 5% was preferred. In addition, this level was set in social sciences studies.

This was substituted to;

$n = 1.96^2 \times 0.3 \times 0.5/0.05^2$

= 384 households + non-response rate of 10%

= 423 households

Sampling Techniques

Purposive sampling was used to select the traders and municipal workers. For traders, the research obtained respondents from the list of the traders registered by Turkana central sub county Traders Association for different business that generates the waste in Lodwar town. The businesses included shops/supermarkets, markets, Hotels, learning institutions, churches/mosque and government institutions among others. For the municipal workers the selection was based on the participation in management of the waste in Lodwar town.

For the households, a stratified sampling was done based on the economic status of the different estate. The households were divided into two strata (sub groups) namely those who lived in affluent urban estates and those who lived in peri urban areas. Proportionate distribution where the sample was distributed as per the size of the sub groups. This was done to ensure representation of the households in the sample. In each stratum, list of the household was done and individual household selected without replacement until the sample size for that stratum was achieved.

Research Instruments

The researcher used questionnaire for households and interview schedule for ccounty authorities in Lodwar town to collect data from sampled respondents. The questionnaire comprised of various sections. The first section captured personal data to help understand demographic profile of the respondents. The rest of the sections contained questions that sought to provide answers to the researcher's study variables. The researcher administered the questionnaires.

The interview schedule was designed for ccounty authorities in Lodwar town. The interview was conducted through discussions using a set of open-ended questions to find out the relative opinion from the respondents. This enabled the researcher to obtain qualitative data that the questionnaires might not have captured.

Data Management and Analysis

Data was checked for accuracy, uniformity, logical completeness and consistency before analysis. Data were then analyzed with descriptive and inferential statistics with the aid of Statistical Package for Social Sciences

(SPSS) version 26. Descriptive statistics included mean, frequency, percentage, and standard deviation. Inferential statistics used were chi square. Frequency distribution tables did presentation of the findings.

RESULTS AND DISCUSSION

Socio-Demographic Characteristics of the Study Participants

The numbers of questionnaires distributed were 423 however; 345 questionnaires were correctly filled and returned. Majority of the respondents 206(59.7%) were female and most of respondents (49.9%) were aged between 29 to 39 years. Majority of the respondents 223(64.6%) resided in urban areas. The study findings revealed that 139(40.3%) of the respondents were Single not married. The study findings further indicated that 160(46.1%) of the respondents were Christian's (protestants), 152(44.1%) were Catholics and 33(9.6%) were Muslims respectively and 135(39.1%); of respondents had their highest level of education to be college level. On occupation majority of respondents 214(62%) were business people. The frequency descriptions of these socio-demographic characteristics are indicated in Table 1.

Table 1: Socio-Demographic Characteristics of the Study Participants.

		Frequency	Percentage
Gender	Male	139	40.3
	Female	206	59.7
	Total	**345**	**100**
Age bracket			
	18 to 28 years	88	25.5
	29 to 39 years	172	49.9
	40 to 50 years	75	21.7
	51 and above years	10	2.9
	Total	**345**	**100**
Location of Residents			
	Urban	223	64.6
	Sub-urban	122	35.4
	Total	**345**	**100**
Marital Status			
	Single/never married	139	40.3
	Divorced/separated	38	11
	Monogamous marriage	130	37.7
	Polygamous marriage	34	9.9
	Windowed	4	1.2
	Total	**345**	**100**
Age bracket			
	Christian (Catholic)	152	44.1
	Christian (Protestant)	160	46.4
	Muslim	33	9.6
	Total	345	100
Highest level of education			
	Primary school	54	15.7
	High school (O Level)	95	27.5
	College	135	39.1
	University	25	7.2
	Total	**345**	**100**
Occupation			
	Private sector	1	0.3
	Civil servant	19	5.5
	Municipal worker	11	3.2
	Business person	214	62
	Others	100	29
	Total	**345**	**100**

Influence of "polluter pays" principle on Plastic Waste Handling

The researcher sought to determine the influence of "polluter pays" principle on plastic waste handling in Lodwar municipality. The results are presented in Table 2.

