

Role of the Community in Pollution Management in Mukuru Informal Settlement of Nairobi County, Kenya

Lucas E Esekun^{1*}, Ferdinand Nabiswa¹ and Edward Neyole²

¹Department of Emergency Management Studies, Masinde Muliro University of Science and Technology, Kakamega, Kenya

²Department of Disaster preparedness and Engineering management, Masinde Muliro University of Science and Technology, Kakamega, Kenya

Abstract

Meaningful community participation is a challenging, but promising, feature of environmental protection in developing countries such as Kenya and most especially in pollution management. This study employed a descriptive research design. The target population of this study comprised of households' heads and community leaders as key informants. The sample size of the household heads interviewed were ascertained through the use of Yamane's formula which arrived at 352 household heads. Primary data was collected through questionnaires which were self-administered with assistance from the research assistants. The study used multiple regressions to establish the relationship between the independent variables and the dependent variables. The study established that there was a positive significant correlation between pollution management and responsible waste management as shown by a correlation figure of 0.715. The study also established that there was a positive correlation between pollution management and participatory planning with a correlation figure of 0.621, and that there was also a positive correlation between pollution management and participatory budgeting with a correlation value of 0.681.

Keywords: Community • Community participation • Pollution • Pollution management • Responsible waste management • Participatory planning • Participatory budgeting

Introduction

Community involvement in protecting their environment and related environmental issues is generally supported for its potential to provide low-cost sources of information to government agencies, increased acceptance of and confidence in government decisions, empowered community members on issues that affect them and advancement of democratic ideals. Moreover, community involvement can result in the collective transition from victims to agents of change. Community participation is a topical theme in current policy and discussion revolving around decision-making processes especially those dealing with pollution management [1]. The issue of community participation is now an established principle when one considers issues dealing with decision-making to achieve sustainable development goals including environment protection. Societal structures in the developing world still revolve around small clusters of communities defined by geo-political, economic and cultural bonds especially in the informal settlements. To such societies, the top-down decision-making regime has been seen to be most ineffective in terms of achieving sustainable development. Surprisingly as, most developing countries especially those in Africa have tended to vigorously employ a non-participatory approach to

decision-making [2]. In this regime policy is dictated by those in power and the communities are relegated to the position of recipients and implementers. In most cases however, especially in the developing countries like Kenya, regulation of pollution requires direct contact between the regulator and polluting firms. This notwithstanding, direct involvement of affected citizens is uncommon. This may lead to inefficiencies where local pollution impacts are (or are perceived to be) severe, local circumstances differ, and government regulation does not adequately account for local circumstances, knowledge and preferences. In such cases, efficient pollution control may require direct communication between the firm, the community and the regulator. This study specifically seeks to establish the role the community plays in the management of pollution.

Problem statement

Governments around the world have made numerous efforts to protect the environment from pollution by developing numerous policies and regulations. However, in spite of the numerous policies and regulations to protect households, environmental pollution continues to devastate households' world over. In China for example, environmental pollution is at very high levels where its steel plants

*Address for Correspondence: Lucas E Esekun, Department of Emergency Management Studies, Masinde Muliro University of Science and Technology, Kakamega, Kenya, Tel: 254 723776852; E-mail: lucasesekun@gmail.com

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Received: 07 October, 2019; Manuscript No. ARWM-20-3320; **Editor assigned:** 10 October, 2022, PreQC No. ARWM-20-3320 (PQ); Reviewed: 24 October, 2022, QC No. ARWM-20-3320; **Revised:** 20 July, 2022, Q1 No. ARWM-20-3320 (Q1); Manuscript No. ARWM-20-3320 (R); **Published:** 17 August, 2022, DOI: 10.37421/2475-7675.2022.7.231

were shut down over a period of five months in order to reduce winter pollution in Beijing and its surrounding areas. In South Africa, mercury emissions are very high as a result of the gold mining and combustion of coal. The social implication of the environmental pollution on the well-being of slum dwellers has indicated an increasing number of severe health problems: Mild irritation to the upper respiratory tract, chronic respiratory system disease, heart disease, lung cancer, children's acute respiratory infection and adults' chronic bronchitis [3]. In Mukuru informal settlement, had reported that waterborne cholera outbreaks had been consistent with the latest one being in the year 2017 and early 2018. Reported that approximately 10%-20% of cholera cases result in severe illness, and without proper treatment, had resulted to death by dehydration within a few hours of contamination. This means that either the government's efforts to manage environmental pollution are not working or they are not adequate to guarantee a conducive environment for the households. This calls for use of other mechanisms to compliment the governments' efforts of pollution management. This study sought to establish the role the community plays in the management of environmental pollution and whether community participation has any influence on pollution management.

