

Original Article

Effect of Food Wastage on Climate and Environmental Sustainability: An Assessment of Perception of Consumers in the Kumasi Metropolis

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Abstract: Food waste is a moral problem with worldwide effects. One-third of all food produced worldwide, or around 1.3 billion tons, is lost or wasted each year. The study evaluated the influence of food waste on climate change and environmental sustainability using residents of the Kumasi Metropolitan Area as a case study. The study employed a two-stage sampling technique involving both purposive sampling and simple random sampling techniques in selecting the appropriate respondents for the study. A total sample size of 400 households was engaged. The Statistical Package for Social Sciences (SPSS), version 23, was generally used to evaluate the data gathered from the questionnaire. Per the information generated, it was recognized that majority of the respondents (97.8 %) were aware of food wastage and its impact on the environment. When probed further, it was realized that the most common sources of this information were family members (39.1 %) and the media (33.5 %). Generally, majority of the respondents, at certain instances claimed that they seldom threw away the food items, while in some cases, majority of them were not certain about the rate of disposal of these food items. On the possible causes of food waste among the households engaged, the results revealed that, in all the causes assessed, majority of the respondents affirmed to its importance in contributing to food waste. The research also delved into the possible factors that could have impacted the respondents' rate of wasting food. Of the six factors (age, gender, access to education, household size, and frequency of meals prepared) evaluated, only age and gender had a significant relationship ($P < 0.05$) on the respondents' tendency to waste food. The Kumasi Metropolitan Area's citizens need to be made aware of the negative effects that food waste has on the environment. This can be done through increasing awareness and providing training on waste classification and individual recycling.

Keywords: food, wastage, climate, environmental sustainability, assessment, perception

1. INTRODUCTION

Food waste is a moral problem with worldwide effects. One-third of all food produced worldwide, or around 1.3 billion tons, is lost or wasted each year [1]. Nearly one-third of all food produced each year for human use is either wasted or lost, according to the Food and Agriculture Organization (FAO) of the United Nations [2]. Every food item wasted is a lost opportunity to end world hunger and guarantee food security [3]. Food waste is any food (including grains, vegetables, meat, poultry, and beverages) that was produced with the intention of being consumed by humans but is now found in landfills as garbage [4]. Due to inadequate stock management, economic behavior, and carelessness, the food that is thrown away is either spoiled or expired [5]. Each contributing more than the other, this is taking

