

Socioeconomic and Institutional Determinants of Public Acceptance of Waste-to-Energy Policies: Evidence for Sustainable Energy Transitions

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Abstract:

Waste-to-Energy systems serve as the solution for two separate issues because they handle expanding urban waste amounts and fulfill rising need for power generation. The public must accept Waste-to-Energy systems to achieve success because these systems serve to decrease landfill waste while they create energy from waste materials. This study collected 175 adult participants through purposive sampling to complete a cross-sectional questionnaire survey. The study obtained response data through a five-point Likert scale which SPSS software processed with descriptive statistics and correlation analysis to determine how socioeconomic and institutional elements impact the results. This results showed that 34% of respondents accepted the matter at a moderate level while 29% showed high acceptance and 14% demonstrated very high acceptance. The majority of people showed moderate awareness levels which reached 40 % but 19 % of people said they had no knowledge. Younger respondents between 26 and 30 years old demonstrated the strongest agreement with a mean score of 3.78 but people over 51 years old showed the weakest agreement with a mean score of 3.42. The survey showed that 41% of people had moderate trust in government while 37% expressed high trust in government institutions. Public acceptance of policies is largely determined by citizens understand these policies in conjunction with their social contexts as well as their level of trust in institutions and their evaluation of government actions.

Keywords: Public Acceptance, Waste-to-Energy, Sustainable Energy, Institutional Trust, and Socioeconomic Factors

1. Introduction

Multiple nations have started to include waste-to-energy technology development into their environmental protection plans because of their need to expand sustainable energy usage and their

need to enhance waste management systems [1]. The firm growth of cities together with expanding factories and rising population numbers have controlled to an enormous increase in municipal waste production which created dangerous environmental and public health problems [2]. Landfills for waste disposal fails to protect the environment because it produces land damage and produces methane gas and water contamination [3]. Energy crisis because developing nations along with emerging markets need more power but they lack access to sustainable energy sources which provide reliable supply [4]. Waste-to-Energy technologies provide an effective answer because they transform waste into power and thermal energy and fuel while they decrease the need for landfills and environmental harm [5]. Waste disposal systems which function properly can eliminate 70% of landfill waste while generating vital energy resources through discarded materials [6]. The success of policy implementation requires both technological viability and social community approval.

Environmental infrastructure projects depend on public perception because communities will oppose these projects when they fear air pollution and health dangers and expensive implementation costs [7]. Public develops fears that unregulated industrial facilities will release dangerous substances which will discriminate against poor communities through environmental racism. Communities encounter escalating problems because they cannot verify their information sources and they receive no participation in organizational decision-making activities [8]. Public distrust will stop successful projects from running their scheduled timelines while producing community opposition which leads to complete project termination. Organizations need to understand social elements which impact public acceptance because they must create viable strategies for sustainable energy development [9]. Technology depends on their social position because their age and their educational background and their income level and their job determine their awareness and attitudes toward technology [10].

Support environmental issues more because they learn about nature and new scientific advancements [11]. The older generation together with people who lack education will approach new energy technologies with suspicion because they do not know these systems well. The economic forecast stands as a vital element which impacts the current situation [12]. People in communities become more accepting of projects when they see these initiatives will generate employment opportunities and decrease their waste processing expenses and establish dependable power systems [13]. Support initiatives when they view the expenses as manageable and when all members of the community receive equal benefits from the program. Acceptance depends on institutional elements which play an equal role in its formation [14]. Their assessment of initiatives through their trust relationship with government institutions and their knowledge of policy development and their access to public involvement activities [15].

Environmental regulations become strict enforcement and decision-making systems become equitable [16]. Develop better understanding through effective communication methods which public awareness campaigns and community discussions help them understand. People tend to doubt political decisions when government officials prevent citizens from policy-making activities while hiding their actions from public observation [17]. Assessment of public awareness levels and demographic patterns and institutional trustworthiness and governance standards needs to occur for developing policies which serve all members of society. A survey using structured questionnaires to find out which elements control people accept government policies. This study results will help government officials and urban developers and academic experts who want to create environmentally friendly waste disposal systems and sustainable power production systems.