General objective

The main objective of the study was to establish the role of community participation in pollution management.

Specific objectives

To assess the influence of responsible waste disposal on pollution management in Mukuru informal settlement of Nairobi County, Kenya.

To evaluate the influence of participatory planning on pollution management in Mukuru informal settlement of Nairobi County, Kenya.

To establish the influence of participatory budgeting on pollution management in Mukuru informal settlement of Nairobi County, Kenya.

Ha: Responsible waste disposal has a positive significant influence on pollution management in Mukuru informal settlement of Nairobi County, Kenya.

Ha: Participatory planning has a positive significant influence on pollution management in Mukuru informal settlement of Nairobi County, Kenya.

Ha: Participatory budgeting has a positive significant influence of on pollution management in Mukuru informal settlement of Nairobi County, Kenya.

Responsible waste disposal

There is an indication that the ways in which solid waste is managed, are as diverse as the human race itself. Some methods of waste management are proper and environmentally sound, while some are not. Conventionally, solid waste (in most cases referred to as garbage) is usually collected as a bundle of trash by local authorities or by private firms to be taken to a transfer station and then to a landfill. However, considering the fact that there are not always enough resources and infrastructure for waste management, especially in developing countries, this scenario ultimately implies

that some waste will not be collected, or will be improperly disposed. As a result, landfills, burning waste, rodents and odors which are very common in developing countries have made residential areas susceptible to health hazards. In agreement, the United States Environmental Protection Agency (USEPA) affirms that improper disposal of solid waste exposes the environment and human life to danger by way of emission of greenhouse gasses and contamination of ground water, respectively. In many parts of the world, communities continue to be looked at as passive recipients of government services, and are very often disregarded even in local decision-making processes. Ultimately, this approach results in the people failing to know the role they can play in the process. Therefore, in the midst of several waste management and disposal methods, participation could be a missing link/component in a possible recipe for better solid waste management [4]. Considerable research efforts have been directed to public participation even in the aspects of recycling behaviour. Such researches have had interesting findings emerge in support of public participation in solid waste management. Research findings show that landfill space is now scarce and yet the communities also are less likely to accept landfills to be sited near their habitation for environmental, health and aesthetic reasons. Because it may no longer be viable to use waste management methods of an autocratic nature, the participation of the people in solid waste management decisions and practices becomes inevitable.

Participatory planning

Participatory planning is a process by which a community aims to reach a given socio-economic goal by consciously diagnosing its problems and drafting a course of action to resolve those problems. Explain that arrangements that integrate the local people in the environmental management have been generally well-considered because of its logical approach that defends the establishment of cooperation to prevent and solve environmental problems. Citizen participation can be classified in the following different categories. The first one is passive participation where people participate by being informed about what is going to happen or has already happened. There is also information giving where people provide information by answering questions posed by researches, but they do not have the opportunity to influence proceedings. In participation by consultation, people's concerns are listened by external agents, but there is no obligation of taking these concerns into account in the final decisions. There is also participation by material incentive where people participate by providing resources, such as labour, receiving in return some material incentive. In functional participation citizens form groups to decide objectives to be achieve for common benefits. It usually involves the development of organization initiated and facilitated by external agent. In iterative participation, community groups develop to interact with external groups in joint actions whereas in self-mobilization, people are well organized and take initiatives independent of external institutions.

Participatory budgeting

Participatory budgeting is a process where people have the opportunity to affect the allocation of public resources by means of a local government perspective taking into account sectoral priorities. Involving citizens in resource allocation leads to a redistribution of

funding and resources to areas of greatest need, improving access to infrastructure and resources. In addition to the tangible outcomes described above, participatory budgeting offers planners a tool to build community capacity with the promise of strengthened citizenship capable of protecting the environment. It is also believed that when developing countries involve their citizens in the budgeting process, accountability, transparency and efficiency are enhanced, as citizens are made aware of government operations and how resources are mobilized and utilized for the common good.