The study findings in Table 2 revealed that 13(3.8%) of the respondents strongly agreed with the statement that tax system has been put in place for landfill tax for contaminated site remediation, 1(0.3%) agreed, 75(21.7%) were undecided, 166(48.1%) disagreed and 90(26.1%) strongly disagreed. In terms of mean and standard deviation majority of the respondents disagreed with the Tax system has been put in place for landfill tax for contaminated site remediation (mean= 2.08, standard deviation=0.91). The study findings Also shows that 11(3.2%) of the respondents strongly agreed with the statement that municipality sets certain fee and charges residents for residual waste per household, per square meter living space, 1(0.3%) agreed, 1(0.3%) were undecided, 186(53.9%) disagreed and 146(42.3%) strongly disagreed. In terms of mean and standard deviation majority of the respondents disagreed with the state that Municipality sets certain fee and charges residents for residual waste per household, per square metre living space (mean=1.68, standard deviation=0.79).

Furthermore, the study shows that 13(3.8%) of the respondents strongly agreed with the statement that deposit System has been put in place for certain waste types (for example glass bottles, plastic bottles, 1(0.3%) agreed, 33(9.6%) were undecided, 59(14.5%) disagreed and 248(71.9%) strongly disagreed. In terms of mean and standard deviation majority of the respondents agreed with the statement that Deposit System has been put in place for certain waste types (for example glass bottles, plastic bottles (mean=1.50, standard deviation=0.96). The study lastly shows that 15(4.3%) of the respondents strongly agreed with the statement that There is producer responsibility driven systems for packaging, electric/electronic waste, 14(4.1%) agreed, 34(9.9%) were undecided, 149(43.2%) disagreed and 133(38.6%) strongly disagreed. In terms of mean and standard deviation majority of the respondents disagreed with the statement that there is producer responsibility driven systems for packaging, electric/electronic waste (mean=3.88, standard deviation=1.236).

The study findings reveal that majority of the residents agreed that deposit system has been put in place for certain waste types (for example glass bottles, plastic bottles. However, majority of the residents disagreed that there is producer responsibility driven systems for packaging, electric/electronic waste.

Association between "Polluter Pays" Principle and Plastic Waste Handling

The findings also reveal that majority of the residents disagreed that the Municipality should sets certain fee and charges to the residents for residual waste per household, per square meter living space. In addition, majority also disagreed that Tax system has been put in place

Table 2: Influence of "polluter pays" principle on Plastic Waste Handling.

Statements		SA	A	UD	D	SD	μ	δ
Tax system has been put in place for landfill tax for contaminated site remediation	F	13	1	75	166	90	2.08	0.91
	%	3.8	0.3	21.7	48.1	26.1		
Municipality sets certain fee and charges residents for residual waste per household, per square metre living space	F	11	1	1	186	146	1.68	0.79
		3.2	0.3	0.3	53.9	42.3		
Deposit System has been put in place for certain waste types (for example glass bottles, plastic bottles	F	13	1	33	50	248	1.5	0.96
	%	3.8	0.3	9.6	14.5	71.9		
There is producer financial responsibility driven systems for packaging, electric/electronic waste	F	15	14	34	149	133	1.92	1.02
	%	4.3	4.1	9.9	43.2	38.6		
Total number of respondents (n)	345							

Key: SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, SD-Strongly Disagree, μ-Mean, δ -Standard Deviation.

Table 3: Association between "Polluter Pays" Principle and Plastic Waste Handling.

Plastic waste collection		Plastic Waste Handling				
		Plastic Waste Transportation	Plastic waste Disposal	χ2	*P*-value	
"Polluter Pays" Principle	Tax system	71(20.60%)	45(13.00%)	3(0.90%)	93.572[a]	.000
	Municipality fees	26(7.50%)	55(15.90%)	62(18.00%)		
	Deposit System	10(2.90%)	42(12.20%)	31(9.00%)		

for landfill tax for contaminated site remediation. The Table 3 shows that, 71(20.60%) of the funds received from tax system are used in plastic waste collection, 45(13.00%) of the funds received from the tax system are used in plastic transportation while 3(0.90%) of the funds received from tax system are used in plastic disposal. 26(7.50%) of the funds received from municipality fees are used in plastic waste collection 55(15.90%) of the funds received from municipality fees are used in plastic transportation and 62(18.00%) of the funds received from municipality fees are used in plastic disposal. 10(2.90%) of the funds received from deposit system are used in plastic waste collection, 42(12.20%) of the funds received from deposit system are used in plastic waste transportation and 31(9.00%) of the funds received from deposit system are used in plastic disposal. From the chi-square analysis the "Polluter Pays" Principle is statistically significantly (X^2=93.572) associated with plastic waste handling.

