Impact of Community Behavior Change on Environmental Protection in Rwanda

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Abstract

In Rwanda, regardless of human activities continuously degrading the environmental quality, some protection policies like buffer zone, car freed day, and reduction of charcoal use are implemented. This research analyzed the impact of human behavior change on environmental protection. The authors used a structured questionnaire among 100 respondents selected from households of Nyarugenge district in Kigali city of Rwanda. The results by 26 and 24 percent of respondents indicated that population growth and lack of environmental protection engagement and ownership are key drivers to poor human behavior. Consequently, this leads to degradation of wetland ecosystem services (31%), pollution of air, land and soil quality (27%), and decrease in forest cover listed by 20 percent. Some polices like promotion of environmental protection education and community engagement (34%), polluter pay principle (24%) and car free day (20%) are initiated. These led to enhanced environmental protection awareness and engagement among people. There is also reduction of pollutants, increase of forest cover and increased hygiene, and wetland restoration. The results of this study are indicators that human behavior change, its engagement and involvement can contribute to sustainable protection of environment. Thus, it is recommended that much policies concentrate in changing people's behavior and developing its interest in environmental protection awareness and participation.

Keywords

Community Behavior, Environmental Degradation, Environmental Protection

1. Introduction

Human behavior leads to global warming, urban air pollution and causes environmental problems such as water shortages, environmental noise and biodiversity loss [1]. The understanding of environmental protection recognizes that the causes and consequences of environmental harms are managed at local scale with the engagement of the local communities. Thus, existing laws and policies should consider the fact that the local community is enabled to protect its environment, and seeks to suggest measures which might be taken to strengthen the position of communities [2, 3].

These efforts depend on how people behave toward the environment, what they consume, or what they are willing to give up [4, 5]. For such behavior development, a general framework comprises the (1) identification of the behavior to be changed, (2) examination of the main factors underlying this behavior, (3) design and application of interventions to change behavior to reduce environmental impact, and (4) evaluation of the effects of interventions [6-8].

In Rwanda, the environmental problems are mainly caused by industrial, commercial and human settlement activities in wetland. These are associated with population pressure, serious erosion, pressure on natural resources, massive

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deforestation, pollution in its various forms, and lack of a strong and coherent political, institutional and legal framework [9, 10]. This however, affects the planned poverty reduction and development initiatives due to the fact that these programs cannot be successful without effective and real consideration of the environmental dimension.

Therefore, it is good to ensure that people's behavior in regard to environmental protection is changing through local approach, training and education. This again calls for people's full engagement for better understanding their role in environmental protection and the associated benefits for both present and future generations. Hence, the objective of this study was to assess the importance of local community behavior change on environmental protection with the case of Nyarugenge district in Kigali city. The findings of this study will highlight existing challenges which hinder the protection of environment as results of poor community behavior from which relevant policies can be undertaken.