2. Materials and Methods

2.1 Study Design for Sustainable Energy Transitions

This study used a cross-sectional survey method to evaluate people accept waste-to-energy policies and social factors together with institutional elements affect public acceptance of these policies. A structured questionnaire based on their complete analysis of previous studies and their discussions with field specialists. Questionnaire contained different sections which collected demographic information, policy awareness, government institutions, policy process, economic factors and access to waste-to-energy project information based on [18]. The five-point Likert scale helped respondents rate perception and acceptance items which higher scores indicated stronger agreement or robust backing [19]. Descriptive information together with inferential data through a planned process which delivered strong results for understanding people accept waste-to-energy programs and what elements impact their support [20].

2.2 Study Population and Sample Selection

This included all people reached 18 years of age and older and showed possible understanding or curiosity about energy and environmental subjects. Sample involved 175 participants were selected through purposive sampling to obtain knowledge about policy-related matters. Recruitment process brought together participants from different age groups and educational backgrounds included both men and women across various life stages. This study required all participants to read and write at a basic level while they needed to show interest in joining the study. Sample size provided enough data for researchers to perform both descriptive and inferential analyses which produced reliable statistical outcomes. This sampling approach to generate a strong dataset which served to study public acceptance patterns and determine various social and institutional elements affect policy backing.

2.3 Data Collection

This study collected data through personal interviews and digital questionnaires during the period from January 2023 until July 2023 to achieve both high response rates and easy survey access. Their demographic details together with their knowledge about policies and their thoughts about policy incentives and their trust in institutions and their involvement in consultation activities and their beliefs about economic advantages and their ability to obtain information [21]. We used a five-point Likert scale to measure participant responses about their perceptions and acceptance levels which enabled them to compare results between different participants [22]. Demographic and categorical information through frequency numbers and percentage values while it calculated average scores and variability measures to evaluate perception-based data. Data collection process enabled researchers to obtain public acceptance measurements which stayed consistent and dependable throughout all participant responses [23].

2.4 Data Analysis

This study used SPSS and Excel tools for data analysis. Descriptive statistics to present demographic data and public acceptance levels through frequency counts and percentage distributions and average values and variation measurements [24]. Correlation analysis to determine how independent variables related to public acceptance while linear regression showed socioeconomic and institutional elements predicted acceptance levels. Demographic information together with acceptance level data which demonstrate how various factors affect public acceptance based on [25]. The combined descriptive analysis with inferential statistics to produce a complete understanding of people accept things and what factors influence their support for policies which established dependable findings that apply to different populations [26].

3. Results

3.1 Demographic Profile of Respondents

Demographic profile of respondents is summarized in **Table 1**. Responses from 175 participants taken their unique combination of age range and gender identity and educational background. The majority of respondents belonged to the 31–40 age group which made up 26% of the total respondents. The following age groups included 41–50 years which represented 23% of respondents and 26–30 years which accounted for 19% and 18–25 years which made up 16% and 51 years or older which represented 16% of respondents. Achieved a near-equal gender representation because 52% of participants identified as male while 48% identified as female. Educational background of participants showed that 31% completed undergraduate studies and 25% finished postgraduate education and 20% finished secondary school and 16% reached higher secondary education and 8% obtained professional certification. The sample represents various adult age groups which also includes different levels of educational achievement. Achieved a balanced gender ratio while including participants from various educational backgrounds which enabled it to collect diverse perspectives. Public approval for Waste-to-Energy policies will show their social and institutional elements in upcoming tables.

3.2 Awareness and Knowledge of Waste-to-Energy Technologies

Respondents in **Figure 1** present their knowledge about waste-to-energy technologies at an average level of understanding according to the data. The largest group of people 40% belongs to the moderate awareness category which means they understand basic concepts but they don't know the specific details. Public fails to recognize these items because 19% of respondents declare complete ignorance which proves that people have limited access to these items. Data shows that 15% of respondents have low awareness which suggests they recognize something but they do not understand it properly. General population shows limited knowledge about this subject because only 14% of people achieve high awareness and 12% reach very high awareness. Data shows that only a small number of people possess advanced understanding.

3.2 Social Acceptance of Waste-to-Energy Policies

In **Table 2** presents a mean-based comparison which shows different age groups accept waste-to-energy policies. Data shows people have a moderate positive view because their average ratings fall between 3.42 and 3.78. The highest level of acceptance is recorded among respondents aged 26–30 years ($m = 3.78$), followed by those aged 18–25 years ($m = 3.72$). This study shows that people between ages 31 and 35 give a lower average rating of 3.65 which indicates their acceptance level decreases when they move past their first adult years. Decreasing trend continues into the 36–40 and 41–45 age groups which show averages of 3.58 and 3.55 respectively. The 46–50 age group shows an average rating of 3.48 but people who reach 51 years or older tend to have the lowest acceptance rate which registers at 3.42. The data demonstrates that people under 30 years old show more enthusiasm for policies compared to their older counterparts who belong to different age groups.