Theoretical framework

This study was anchored on interactional field theory as developed to integrate the arguments of community development as a process of interaction. The theory contends that the ultimate goal of community development is to build up a community field where the community capacity for collective action can be created for the common good and social betterment. Forms of interaction include formal and informal social contact within organized and unorganized social activities. Through such purposeful and non-purposeful interactions, social forces are raised to respond to local issues [5]. Specifically, a community field is manifested in the interactional structure among local residents, groups, and organizations contributing together to the accomplishment of specific objectives of community projects. The central focus of community field theory is on structurally oriented interactions through which communication occurs and fosters positive and cohesive relationships among community members. Contended that the field of harmonious relationships facilitates an empowered community in which local residents initiate a process of collective actions to deal with economic, social, cultural, or environmental issues. In the subfield of social change and development, community has been seen as a unique entity where local residents should work together in unity to cope with external or internal social change in response to development issues. Analyzed community by for examining the concept of community field perspectives in the relationships between network structure and development. He found that these network structures can help community members to cooperate with local organizations, to access resources, to get information flowing among them, and to identify attributes of the community that enhance general capacity for local action. Interactional field theory has thus been confirmed by the positive relationship between the community field and economic development through horizontal linkages among community members. Changes of social distance and degrees of community attachment among local residents influence the potential community cohesion and collaborative action that can be taken to approach the community common good. Focused on selected features of small-town social structure and its relationship to the community capacity for local action. Drawing on the interactional perspective, community network analysis, and community power research, he proposed an approach to measuring and evaluating the community field to understand more clearly the relationship between community structure and the capacity for local action [6]. His findings complement the thinking on community social capital and social infrastructure and reveal that social relationships and local residents' interaction structure are importantly associated with the community capacity for local action.

This theory was important in advancing for the close cooperation of the community in the study area, with the relevant authorities in

order to appropriately deal with the pollution menace [7]. Cooperation is important in enhancing enforcement of the relevant regulations and laws meant to protect the community from environmental pollution

Materials and Methods

Research design

Defines a research design as the scheme, outline or plan that is used to generate answers to research problems. This study employed a descriptive research design. This method allows a flexible approach, thus, when important new issues and questions arise during the duration of the study, further investigation will be conducted. For this study, the main focus was quantitative. However some qualitative approach was used in order to gain a better understanding and possibly enable a better and more insightful interpretation of the results from the quantitative study.

Target population

The target population of this study comprised of households' heads and community leaders as key informants. According to the Kenya National Bureau of Statistics, there are approximately 3000 households in Mukuru informal settlements.

Sampling technique

The sample size of the household heads interviewed were ascertained through the use of formula.

$$n = \frac{N}{1 + N(e)^2}$$

Where: N=Population size

n=sample size

e=Margin error of the study set at $\pm 5\%$ Sample size therefore was

$$n = \frac{3000}{1 + 3000(0.5)^2}$$

$$= \frac{3000}{1 + 7.5} = \frac{3000}{8.5} = 352 \text{ households}$$

To avoid nonresponse bias, the study increased the 352 sample size by 10%, to have a sample size of 387. This was important because, researchers commonly add 10% to the sample size to compensate for persons that the researcher is unable to contact. Simple random sampling was used to evenly select the households. Purposive sampling was used to select 10 community leaders.

Data collection

An introductory letter from the University and a research permit from the National Commission for Science, Technology and Innovation was obtained. This was followed by the recruitment of research assistants. The questionnaires were self-administered with assistance from the research assistants. Self-administered questionnaires are advantageous in that they cost less than personal interviews and also enable the researcher to contact participants who might otherwise be inaccessible thereby increasing response rate.

Data processing and analysis

Data analysis is the whole process which starts immediately after data collection and ends at the point of interpretation and processing data. Therefore before processing the responses, the completed questionnaires were edited for completeness and consistency. The study generated both qualitative and quantitative data. Quantitative data was coded and entered into Statistical Packages for Social Science (SPSS) and analyzed using both descriptive statistics and inferential statistics. Descriptive statistics are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. Descriptive statistics involved the use of absolute and relative (percentages) frequencies, measures of central tendency and dispersion (mean and standard deviation respectively). Inferential statistics is used to make judgments of the probability that an observed difference between groups is a dependable one or one that might have happened by chance in this study. The study used multiple regressions to establish the relationship between the independent variables and the dependent variables.

The regression equation was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Whereby the variables were identified as follows:-

Dependable variable Y=Pollution Management

Independent variable X1=Responsible waste disposal

Independent variable X2=Participatory planning

Independent variable X3=Participatory budgeting

While β_1 , β_2 , β_3 and β_4 were coefficients of determination and ϵ was the error term.

Results and Discussion

Karl Pearson's coefficient of correlation

To compute the correlation (strength) between the study variables and their findings the researcher used the Pearson's coefficient of correlation (R). From the study findings, there was a strong positive correlation between pollution management (dependent variable) and responsible waste management, participatory planning and participatory budgeting (independent variables) as shown by Pearson Correlation r values more than 0.5 (Table 1).

		Pollution management	Responsible waste management	Participatory planning	Participatory budgeting
Pollution management	Pearson correlation	1	-	-	-
	Sig. (2-tailed)	-	-	-	-
Responsible waste management	Pearson correlation	0.715	1	-	-
	Sig. (2-tailed)	0.0028	-	-	-
Participatory planning	Pearson correlation	0.621	0.2852	1	-
	Sig. (2-tailed)	0.0041	0.013	-	-

		Pollution management	Responsible waste management	Participatory planning	Participatory budgeting
Participatory budgeting	Pearson correlation	0.681	0.131	0.0418	1
	Sig. (2-tailed)	0.0034	0.013	0.0039	-

Table 1. Coefficient of correlation.