Association between Socio-Demographic Characteristics of Respondents and "Polluter Pays" Principle.

Study further established the association between socio-demographic characteristics of respondents and "Polluter Pays" Principle. The Table 4 shows that 44(12.8%) of the male use tax system to pay for plastic waste disposal, Table 4 71(20.6%) of the male use the municipality fees to pay for plastic waste disposal and 24(7.0%) of the male use deposit to pay for plastic disposal while 75(21.7%) of the female use tax system to pay for plastic disposal, 72(20.9%) of the female use municipality to pay for plastic waste disposal and 59(17.1%) of the female use deposit system to pay for plastic disposal.

On age bracket, 91(26.4%) of the respondent age between 29 to 39 years use tax system to pay for plastic waste disposal, 52(15.1%) of the age bracket 29 to 39 years of the respondents uses municipality fees to pay for plastic waste disposal and 29(8.4%) of the age between 29 to 39 years use deposit system to pay for plastic waste disposal. 21(6.1%) of the age between 18 to 28 years use tax system to pay for plastic disposal, 40(11.6%) of the respondents age between 18 to 28 use municipality fees to pay for plastic disposal and 27(7.8%) of the respondents age between 18 to 28 use deposit system to pay for plastic waste disposal. Furthermore 2(6%) of the respondents age between 40 to 50 years use tax system to pay for the plastic waste disposal, 46(13.3%) of the respondents age between 40 to 50 years municipality fees to pay for the plastic disposal and 27(7.8%) of the respondents age between 40 to 50 years deposit to pay for the plastic disposal. Lastly five (1.4%) of the respondents above the age of 50 years use tax system to pay for plastic disposal, 5(1.4%) of the respondents above the age of 50 years use municipality fees to pay for plastic waste disposal.

On location of Residence, 67(19.4%) of the respondents living in urban centers use tax system to pay for plastic disposal, 106(30.7%) of those living in urban centers use municipality fees to pay for their plastic disposal and 50(14.5%) of the respondents living in urban centers use deposit system to pay for plastic disposal. And 52(15.1%) of the respondents living in sub rural areas use tax system to pay for their plastic disposal 37(10.7%) of the respondents living in sub rural areas use municipality fees to pay for their plastic disposal and 33(9.6%) of the respondents living in sub rural areas deposit system to pay for their plastic disposal.

On marital status, 50(14.5%) of the respondents who are single or never married uses tax system to pay for their plastic disposal, 55(15.9%) of the respondents who are single or never married uses municipality fees to pay for their plastic disposal and 34(9.9%) of the respondents who are single or never married uses deposit system to pay for their plastic disposal. While 8(2.3%) of the respondents who are divorced or separated uses tax system to pay for their plastic disposal, 24(7.0%) of the respondents who are divorced or separated uses municipality fees to pay for their plastic disposal, 6(1.7%) of the respondents who are divorced or separated uses deposit system to pay for their plastic disposal. Furthermore 37(10.7%) of the respondents in monogamous

Table 4: Association between Socio-Demographic Characteristics of Respondents and "Polluter Pays" Principle.