3.3 Trust in Institutions and Governance

In **Table 3** presents respondents' trust in institutions and governance in relation to waste-to-energy policy acceptance. Public opinions about government depend heavily on much people trust their government. The study shows that 41% of people have moderate trust in government while 37% maintain high trust which both lead to better policy backing. However, 22% of respondent's express low trust in government, which tends to reduce acceptance levels. The public base its opinions about official matters through their level of confidence in government transparency. About 40% of respondents perceive moderate transparency, while 34% report high transparency, both contributing positively to acceptance. The data shows that 26% of respondents feel there is insufficient transparency which creates negative effects on their support for policy execution. The study findings show that

citizens will support policies when they trust their institutions and they can see through organizational operations but low trust and poor transparency will block policy success and public backing.

3.4 Procedural Fairness and Participatory Governance

Respondents view procedural fairness together with their opinions about participatory governance which they rated at five different evaluation levels as shown in in **Figure 2**. The highest number of respondents which stands at 29% belongs to the moderate category because they view governance processes as fair enough but they want more participation. A total of 26% of participants gave their highest rating to these processes which means that most of them view these processes positively. Data shows that 20% of people view this matter as unimportant because they doubt the system provides complete openness and full participation to all members. The two ends of the spectrum show that 17% of people recognize both maximum fairness and full participation but only 8% experience the lowest possible satisfaction which forms the smallest group. This results show that people have a moderately positive view of governance quality but their opinions about governance quality differ significantly.

3.5 Public Waste-to-Energy Policies for Sustainable Energy Transitions

Public acceptance levels of waste-to-energy policies for sustainable energy transitions as summarized in **Table 4**. The study findings show that most people view this matter positively because their approval levels reach between moderate and high categories. The most common group of participants shows moderate acceptance at 34% with a mean score of 3.55 which indicates they support the concept in a moderate way. A notable share report high acceptance (29%, $m = 3.78$), while 14% demonstrate very high acceptance, recording the highest mean value 4.05, reflecting strong endorsement of initiatives. Indicates that people in the acceptance group show lower numbers than those in the other groups. This results shows that 14% of people have low acceptance at 3.12 and 9% belong to the very low acceptance group which stands at 2.85. Support levels continue to increase because the average values for each category keep rising. Demonstrate that most people support the current policies which proves these policies hold value for sustainable energy development.

4. Discussion

This results findings demonstrate that public approval for waste-to-energy policies depends on four main elements. In similar studies [27] indicate that public knowledge about these policies and the diverse characteristics of residents and their trust in institutions and the effectiveness of government operations. Analysis revealed that public views maintain a steady positive trend which shows moderate support across all studied dimensions. Different age groups together with varying knowledge levels and institutional trust levels create distinct patterns of public opinion [28]. Demographic composition presented in **Table 1** shows that the survey sample includes a wide range of adult respondents who maintain equal representation. The population between 31 and 40 years old makes of the total group while the next largest groups include people aged 41 to 50 at 23% and those aged 26 to 30 at 19%. The younger population between 18 and 25 years and the older group aged 51 and above each make up 16% of the total population.

Table 1. Demographic Profile of Respondents with Percentage

Variable	Category	Frequency	Percentage (%)
Age	18–25	28	16
	26–30	33	19
	31–40	45	26
	41–50	40	23

	51+	29	16
Gender	Male	91	52
	Female	84	48
Education	Secondary	35	20
	Higher Secondary	28	16
	Undergraduate	55	31
	Postgraduate	44	25
	Professional Certification	13	8

The study achieved an almost perfect balance between male and female participants because it included 52% male subjects and 48% female subjects. Educational attainment is also substantial, as 31% hold undergraduate degrees and 25% postgraduate qualifications, meaning that 56% of respondents possess higher education. In another studies [23] diverse demographic characteristics of this group create trust in future perception-based results because these results will show opinions from various stages of life and different educational levels instead of representing only one particular group [29]. People know about technologies but they lack complete understanding of these system as shown in **Figure 1**. The majority of respondents which is 40% belong to the moderate awareness group because they understand basic concepts yet they lack deep knowledge about technical aspects. However, awareness gaps remain significant. Survey results show that 34% of respondents either do not know about the technology at all or have only minimal knowledge which affects more than one-third of the population. Data shows that 26% of respondents possess high or very high awareness levels which breaks down. The uneven distribution of concepts shows people recognize basic ideas but they struggle to understand more complex concepts. Presence of moderate awareness levels probably explains why people support acceptance but their support lacks substantial backing [30].