2. Materials and Methods

2.1. Description of Study Area

This study was conducted in Nyarugenge district located in Kigali city of Rwanda. Nyarugenge district covers an area of 340 Km^2 with a total population of 284,561 including 148,132 men and 136,429 women. Its population density is estimated at 2,149 people per square Kilometer.
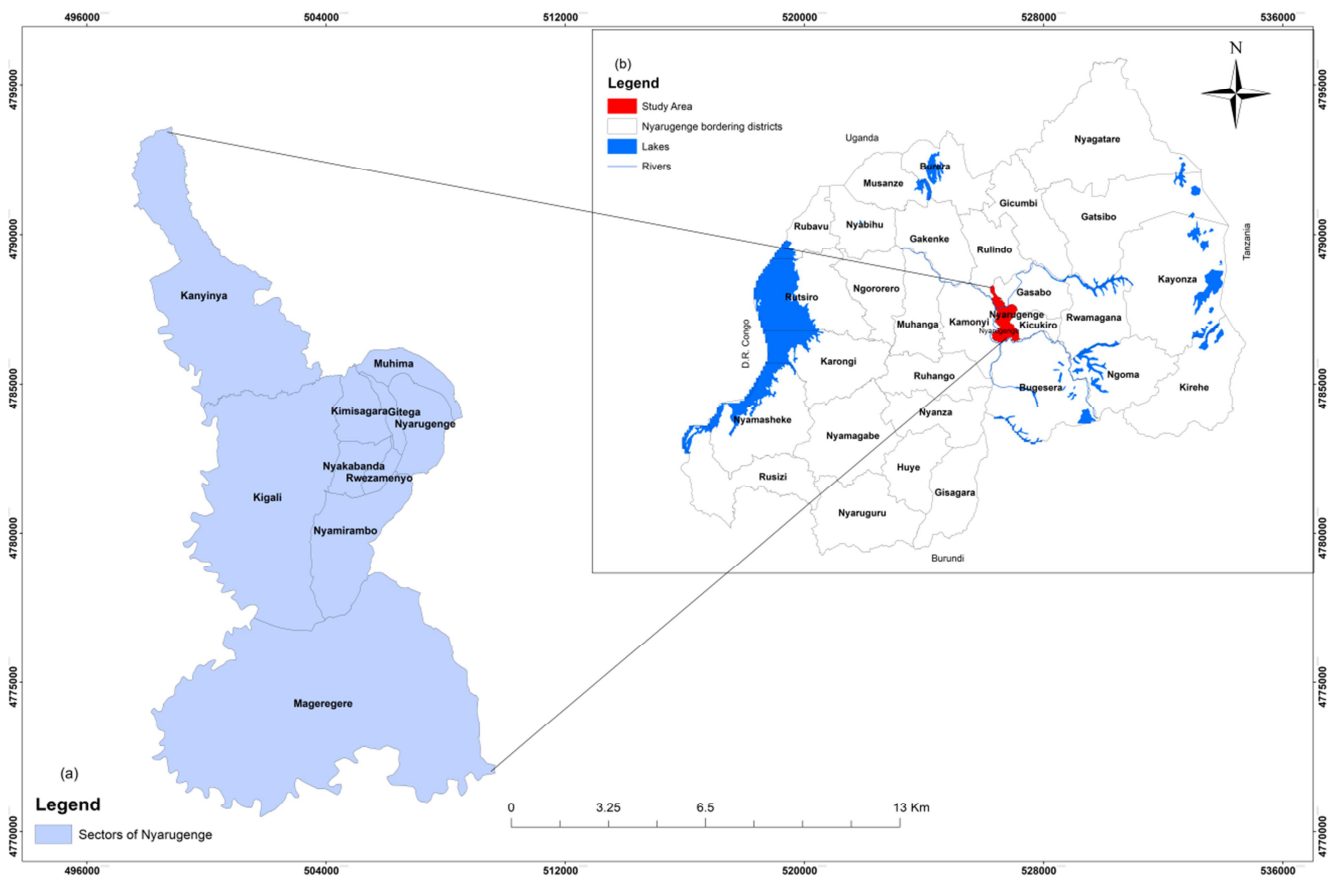

Figure 1. Location of study area.

The district of Nyarugenge (Figure 1) is composed by 10 sectors, namely: Gitega, Kanyinya, Kigali, Kimisagara, Mageragere, Muhima, Nyakabanda, Nyamirambo, Nyarugenge and Rwezamenyo. It borders with Gasabo, Kicukiro, Kamonyi and Rulindo districts [11]. The district was considered due to the fact that it is viewed as the hart of Kigali city and that much waste and other environmental issues can be registered in this area. In addition, repetitive flood and high level of air pollution are reported due to poor human settlement located in risk prone areas, advanced number of second-hand automobiles and industries [12]. The authors considered all these facts and then chose to assess how community behavior change can contribute to protecting the environment in this area.