Tax system		"Polluter pays" principle				
		Municipality fees	Deposit System	$\chi 2$	*P*-value	
Gender	Male	44(12.8%)	71(20.6%)	24(7.0%)	10.215[a]	.006
	Female	75(21.7%)	72(20.9%)	59(17.1%)		
Age Bracket	18 to 28 years	21(6.1%)	40(11.6%)	27(7.8%)	67.565[a]	.000
	29 to 39 years	91(26.4%)	52(15.1%)	29(8.4%)		
	40 to 50 years	2(.6%)	46(13.3%)	27(7.8%)		
	51 and above years	5(1.4%)	5(1.4%)	0(0.0%)		
Location of Residence	Urban	67(19.4%)	106(30.7%)	50(14.5%)	9.951[a]	.007
	Sub-urban	52(15.1%)	37(10.7%)	33(9.6%)		
Marital Status	Single/never married	50(14.5%)	55(15.9%)	34(9.9%)	32.453[a]	.000
	Divorced/separated	8(2.3%)	24(7.0%)	6(1.7%)		
	Monogamous marriage	37(10.7%)	50(14.5%)	43(12.5%)		
	Polygamous marriage	22(6.4%)	12(3.5%)	0(0.0%)		
	Windowed	2(.6%)	2(.6%)	0(0.0%)		
Faith	Christian (Catholic)	60(17.4%)	53(15.4%)	39(11.3%)	16.840[a]	.002
	Christian (Protestant)	44(12.8%)	72(20.9%)	44(12.8%)		
	Muslim	15(4.3%)	18(5.2%)	0(0.0%)		
Highest Level of Education	Primary school	26(7.5%)	26(7.5%)	2(.6%)	85.308[a]	.000
	High school (O Level)	31(9.0%)	40(11.6%)	24(7.0%)		
	College	51(14.8%)	45(13.0%)	39(11.3%)		
	University	7(2.0%)	0(0.0%)	18(5.2%)		
	No formal education	4(1.2%)	32(9.3%)	0(0.0%)		
Occupation	Private sector	0(0.0%)	0(0.0%)	1(.3%)	27.040[a]	.001
	Civil servant	4(1.2%)	10(2.9%)	5(1.4%)		
	Municipal worker	5(1.4%)	6(1.7%)	0(0.0%)		
	Business person	70(20.3%)	103(29.9%)	41(11.9%)		
	Others	40(11.6%)	24(7.0%)	36(10.4%)		

marriages uses tax system to pay for their plastic disposal, 50(14.5%) of the respondents in monogamous marriages uses municipality fees to pay for their plastic disposal, 43(12.5%) of the respondents in monogamous marriages uses deposit system to pay for their plastic disposal. Moreover, 22(6.4%) of the respondents in polygamous marriages uses tax system to pay for their plastic disposal, 12(3.5%) of the respondents in polygamous marriages uses municipality fees to pay for their plastic disposal, 0(0.0%) of the respondents in polygamous marriages uses deposit system to pay for their plastic disposal. Lastly, two (.6%) of the widowed use tax system to pay for their plastic disposal. 2(.6%) of the widowed use municipality fees to pay for their plastic disposal, and there was no widowed respondent using deposit system.

On religion, 60(17.4%) of the Christians (Catholic) use tax system to pay for their plastic disposal, 53(15.4%) of the Christians (Catholic) use municipality fees to pay for their plastic disposal, 39(11.3%) of the Christians (Catholic) use deposit system to pay for their plastic disposal. While 44(12.8%) of the Christians (Protestant) use tax system to pay for their plastic disposal, 72(20.9%) of the Christians (Protestant) use municipality fees to pay for their plastic disposal, 44(12.8%) of the Christians (Protestant) use deposit system to pay for their plastic disposal. Lastly 15(4.3%) of the Muslims use tax system to pay for their plastic disposal, 18(5.2%) of the Muslims use municipality fees to pay for their plastic disposal, there is no Muslims using deposit system to pay for their plastic disposal.

On the highest level of education, 26(7.5%) of the respondents whose highest level of education is primary school level use tax system to pay for the plastic disposal, 26(7.5%) the respondents whose highest level of education is primary school level use municipality fees to pay for the plastic disposal, 2(.6%) of the respondents whose highest level of education is primary school level use deposit system to pay for the plastic disposal. On the other hand, 31(9.0%) of the respondents whose highest level of education is high school (O level) use tax system to pay for the plastic disposal, 40(11.6%) of the respondents whose highest level of education is high school (O level) use municipality fees to pay for the plastic disposal, 24(7.0%) of the respondents whose highest level of education is high school (O level) use deposit system to pay for the plastic disposal. Moreover, 51(14.8%) of the respondents whose highest level of education is college use tax system to pay for the plastic disposal, 45(13.0%) of the respondents whose highest level of education is college use municipality fees to pay for the plastic disposal and 39(11.3%) of the

Table 5: Association between Demographic Characteristics of Respondents and Plastic Waste Handling.