place in developing and impoverished nations. The rate of food waste is significant not just in industrialized nations but also in emerging nations, which is currently reaching these proportions. This is mostly caused by the inadequate infrastructure, broken distribution networks, and corruption [6]. The amount of food that does not make it to the market in some nations is higher than 50 %, and even fewer products actually make it to the local population. Children and adults are undernourished in micronutrients, which is generating billions of dollars in losses and ruining many lives. The pressures placed on food production by variables such as climate change are universally accepted to be significant [7]. Since climate change has an impact on so many important agricultural factors, it specifically affects food production [8]. However, dietary decisions and sensible food management can also help to mitigate climate change [9]. Food waste negatively impacts not only the residents of the countries in issue but also the economy and environment. The majority of food produced in wealthy countries is lost throughout the retail and consumption stages, resulting in waste volumes that are comparable to the whole net food production in sub-Saharan Africa [10]. These staggering estimates of food waste include both significant negative social and environmental externalities, such as excessive agricultural input consumption, greenhouse gas emissions, and biodiversity loss, as well as significant economic opportunity costs due to the increasing global food demand [11]. Paper, food scraps, and garden trash are among the easily biodegradable organic materials included in daily rubbish, which accounts for about 58 percent of the weight of waste generated. Methane and carbon dioxide are produced during the breakdown of these pollutants. Methane and carbon dioxide, two greenhouse gases, both have negative environmental effects and cause global warming. The likelihood of numerous extreme occurrences increases as a result, and rainfall patterns may change. These occurrences have the potential to damage infrastructure and property, which requires attention. Therefore, it is now more important than ever to discover strategies to reduce and manage the waste we produce as a result of climate change. This is due to the possibility of reducing greenhouse gas emissions while reducing the demand on the planet's natural resources through waste minimization and recycling. According to estimates from the Food and Agriculture Organization of the United Nations, one third of the food produced for human consumption globally is incorrectly handled or wasted [12]. This indicates a waste of natural resources that are used in the production, processing, packing, and marketing of food, as well as a missed opportunity to increase food security or reduce poverty, malnutrition, and inequality [13]. Food wastage is a topic of interest that is growing more and more important due to its moral, financial, and environmental repercussions [14]. Food that is lost comprises food that is thrown away during production, distribution, retail, and food service activities as well as food lost before, during, or after a meal is made in the home. Raw or cooked food products make up food waste [15]. Thus, waste food is produced while food is being produced. Food production, manufacturing, transportation, storage, sale, and preparation utilize a lot of resources, so it is clear that food waste is bad for the environment. According to the dynamics of the production of food waste, several industries and nations appear to be the main contributors. In prosperous economies, such those in industrialized countries, post-consumer food waste makes up the majority of losses, and individual families are mostly responsible for unnecessary food waste [16]. Product Life Cycle Assessment (LCA), according to [17], takes into account the potential effects of a product or a service system across the course of its life, from manufacturing to use and disposal. A product's environmental burdens, wastes released into the environment, and the effects of those energy and material are all evaluated by LCA. The amount of food that was squandered may be compared to the amount of time, money, and resources that were wasted. If we consider food waste, we must also add the waste of all agricultural components, raw materials, energy expended during food production, gasoline utilized during transportation, and logistics. According to FAO, food waste emits an estimated 3.3 billion tons of carbon dioxide that is produced but not used, making it the third-largest source of carbon dioxide emissions after the US and China (2013). For every 10 tons of recycled food waste, according to [17], we could reduce carbon

emissions by 4.9 tons. Food waste is a complicated problem that requires interdisciplinary management strategies. If properly managed, it can save a sizable sum of money, feed the hungry, and ease the strain on the environment. It can also be very advantageous and has numerous economic and ecological advantages, including the development of new job and business prospects. Additionally, food waste compost can be applied to agriculture to increase food security. The production of bioenergy from garbage and the decrease in greenhouse gas emissions are two environmental benefits of waste management. Reduced gas emissions contribute to better health and lower health care expenses because of pollution [18]. Due to the size of the agriculture sector's impact on climate change, decreasing food loss and waste is also crucial in plans to reduce global climate change. Therefore, reducing food waste and its underlying impact on climate change requires an awareness of the elements connected with the practice of waste as well as its causative and interdependent links with the environment. The study makes it possible for the nation, businesses, and other groups to track and report the amount of food wasted and lost, particularly in the Kumasi Metropolitan Area. Additionally, it will demonstrate how food waste happens, enabling focused efforts to lessen it. The Kumasi Metropolitan Area is one of the renowned areas of the country for its abundance of foods at comparatively cheaper charges. Being a food basket of the nation, the possibility of foodstuffs being wasted every day is irresistible. The relatively cheaper costs involved in purchasing foodstuffs in the area is one factor that influences people to procure more than their household requirements. These facilitates the generation of high magnitudes of wastes as a result of poor planning during the procurement of the foodstuffs or during cooking. Concerns about whether these wastes are produced as a result of the availability of food or other underlying issues have surfaced in light of these unending waste cycles. The goal of the current study is to close this knowledge gap by evaluating consumers' level of knowledge regarding the rate of waste production in the Kumasi Metropolitan Area and how this threat may impact the environment and the climate. This study examined the impact of food waste on global warming and environmental sustainability using residents of the Kumasi Metropolitan Area as a case study.