2.2. Data Collection and Analysis

For this study, the sample was taken from the total 72,280 households [13] of Nyarugenge district. The following Yamen's formula was adopted to calculate the sample size.

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

Where n is the sample size, N is the population size, and e is the level of precision. To minimize the risk that the sample size was not represented the true population the margin error was fixed at 10%. Therefore, the sample became:

$$n = \frac{72,280}{1+72,280(0.1)^2} = 99.9 = 100 \qquad (2)$$

In order to ensure that each sector was represented, the proportionate sampling method [14, 15] was adopted as follows:

$$ni = \frac{Ni*n}{N} \qquad (3)$$

Where ni is the sample size proportion to be determined, Ni is the population proportion in the sector, n is the sample size calculated in equation 2 and N is the total population considered by the study.

Table 1. Respondents per sector.

Sector	Households	Sample
Gitega	7,415	10
Kanyinya	5,760	8
Kigali	8,116	11
Kimisagara	11,648	16
Mageragere	6,220	9
Muhima	7,339	10
Nyakabanda	6,375	9
Nyamirambo	9,593	13
Nyarugenge	5,558	8
Rwezamenyo	4,256	6
Total	72,280	100

The data collected among respondents was completed by using a questionnaire. Finally, the collected data were analysed by using the Statistical Package for Social Sciences (SPSS) software. This tool was used to quantify the data and to put them into representative interpretation like tables and graphics.

3. Results

3.1. Description of Respondents

Table 2. Description of respondents by age, sex, education and marital status.

Age					
Age	Below 20	21 - 35	36- 55	56 and above	Total
Frequency	11	47	23	19	100
Percentage	11	47	23	19	100

Gender			
Gender	Female	Male	Total
Frequency	62	38	100
Percentage	63	38	100

Education					
Education	Illiterate	Primary	Secondary	University	Total
Frequency	3	32	41	22	100
Percentage	3	32	41	22	100

Status					
	Single	Married	Widow(er)	Divorced	Total
Frequency	22	50	19	9	100
Percentage	22	50	19	9	100

Based on the results in Table 2, majority of respondents (47%) are aged between 21 and 35 years old. The same Table 2 indicated that 62 percent of respondents were female, 41 and 32 percent attended secondary and primary studies, respectively. Finally, 50 percent of households in Nyarugenge district are married and 22 percent of them are single.

3.2. Human Behaviors Which Cause Environmental Degradation

Table 3. Human behaviors.

Human behaviors	Frequency	Percentage
Building houses in restricted areas	24	24
Settling commercial and other human activities in wetland	23	23
Emission of pollutants	19	19
Throwing wastes anywhere	14	14
Cutting off trees without permission	11	11
Usage of polythene bags	9	9
Total	100	100

The results in Table 3 as asserted by 24 and 23 percent of households, building houses in restricted area and settling commercial and other human activities in wetland are the key human behaviours which impact on environmental quality in Nyarugenge district, respectively.

Table 4. Causes of wrong human behaviors.

Causes	Frequency	Percentage
Population growth	26	26
Lack of community engagement and ownership	24	24
Illiteracy	22	22
Poor message delivery and communication system	16	16
Disrespect of environmental protection polices	12	12
Total	100	100

The results in Table 4 indicated that population growth (26%) and lack of community engagement and ownership (24%) in environmental protection are the major concerns in this area. Accordingly, poor message delivery and communication system and disrespect of environmental protection polices initiated by the government along with illiteracy contribute to environmental degradation as well.

3.3. Initiated Human Behavior Change Policies

The results in Table 5, as indicated that 34 percent of

households, revealed that the promotion of environmental protection education and community engagement is the major human behavior change policies initiated in Nyarugenge district. Also, as shown in Table 5, there is regular delivery of environmental protection messages on social media (32%) and polluter pay principle asserted by 24 percent.

Table 5. Community behavior change policies under execution.