Plastic waste collection		Plastic Waste Handling				
		Plastic Waste Transportation	Plastic waste Disposal	$\chi 2$	*P*-value	
Gender	Male	56(16.2%)	37(10.7%)	46(13.3%)	20.734[a]	.000
	Female	51(14.8%)	105(30.4%)	50(14.5%)		
Age Bracket	18 to 28 years	4(1.2%)	63(18.3%)	21(6.1%)	154.631[a]	.000
	29 to 39 years	91(26.4%)	53(15.4%)	28(8.1%)		
	40 to 50 years	2(.6%)	26(7.5%)	47(13.6%)		
	51 and above years	10(2.9%)	0(0.0%)	0(0.0%)		
Location of Residence	Urban	69(20.0%)	87(25.2%)	67(19.4%)	1.822[a]	.402
	Sub-urban	38(11.0%)	55(15.9%)	29(8.4%)		
Marital Status	Single/never married	32(9.3%)	73(21.2%)	34(9.9%)	61.388[a]	.000
	Divorced/separated	1(.3%)	18(5.2%)	19(5.5%)		
	Monogamous marriage	50(14.5%)	49(14.2%)	31(9.0%)		
	Polygamous marriage	24(7.0%)	0(0.0%)	10(2.9%)		
	Windowed	0(0.0%)	2(.6%)	2(.6%)		
Faith	Christian (Catholic)	62(18.0%)	44(12.8%)	46(13.3%)	24.402[a]	.000
	Christian (Protestant)	35(10.1%)	78(22.6%)	47(13.6%)		
	Muslim	10(2.9%)	20(5.8%)	3(.9%)		
Highest Level of Education	Primary school	25(7.2%)	19(5.5%)	10(2.9%)	66.751[a]	.000
	High school (O Level)	15(4.3%)	65(18.8%)	15(4.3%)		
	College	42(12.2%)	37(10.7%)	5616.2%)		
	University	14(4.1%)	11(3.2%)	0(0.0%)		
	No formal education	11(3.2%)	10(2.9%)	15(4.3%)		
Occupation	Private sector	0(0.0%)	0(0.0%)	1(.3%)	21.292[a]	.006
	Civil servant	1(.3%)	8(2.3%)	10(2.9%)		
	Municipal worker	0(0.0%)	4(1.2%)	7(2.0%)		
	Business person	71(20.6%)	89(25.8%)	54(15.7%)		
	Others	35(10.1%)	41(11.9%)	24(7.0%)		

respondents whose highest level of education is college use deposit system to pay for the plastic disposal. Furthermore, 7(2.0%) of the respondents whose highest level of education is university level use tax system to pay for the plastic disposal, 0(0.0%) of the respondents whose highest level of education is university level use municipality fees to pay for the plastic disposal and 18(5.2%) of the respondents whose highest level of education is university level use deposit system to pay for the plastic disposal. Lastly 4(1.2%) of the respondent with no formal education use tax system tax system to pay for their plastic waste disposal, 32(9.3%) of the respondent with no formal education use municipality fees to pay for their plastic waste disposal, there was respondent with no formal education using deposit system to pay for their plastic waste disposal.

On occupation, there is no respondent in the private sector using tax system and also municipality fees to pay for the plastic waste disposal, however, 1(.3%) of the respondent in private sector use deposit system to pay for their plastic waste disposal. 4(1.2%) of the respondents in civil servant sector use tax system to pay for their plastic waste disposal, 10(2.9%) of the respondents in civil servant sector uses municipality fees to pay for the plastic waste disposal and 5(1.4%) of the respondents in civil servant sector use deposit system to pay for their plastic waste disposal. There was 5(1.4%) of municipal worker using tax system, however, 6(1.7%) of the municipal workers uses municipal fees to pay for plastic waste disposal and there was no municipal worker using deposit system to pay for plastic waste disposal. 70(20.3%) of the business people use tax system to pay for plastic disposal, 103(29.9%) of the business people use municipality fees to pay for the plastic waste disposal and 41(11.9%) of the business people use deposit system to pay for plastic disposal. Lastly 40(11.6%) of the people with other occupation use tax system to pay for plastic waste, 24(7.0%) of the respondents with other occupations use municipality fees to pay for the plastic waste disposal and 36(10.4%) of the respondents with other occupations use deposit system to pay for plastic waste disposal.