2. MATERIALS AND METHODS

The Kumasi Metropolitan Area in the Ashanti Region served as the research site. 1,730,249 people live there, which is 36.2% of all Ashanti Region population. A broad base population pyramid that tapers off with a relatively small number of elderly people (60 years and older) may be seen in the population of the Metropolis. The age dependence ratio for the Metropolis is 58; for males and females, it is 59.9 and 56.3, respectively. In total, 440,283 households, with an average household size of four individuals, make up the Metropolis. With a share of 39.7%, children make up the majority of the household, followed by spouses with a share of 9.9%. In the Metropolis, nuclear families (head, spouse(s), and children) make up 26.9% of all households, and nuclear families with only one parent make up 12.9% of all households. A total of 89.5 % of people aged 11 and over are literate, compared to 10.5 percent who are not. Seventy-two percent of those who are literate are able to read and write in both English and a Ghanaian language. There are 148,413 homes in Kumasi Metropolis, with an average of roughly 12 people living in each one. The Metropolis's median household size is 3.9 people. Public dump (open area), collection, and public dump (container) are the three most popular ways to dispose of solid waste (15.6 %). 1.9 percent of homes conduct indiscriminate solid waste disposal. The three most frequent methods used by houses in the Metropolis for disposing of liquid trash are throwing liquid garbage onto a compound (15.4 %), putting liquid waste into a drainage system (35.2 %), and 35.9 % through gutters. This study employed a two-stage sampling technique involving both purposive sampling and simple random sampling techniques. In the first stage, a purposive sampling technique was used to select 10 communities within the Kumasi Metropolitan Area. The second stage involved the random selection of

households in the respective communities. In each of these communities, a specific number of households were selected based on the target number of households required for the study. In selecting the respondents' (households'), limitation was placed on households who have been in the study area for less than 6 months. This, at least ensured that each household interviewed has a fair knowledge on waste generation and its impacts in the research setting. The sample size for this research was determined using the Yamines sample size formula; $n = N / 1 + N(e)^2$, where; n = sample size, N = Total population and e = level of precision. Since the research will target households, 440,283 will be the total households from which the sample size will be generated. Employing the formula gives a sample size of 400 households. Specifically, these households were nominated from ten (10) communities within the study area. Hence, in each community, 40 households will be engaged to provide relevant information pertaining to the research objectives. The study relied on self-prepared questionnaire to solicit primary information from the respondents (households). The questionnaire was prepared in four themes, viz., the overview of the households' general knowledge on food wastage and its role in climate change, sources of food wastage and the significant reasons which are causing food wastage and their views on the impact of food wastage on climate and the environment. Data collection was done either in the early morning (around 7:00 – 9:00 am) or evening (around 5:00 – 7:00 pm). This ensured, the possibility of engaging as many households without possible impediments such as work or daily routines. Prior to their engagements, the respondents were assured of the secrecy of their information and their identity. They were also educated on the aim of the research and its implication on their livelihood. As such, households who may not be interested / willing to participate will not be forced against their wishes. The Statistical Package for Social Sciences (SPSS), version 23, was generally used to evaluate the data gathered from the questionnaire. Specifically, the individual objectives are analyzed as follows;

Objective 1: To determine respondents' general knowledge on food wastage and its role in climate change. Descriptive statistics such as frequency tables and graphs will be used to summarize the perceived views of the households regarding their behaviors towards waste generation and its impact on climate change and the environment.

Objective 2: To assess the major sources of food wastage and the significant reasons which are causing food wastage? It is assumed that certain socio-economic and institutional factors affect peoples' decision making. In this regard, a regression analysis will be employed to determine the key factors affecting the respondents' (households') decisions regarding food wastage.

Objective 3: To ascertain respondents' views on the impact of food wastage on climate and the environment. The presumed impacts of food wastage on climate and the environment were listed on a 5-Point Likert's scale (Strongly Agree, Agree, uncertain, disagree and strongly Disagree) and respondents indicated their views on these impacts based on the provided options.