Environmental protection polices	Frequency	Percentage
Promotion of environmental protection education and community engagement	34	34
Regular delivery of environmental protection messages on social media	32	32
Fining environmental polluters (polluter pay principle)	24	24
Usage of cooking gas than firewood	16	16
Total	100	100

3.4. Recorded Environmental Protection Due to Human Behavior Change

Table 6. Proofs of environmental protection due to human behavior change.

Proofs	Frequency	Percentage
Advanced community awareness and engagement	27	27
Reduction of pollutants	24	24
Spread of forest cover	19	19
Increase hygiene and ban of polythene bags	16	16
Wetland restoration	14	14
Total	100	100

With reference to Table 6, 27 percent of respondents pointed out advanced environmental protection awareness and engagement among people. This expresses that people consider protecting the environment as their concern not that of government only. In addition, there is reduction of pollutants and increase of forest cover, as highlighted by 24 and 19 percent, respectively.

4. Discussion

In Rwanda, during and after the 1994 Genocide against Tutsi, environment has registered considerable quality decline which even caused low agricultural productivity and decreased forestland as well [10]. The government then recognized the role of environment in sustainable development and initiated its protection measures like development of practices which can help to change human perspectives/behavior on usage and protection of environment. And to date, considerable changes like increase forestland, buffer zones creation which improved the land and water quality are recorded countrywide [16].

The results of this study in Table 2 indicated that 41 percent and 32 percent attended secondary and primary studies, respectively. This expresses that people can understand the role of environment since courses related are delivered from

primary schools upward. Regardless the fact that people might possess environmental protection awareness, there is still evidence of environmental degradation in Nyarugenge district. These was certified by the fact that some households consulted (Table 3) still build houses in restricted areas and settle other human activities in wetland, and throwing wastes anywhere (Table 3). This agree with recent studies [17, 18] which indicated that in developing urban areas, environmental degradation is recorded due to the fact that people do not respect all building codes and their wastes are not appropriately managed.

In addition, as previously stated [19, 20] high population growth, lack of environmental protection ownership and initiatives and poor message sharing among people lead to severe environmental degradation. This is similar to the results in Table 4 where population growth, lack of environmental protection ownership and poor message delivery were highlighted as primary causes of negative human behavior in Nyarugenge district. Consequently, as indicated in Table 3, such negative human behaviors contribute to the pollution of air, soil and water quality, degradation of ecosystem services and loss of biodiversity.

Nevertheless, it is suggested [21] human behavior can be changed if strong policies are made. Similarly, as indicated in Table 5, the policies initiated for human behavior change have significantly contributed to the environmental protection. There is advancing community environmental protection awareness and engagement, reduction of pollutants and increased forestland (Table 6). Therefore, as recently reported [22], the change of human behavior regardless of the cost, can be useful and beneficial to the environment but also to human wellbeing. This is the case under record in Nyarugenge district which certifies how positive human behavior change has contributed to the protection of environment.

5. Conclusion

This study assessed the impact of community behavior change on the protection of environment with the case of Nyarugenge district. Structured questionnaire was used to collect data from 100 households leaders selected from all households of the study area. The results indicated that population growth (26%), lack of community engagement and ownership in environmental protection (24%) are among the drivers to poor human behavior which lead to the degradation of environment in Nyarugenge district. As respondents indicated, such behaviors contributed to building houses in restricted area (24%) and settling commercial and other human activities in wetland (23%). Consequently, there is degradation of ecosystem services (31%) and pollution of

the air, land and soil quality, as listed by 27 percent. However, there is progress in environmental protection in this area. This resulted from promotion of environmental protection education and community engagement and polluter pay principle. Also, car free day and relocation of households relocating in wetland and setting up buffer zones contributed a lot. And so far, people consider protecting the environment as their concern not only that of government only. Finally, regardless the recorded progress, further policies strengthening people's behavior and developing its interest in environmental protection awareness and participation are recommended.

Acknowledgements

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