As illustrated in Table 1. It was clear that there was a positive significant correlation between pollution management and responsible waste management as shown by a correlation figure of 0.715. It was also clear that there was a positive correlation between pollution management and participatory planning with a correlation figure of 0.621, there was also a positive correlation between pollution management and participatory budgeting with a correlation value of 0.681. There was no multi co-linearity problem.

Coefficient of determination

The coefficient of determination was carried out to measure how well the statistical model was likely to predict future outcomes. The coefficient of determination, r^2 is the square of the sample correlation coefficient between outcomes and predicted values. As such it explains the effect of the independent variables (responsible waste management, participatory planning and participatory budgeting) on the dependent variable. The three independent variables that were studied, explain 74.5 percent of the pollution management as represented by the adjusted R^2 . This therefore means that other factors not studied in this research contribute 25.5 percent of the pollution management. Therefore, further research should be conducted to investigate the other factors (25.5%) that influence the pollution management (Table 2).

Model	R	R-square	Adjusted R-square	Std. error of the estimate
1	0.863	0.745	0.683	0.4415

Table 2. Model summary.

Multiple linear regression

Simple regression analysis was conducted to determine the relationship between pollution management in Mukuru informal settlements and the three independent variables. As per the SPSS generated in Table 3. The equation:

$$(Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon) \text{ becomes:}$$

$$Y = 1.287 + 0.717X_1 + 0.652X_2 + 0.709X_3$$

The regression equation above has established that taking all factors into account (responsible waste management, participatory planning and participatory budgeting) constant at zero, pollution management in Mukuru informal settlements will be 1.287. The findings presented also shows that taking all other independent variables at zero, a unit increase in responsible waste management will lead to a 0.717 increase of pollution management in Mukuru informal settlements; a unit increase in participatory planning will lead to a 0.652 increase of pollution management in Mukuru informal settlements; and a unit increase in participatory budgeting

will lead to a 0.709 increase in pollution management in Mukuru informal settlements. This means that responsible waste management contributes most to pollution management in Mukuru informal settlements followed by participatory budgeting while participatory planning contributed the least to pollution management in Mukuru informal settlements.

Model	Unstandardized coefficients		Standardized coefficients		Sig.
	B	Std. Error	Beta	T	
(Constant)	1.287	1.296		1.614	0.0348
Responsible waste management	0.717	0.287	0.168	2.086	0.0219
Participatory planning	0.652	0.166	0.201	3.517	0.0255
Participatory budgeting	0.709	0.318	0.059	3.448	0.0231

Table 3. Multiple linear regression.

At 5% level of significance and 95% level of confidence, participatory planning had a 0.0255 level of significance; participatory budgeting showed a 0.0231 level of significance; and responsible waste management showed a 0.0219 level of significance hence the most significant factor [8-11]. This implies that all the three independent variables (responsible waste management, participatory planning and participatory budgeting) significantly affected the dependent variable (pollution management).

Conclusion

The study concluded that responsible waste disposal had a 0.0219 level of significance, therefore, the alternate hypothesis “responsible waste disposal has a positive significant influence on pollution management in Mukuru informal settlement of Nairobi County, Kenya” was accepted. The study also concluded that participatory planning had a 0.0255 level of significance. As such the alternate hypothesis “participatory planning has a positive significant influence on pollution management in Mukuru informal settlement of Nairobi County, Kenya” was accepted. The study further concluded that participatory budgeting had a 0.0231 level of significance. As such, the alternate hypothesis “participatory budgeting has a positive significant influence of on pollution management in Mukuru informal settlement of Nairobi County, Kenya” was accepted.

Recommendations

The study recommends that extensive sensitization be done on the need for the community to be responsible in how they dispose of the waste they generate at the household level or in their businesses and institutions.

The study also recommends that the community members be always involved in the planning process of the policy making meant for pollution management and environmental protection in general. The government should thus move from the top-down approach used in pollution management.

The study also recommends that the community be constantly involved in the budget making process of financing the pollution management efforts. This will ensure accountability on how the funds meant for pollution management are utilized.

Having found that the factors studied in this study contributed to 74.5 percent of the pollution management, the study recommends that further study be done to establish the other factors (25.5 percent) that influence pollution management.

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How to cite this article: Lucas E Esekun, Ferdinand Nabiswa, Edward Neyole . "Role of the Community in Pollution Management in Mukuru Informal Settlement of Nairobi County, Kenya ". *Adv Recycling Waste Manag* (7): (6) (2022) :231