3. RESULTS AND DISCUSSION

Table 01 highlights the socio-economic characteristics of the respondents engaged in the study. Specifically, emphasis was laid on the age distribution, gender distribution, educational status, main source of income and average monthly income. As demonstrated in the table, the results revealed that 74 (18.5 %) of the respondents had 18-29 years, 142 (35.5 %) had 30-39 years and 77 (19.3 %) had 40-49 years. The remaining proportions were 66 (16.5 %) and 41 (10.2 %) respectively for the respondents who had 50-60 years and those who were above 60 years. The data generally revealed that more than two-thirds (73.3 %) of the respondents were below 50 years (Table 01). Age generally has a direct impact on the rate at which food is wasted. This is because, age increases with experience and consumers' knowledge on food waste and its consequences on the environment. Hence, elderly people

are more cautious in preventing food waste compared to younger consumers. On the sex distribution, the findings revealed that 124 men and 276 women responded to the survey. For males, this corresponds to 31.0 % and for females, 69.0 %. This clearly indicates that more women were engaged as compared to the males. The high percentage of female responses may be a result of the fact that women are frequently left in the house to complete tasks like cooking and laundry. The high proportion of female responses may have a beneficial impact on the amount of food wasted. This is so because women are more accustomed to buying and preparing food. As a result, they have more experience than their male colleagues in ensuring minimal food is wasted. The data gathered also revealed that 39 (9.8 %) out of the total respondents engaged had never been to school. The remaining proportions were 71 (17.8 %) for those who had completed basic education, 123 (30.8 %) for those who had completed secondary education and 167 (41.8 %) for those who had completed tertiary education (Table 01). The data gathered generally revealed that only few of the respondents had never been to school with a generally high levels of education, as depicted by 30.8 % and 41.8 % respectively for those who had completed secondary education and tertiary education (Table 01). Education has been touted as one of the important factors associated with food waste. For instance, a higher degree of education has been linked to a larger self-reported amount of food waste [19]. On the respondents' main source of income, the data revealed that 27 (6.8 %) of the respondents were unemployed, 8 (2.0 %) earned their living as farmers, 157 (39.3 %) were traders, 125 (31.3 %) were public servants whiles 47 (11.8 %) were artisans. The remaining 36 (9.0 %) of the respondents were into different ventures / activities that were different from the options provided during the survey (Table 01). The respondents were also interrogated on the average income they earn every month. Per the data gathered, 128 (32.0 %) of the respondents earned below GH C 1000 every month, 130 (32.5 %) earned GH C 1000 – 1999 every month and 95 (23.8 %) earned GH C 2000 – 2999 every month. The remaining proportions were 28 (7.0 %) and 19 (4.8 %) respectively for the respondents who earned GH C 3000-3999 and more than GH C 4000 every month (Table 01). From the data gathered, it was clear that majority (93.2 %) of the respondents had at least one source of income (Table 01). This could have had a direct impact on the amount of income generated by the respondents. The data also revealed that, on the average, around 32 % of the respondents earned less than GHC 1000 with the remaining (68 %) earning an average of GHC 1000 or more (Table 01). The generally high income of the respondents could have an impact on the rate of food waste. This is because; households that generate enough income are more likely to buy more food items which can result in a possible accumulation of waste. However, other research shows a connection between higher food waste and poorer income [20].

Table 01: Socio-economic characteristics of the respondents (households) engaged.

Characteristics	Frequency	Percentage (%)
Age distribution		
18-29 years	74	18.5
30-39 years	142	35.5
40-49 years	77	19.3
50-60 years	66	16.5
Above 60 years	41	10.2
Gender		
Male	124	31.0
Female	276	69.0
Educational status		
None	39	9.8
Basic	71	17.8
Secondary	123	30.8

Tertiary	167	41.8
Primary source of income		
Unemployed	27	6.8
Farming	8	2.0
Trading	157	39.3
Public servant	125	31.3
Artisan	47	11.8
Others	36	9.0
Average income / month (GH C)		
Below 1000	128	32.0
1000-1999	130	32.5
2000-2999	95	23.8
3000-3999	28	7.0
Above 4000	19	4.8

The study also delved into the respondents' general awareness of food waste. A summary of the results is demonstrated in Table 01. The results revealed that 391 (97.8 %) of the respondents were aware of food waste whereas the remaining 9 (2.3 %) said otherwise. When the former group was probed further on where specifically they sourced their information, 153 (39.1 %) said they sourced the information from their family members, 50 (12.8 %) said they got their information from colleagues (friends), 131 (33.5 %) sourced their information from the media such as radio and television whereas the remaining 57 (14.6 %) said they sourced the information from the internet. It has been shown that increasing consumer awareness of their own food waste behaviors and the detrimental repercussions of food waste can significantly reduce food waste levels [21,22]. Per the information generated, it was recognized that majority of the respondents (97.8 %) were aware of food wastage and its impact on the environment. When probed further, it was realized that the common sources of this information were family members (39.1 %) and the media (33.5 %). The fact that majority of them sourced information from their family members could be attributed to their direct and constant connection with the members of their households, which includes sharing numerous information such as food waste.