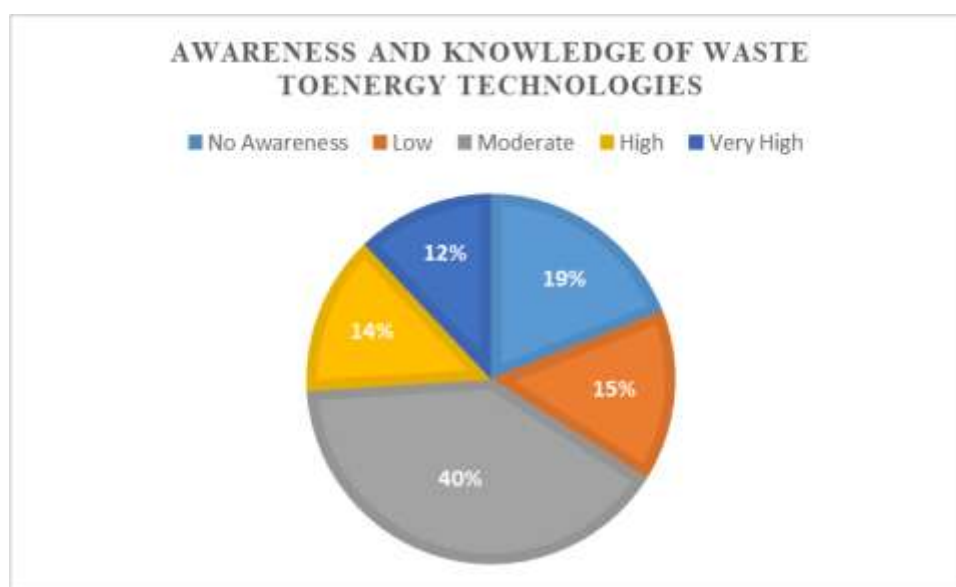


Figure 1. *Awareness and Knowledge of Waste-to-Energy Technologies*

Information about social acceptance across different age groups shows a particular pattern which **Table 2** displays through its data. People who belong to the 26–30 age group show the greatest average

acceptance score of 3.78 while people between 18 and 25 years old show the second highest average score of 3.72. The acceptance rate decreases throughout the various older age ranges which show 3.65 for ages 31–35 and 3.58 for 36–40 and 3.55 for 41–45 and 3.48 for 46–50 and 3.42 for people who are 51 years old or older. Support levels drop by 0.36 points between the group which shows the most support and the group which shows the least support. Younger populations seem to prefer these policies because they understand environmental issues better and they embrace new technology and they think about what will happen in the future [31]. Previous studies [32] show that people who belong to older age groups tend to show more caution because they either fear potential dangers or they have not seen modern energy solutions before.

Table 2. Social Acceptance of Waste-to-Energy Policies

Age Group (years)	Mean Score	SD	N
18–25	3.72	0.79	28
26–30	3.78	0.82	33
31–35	3.65	0.85	25
36–40	3.58	0.88	20
41–45	3.55	0.87	25
46–50	3.48	0.89	15
51+	3.42	0.90	29

Public opinions about institutional transparency and trust which demonstrate how governance credibility shapes their attitudes as presented in **Table 3**. The majority of respondents show trust in government at various levels because 41% of them express moderate trust and 37% express high trust. The data shows that 78% of survey participants have positive feelings about their institutional trust levels. However, 22% report low trust, representing a significant minority whose skepticism may reduce policy acceptance. The public assesses organizational transparency through a similar framework because 40% of people view moderate transparency and 34% see high transparency but 26% believe organizations lack sufficient transparency. The data shows that most people believe institutions hold value but about twenty-five percent doubt about how openly institutions operate. Similar studies [33] show different levels of support for public initiatives because they need to see institutional approval before they will support these initiatives.