Association between Socio-Demographic Characteristics of Respondents and Plastic Waste Handling

In addition, the study determines the association between demographic characteristics of respondents and plastic waste handling Table 5. On plastic handling, 56(16.2%) of the male practice plastic waste collections

Table 5, 37(10.7%) of the male practice plastic waste transportation and 46(13.3%) of the male practice plastic disposal. 51(14.8%) of the female collect their waste, 105(30.4%) of the female pay for plastic waste transportation and 50(14.5%) Of the female disposes their plastic waste

On age brackets, 4(1.2%) of those between 18 to 28 years collect their plastic waste, 63(18.3%) of those between 18 to 28 years paid for the plastic waste collection and 21(6.1%) of the respondent between 18 to 28 years dispose their waste. 91(26.4%) of the respondent between age 29 to 39 collect their plastic waste, 53(15.4%) of the respondent between age 29 to 39 years pay for plastic waste transportation and 28(8.1%) of the respondent between the age brackets of 29 to 39 dispose their plastic waste. Moreover, 2(.6%) of the respondents between ages 40 to 50 years collect the plastic waste, 26(7.5%) of the respondents between age bracket of 40 and 50 years paid for plastic waste transportation, and 47(13.6%) of the respondents between age brackets of 40 to 50 years dispose their plastic waste

On location of the residence, 69(20.0%) of the respondents living in urban centers practice plastic waste collection, 87(25.2%) of the respondents preferred paying for their plastic waste to be transported and 67(19.4%) of the respondents disposes their plastic waste. On the other hand, 38(11.0%) of the respondents living in sub rural areas collects their plastic waste for disposal, 55(15.9%) of the respondents living in sub rural areas paid for their plastic waste to be transported and 29(8.4%) of the respondents in sub rural areas disposed their plastic waste disposal.

RESULTS AND DISCUSSION

The objective of the study was to determine the influence of "polluter pays" principle on plastic waste handling in Lodwar Town. The findings reveal that majority (48.1%) of the residents disagreed that the municipality sets certain fee and charges to the residents for residual waste per household, per square metre living space. The study disagreed with[10] who noted that the municipality has sets certain fee and charges to the residents for residual waste per household. Households' general faces complex tax rate, which had result in system revenues to increasing.

In addition, majority (53.9%) also disagreed that Tax system has been put in place for landfill tax for contaminated site remediation. The finding by[11] who concluded that an increase in tax on imported plastic materials could also motivate recovery of plastic waste for recycle and reuse. An additional 1% tax on plastic imports would be sufficient to cover plastic-related waste management when plastic waste recovery and collection efficiency rates are low. This plastic recovery- revenue exercise could be expanded to other materials such as paper and metal to fully understand the possibility of sustainable financing of MSW management and reducing environmental harm in developing countries like Nepal. The study finding reveals further that majority (71.9%) of the residents agreed that Deposit System has been put in place waste types (for example glass bottles, plastic bottles. However, majority (43.2%) of the residents disagreed that there is producer responsibility driven systems for packaging, electric/electronic waste.

CONCLUSION AND RECOMMENDATION

Conclusion of the Study

The study concludes that "polluter pays" principle have a significant effect on plastic waste handling in Lodwar municipality. Contrary the municipality has not put in place for landfill tax for contaminated site remediation. Further, there is no producer responsibilities driven financial systems for packaging, electric/electronic waste in the municipality however deposit System has been put in place waste types (for example glass bottles, plastic bottles).

Recommendations of the Study

The study recommends that County administration should put in place mechanisms to attract and leverage public private partnership as a vehicle to mobilize resources and enhance private sector participation in sustainable waste management and circular economy development activities.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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