Table 02: Respondents' awareness of food waste.

	Frequency	Percentage (%)
Awareness of food waste		
Yes	391	97.8
No	9	2.3
If yes, source of information		
Family members	153	39.1
Friends	50	12.8
Media (Radio / TV)	131	33.5
Internet	57	14.6

Table 02 summarizes the rate at which different food items are discarded by the respondents (households) engaged in the research. The data generally revealed contrasting views among the respondents with respect to the rate at which different food items are discarded. Specifically, the results revealed that majority of the respondents sparingly threw away cooked foods (47.0 %), dairy products (49.0 %), vegetables (61.8 %) and eggs (58.8 %). On the other hand, majority of the respondents at different instances, were uncertain about the actual rate at which they discarded fresh

meat / fish (69.0 %), fruits (57.0 %), bread (57.0 %) and beverages (52.3 %) as highlighted in Table 03. Per the data gathered, it was clear that the respondents had varying opinions on the rate at which different food items are discarded. Generally, majority of the respondents, at certain instances claimed that they seldom threw away the food items, while in some cases, majority of them were not certain about the rate of disposal of these food items. For instance, most of the respondents purported that they sparingly threw away cooked foods, dairy products, vegetables and eggs. On the other hand, majority of the respondents claimed that they were uncertain about the rate of disposal of fresh meat / fish, fruits, bread and beverages (Table 02). The general inference of the results is that the respondents possibly wasted both cooked and raw food items, a situation that had earlier been buttressed by FAO (2014). This could have been the reason for the varying responses from the respondents, regarding their rate of wasting the food items evaluated. Various food products have variable degrees of negative environmental impacts, according to [23]. For instance, N₂O and CH₄ emissions from animal feed production, enteric fermentation, and manure management are GHG emissions linked to food products derived from animals. Additionally, [24] emphasized how production of beef in particular has the highest environmental effect of any food group. The effect of fish on the ecosystem has also been noted by [25]. Similarly, other authors have highlighted the impacts of different food items such as dairy products [26], carbohydrate-rich foods such as bread and potato [27] and fruits and vegetables [28] on the environment.

Table 03: Respondents' views on the rate at which different food items are discarded.

Food items	Regularly	Uncertain	Sparingly
Cooked food	139 (34.8 %)	73 (18.3 %)	188 (47.0 %)
Fresh meat / fish	36 (9.0 %)	276 (69.0 %)	88 (22.0 %)
Dairy products	53 (13.3 %)	151 (37.8 %)	196 (49.0 %)
Fruits	88 (22.0 %)	228 (57.0 %)	84 (21.0 %)
Vegetables	40 (10.0 %)	113 (28.3 %)	247 (61.8 %)
Bread	29 (7.3 %)	228 (57.0 %)	143 (35.8 %)
Eggs	27 (6.8 %)	138 (34.5 %)	235 (58.8 %)
Beverages	93 (23.3 %)	209 (52.3 %)	98 (24.5 %)

The respondents' views on the possible causes of food waste are illustrated in Table 04. Largely, the data revealed that, in all the factors evaluated, majority of the respondents affirmed to their significance in contributing to food waste. Specifically, most of the respondents slightly agreed to the fact that; the individual responsible for household food shopping (1.92), frequency of purchasing (1.87), frequency of eating out (2.00) and impulse buying are major contributors of food waste. Similarly, most of the respondents strongly agreed to the fact that; the individual responsible for household food cooking and preparation, checking storage before shopping (1.74), planning of shopping (1.78) and over preparation of food can influence the rate at which food is wasted (Table 03). The results largely revealed that, in all the causes assessed, majority of the respondents affirmed to their importance in contributing to food waste. This clearly indicated that all the factors assessed were possible contributors to food waste. Similar to the results obtained, [29] stressed that lack of proper planning can lead to food waste. He purported that food waste can be caused indirectly by actions taken during the planning stage, such as poor or insufficient planning. Too many things can be purchased as a result of poor planning. This makes it more likely that some products would not be able to be consumed before going bad. Another important contributing factor highlighted by the respondents was the individual responsible for household food cooking and preparation. Similar assertion has been echoed by [30] and [31]. According to [32], when food is being prepared by an inexperienced person, it