Table 3. Trust in Institutions and Governance with Interpretation

Institutional Factor	Frequency	Percentage (%)	Interpretation
High Trust in Government	65	37	Strong positive influence
Moderate Trust in Government	72	41	Moderate influence
Low Trust in Government	38	22	Reduces acceptance
High Transparency Perception	60	34	Positive effect
Moderate Transparency	70	40	Moderate effect
Low Transparency	45	26	Reduces acceptance

Institutional dimension shows its strength through the public perception of procedural fairness and participatory governance which appears in **Figure 2**. The largest share of respondents (29%) evaluates governance processes as moderately fair and participatory, while 26% rate them as high. Together, 55% express generally positive perceptions. The data shows that 20% of people feel unfairly treated while 8% believe they receive very poor treatment which results in 28% of people holding negative views about governance systems. Only 17% report very high fairness. People show general acceptance

of governance but they fail to express strong trust in its operations. The process of public participation together with perceived fairness needs major improvements to create better policy legitimacy [34]. In **Table 4** shows the public acceptance levels which form from the combined effects of awareness levels and trust factors and governance structures. The largest group of respondents (34%) reports moderate acceptance (mean = 3.55), followed by 29% reporting high acceptance (mean = 3.78). A smaller but important segment (14%) demonstrates very high acceptance, with the highest mean score (4.05). The data shows that most people accept the information because only 14% expressed low acceptance with an average rating of 3.12 and 9% showed very low acceptance with an average rating of 2.85. The data shows an increasing trend of support because all acceptance groups display rising average scores which demonstrate that positive opinions outnumber negative ones by a large margin. The results show the same pattern throughout all of the data [35].

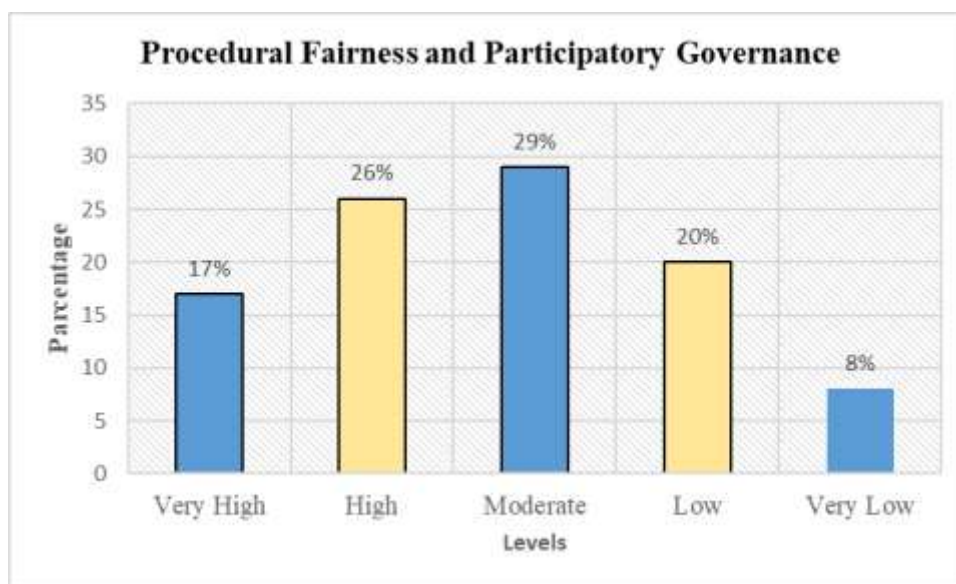


Figure 2. Procedural Fairness and Participatory Governance

Table 4. Public Waste-to-Energy Policies for Sustainable Energy Transitions

Acceptance Level	Frequency	Percentage (%)	Mean Score
Very Low	15	9	2.85
Low	25	14	3.12
Moderate	60	34	3.55
High	50	29	3.78
Very High	25	14	4.05

This results shows that people at moderate levels dominate the awareness category with 40% and institutional trust with 41% and governance fairness with 29% and policy acceptance with 34%. People tend to support things but their backing remains conditional because public support mainly appears in the middle categories. The current moderate public views would transform into stronger acceptance through the combination of improved public knowledge and better organizational clarity and increased citizen involvement in decision-making processes [36]. The research shows that policy achievements need more than technology to succeed because institutions must maintain public trust while citizens need to take active roles in policy development.

5. Conclusion

This study shows that people generally support waste-to-energy policies but their support depends on various social and institutional elements. These policies depend on their level of awareness and their demographic profile and their trust in institutions and their views about how fair the government operates. People show general support for the concept but their acceptance depends on their knowledge level and their confidence in how decisions get made. People need to understand the situation better while governments must show all their dealings to build lasting trust with their citizens who should have equal access to participate.

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