increases the possibility of food waste due to the high possibility of preparing too much food beyond the requirement of the household or preparing food with relatively bad taste. This can occur either consciously or accidentally. When food tastes terrible, it is more likely to be thrown out, which is sometimes the result of poor cooking techniques [33].

Table 04: Views of the respondents on the possible causes of food wastage.

Contributing Factors	Sum	Mean	General Response
Individual responsible for household food shopping	767	1.92	Agree Slightly
Individual responsible for household food cooking and preparation	625	1.56	Strongly Agree
Frequency of purchasing	749	1.87	Agree Slightly
Frequency of eating out	798	2.00	Agree Slightly
Checking storage before shopping	695	1.74	Strongly Agree
Planning of shopping	711	1.78	Strongly Agree
Impulse buying	735	1.84	Agree Slightly
Over preparation of food	522	1.31	Strongly Agree

Table 04 summarizes the relationship between certain characteristics of the respondents engaged in the study and their level of awareness and likelihood of food wastage. Specifically, six key factors- age, gender, access to education, household size, and frequency of meals prepared- were highlighted in the research to ascertain their level of impact on the rate of food wastage among individuals in the research area. Based on the information generated, it was revealed that, while, age and gender had significant impacts ($P < 0.05$) on the respondents' general awareness and tendency to waste food, access to education, household size, and frequency of meals prepared had no significant relationship ($P > 0.05$) with the respondents' awareness and tendency to waste food (Table 04). The implication of this result is that, both the gender and age of the respondents engaged could impact their general understanding and rate of wasting food. From the six factors (age, gender, access to education, household size, and frequency of meals prepared) that were evaluated, only age and gender had significant associations ($P < 0.05$) on the respondents' tendency to waste food. The amount of waste generated and consumer attitudes about waste have been found to vary with age, with elderly consumers discarding less and viewing food waste more negatively than younger consumers [34]. Given that older consumers have gone through times of food shortage while younger consumers have not, this may be tied to their social and cultural backgrounds and, consequently, their upbringing. Consumer attitudes and behavior about food management have been linked to upbringing [35]. Additionally, older shoppers may squander less since they frequently have more free time and are more knowledgeable about avoiding food waste [36]. Food waste is also found to be influenced by gender (or sexuality). Males waste more than females, according to certain research [37], however the contrary has also been reported [38]. Furthermore, [39] found that women are typically more conscious of food waste and have serious intentions to reduce waste [40]. However, because household trash is produced by a group of individuals who share food management responsibilities, it can be tricky to pinpoint who is in charge of which piece of food waste.

Table 05: Possible factors influencing the respondents' rate of food wastage in the study area.

Contributing Factors	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Age	2.099	.804	6.817	1	.009	8.156	1.687	39.418

Gender	3.710	1.246	8.867	1	.003	40.853	3.554	469.594
Access to education	-1.899	1.352	1.974	1	.160	.150	.011	2.117
Income level	1.331	.864	2.376	1	.123	3.785	.697	20.565
Household size	.201	.240	.704	1	.402	1.223	.764	1.956
Frequency of meals prepared	-17.888	3745.118	.000	1	.996	.000	.000	.
Constant	17.391	3745.118	.000	1	.996	35720959.286		

Table 06 highlights the views of the respondents on some anticipated impacts of food wastage on the environment. The results gathered indicated that, in all the impacts evaluated, most of the respondents were in support of their significance in destabilizing the sustainability of the environment. Specifically, the results revealed that majority of the respondents strongly agreed to the fact that food wastage can contribute to greenhouse gas emissions (1.74), air pollution (1.49) and spread of communicable diseases (1.78). In the same vein, most of the respondents agreed to the fact that soil quality through acidification (2.10), fresh water and marine water quality via eutrophication (1.95), and soil degradation (2.21) can all result from indiscriminate food wastage (Table 0). Largely, in all the impacts assessed, most of the respondents were in support of their significance in destabilizing the sustainability of the environment. The implication of this result is that, the respondents deemed all the impacts important and claimed that they could result from indiscriminate food waste. Similarly, FAO (2014) asserted that food waste has a negative impact on the environment. According to FAO (2013), food waste emits an estimated 3.3 billion tons of carbon dioxide that is produced but not used, making it the third-largest source of carbon dioxide emissions after the US and China. The globe is currently dealing with the issue of food waste, according to [41]. In addition to contributing to global hunger, food waste has an influence on the environment [42]. The crises include pollution, waste, climate change, and loss of biodiversity [43]. Every time food is lost or squandered, the already limited natural resources are put under more stress. As a result, the more food that is lost across the supply chain, the more of an impact it has on the environment since we need to take into account the energy and natural resources used to produce, process, and store the food. When food waste enters landfills, methane, a potent greenhouse gas, is released. Global warming is ultimately brought on by this lethal gas, which also contains carbon dioxide and chlorofluorocarbons [44]. In order to maintain a balance between the expansion of the global economy and the depletion of natural resources, sustainable production and consumption practices are therefore required.

Table 06: Respondents' views on the impacts of food wastage on the environment.

Possible impacts	Sum	Mean	General Response
Greenhouse gas emissions	695	1.74	Strongly Agree
Soil quality through acidification	840	2.10	Agree
Fresh water and marine water quality via eutrophication	778	1.95	Agree
Soil degradation	882	2.21	Agree
Air pollution	597	1.49	Strongly Agree
Spread of communicable diseases	711	1.78	Strongly Agree

4. CONCLUSION

Food waste is a stream that is created during various phases of the food life cycle that has several social, economic, and environmental implications. In developing nations like Ghana, the household's contribution to the generation of food waste is crucial at each of those stages. It was in view of this that this research was conducted to evaluate the influence of food waste on climate change and environmental sustainability, using residents of the Kumasi Metropolitan Area as a case study. Per the information generated, it was recognized that majority of the respondents (97.8 %) were aware of food wastage and its impact on the environment. When probed further, it was realized that the most common sources of this information were family members (39.1 %) and the media (33.5 %). Generally, majority of the respondents, at certain instances claimed that they seldom threw away the food items, while in some cases, majority of them were not certain about the rate of disposal of these food items. On the possible causes of food waste among the households engaged, the results revealed that, in all the causes assessed, majority of the respondents affirmed to its importance in contributing to food waste. The research also delved into the possible factors that could have impacted the respondents' rate of wasting food. Of the six factors (age, gender, access to education, household size, and frequency of meals prepared) evaluated, only age and gender had a significant relationship ($P < 0.05$) on the respondents' tendency to waste food.

5. RECOMMENDATIONS

Based on the results obtained, the following recommendations have been highlighted;

- The first recommendation of this study is to further investigate how consumers manage and behave with regard to food waste. Since this was a small-scale research study with constrained time and funding, there should be room to expand on this subject in great detail. It can be proposed to collect a much more in-depth analysis in the area using both quantitative and qualitative approaches. More surveys might be distributed, industry workers might be questioned, and focus groups might be held.
- There is also a need to consider ways to give consumers greater information on food labeling. Customers will be able to comprehend the dates on food products and may experience a decrease in their food waste as a result of making better decisions when buying food or selecting whether to eat it or throw it away.
- The Kumasi Metropolitan Area's citizens need to be made aware of the negative effects that food waste has on the environment. This can be done through increasing awareness, providing training on waste classification and individual recycling, and keeping in mind the long-term nature of behavioral and social change.
- Educational and training programs on reducing food waste should be incorporated into all national school curriculums.
- Designing rewards and / or punishments to discourage food waste.
- Food items should be planned prior to purchase and preparation of food should be equally planned to meet the household demand.

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