International Journal of Engineering Inventions
e-ISSN: 2278-7461, p-ISSN: 2319-6491
Volume 12, Issue 3 [March. 2023] PP: 42-52

Conversion of Domestic and Industrial Waste in Lokoja to Sustainable Low Carbon Footprint Energy.

Engr. Jatto Y Isah
Kogi State Polytechnic,Lokoja,Kogi State, Nigeria.

Omejeh Timothy Enejoh
Kogi State Polytechnic,Lokoja,Kogi State Nigeria

Engr. Ibrahim Haruna
Kogi State Polytechnic,Lokoja,Kogi State Nigeria

Engr. Stephen Arome Akubo
Kogi State Polytechnic,Lokoja,Kogi State Nigeria

Abstract
Municipal and industrial trash are now regular environmental annoyances in urban areas all over the world. Examining initiatives that concentrate on turning waste polluting materials into valuable resources that can be utilised to make biofuels is the goal of this study. Municipal sewage contains a sizable amount of microorganisms and lipids that might be used to make biodiesel. Thousands of tonnes of dry sludge, household waste, and industrial waste are dumped in Lokoja and its surroundings every day. Disposing of this material is expensive for the government and environmental workers, not to mention the harm it does to the environment when it is dumped or burned. This research study uses questionnaire to understand the impact of technical factor, community engagement and stakeholder engagement on the effectiveness of sustainable waste to energy projects. Results and findings from analysis of generated data using IBM SPSS show that these variables have a direct impact on effective waste management. This research becomes more pertinent in its effort to produce energy from what was previously thought of as an environmental annoyance through a low carbon footprint, sustainable approach as a result of the global energy crisis and the necessity to complement the national grid with off-grid electricity.
Keywords— *Thermochemical Waste to Energy Conversion, Waste Biochemical Conversion ,Waste to Energy Projects,Economic Profitability,Environmental benefits*

Date of Submission: 01-03-2023 Date of acceptance: 12-03-2023

I. Introduction

Waste to energy (WTE) or energy from waste (EFW) is the major treatment method for turning trash into fuel[1].Converting garbage into energy is a method of energy recovery. Waste to Energy processes either result in the production of a combustible fuel commodity, such as methane, methanol, ethanol, or synthetic fuel, or they burn waste materials to produce power and/or heat. Every year, the Lokoja region collects hundreds of tonnes of solid garbage, the most of which is dumped on open fields. The majority of the municipal solid garbage that is collected, between 75 and 80 percent, is made up of food remnants, paper, fruits, vegetables, plastics, etc[2] [3].

Thermochemical and biological techniques can be used to convert municipal waste into energy. The landfill gas produced by the natural decomposition of municipal waste can be collected, cleaned, and scrubbed prior to being fed into internal combustion engines or gas turbines for the purpose of generating heat and power [4].

In an anaerobic digester, municipal solid waste can be biochemically stabilized to produce fertilizer and biogas (for heat and power). Sludge from sewage treatment plants can be used to produce biogas, which is a useful resource for both municipalities and the general public.

Additionally, this industry generates a lot of organic by-products and trash that can be converted into biomass energy. From meat manufacturing to confectionary, all areas of the food business produce waste that can also be used as a source of energy. Fast-expanding food and beverage industries have grown in significance in the region's major economies during the past few decades.

The overall purpose of this study is to assess if recycling municipal and industrial waste in Lokoja Kogi State is feasible. In order to achieve the state, national, and sustainable development aim of clean energy for all, and its surroundings into useful sustainable energy.The specific goals are to: - Determine the energy production capacity of Lokoja's waste; - Assess the processes involved in converting energy to waste; - Determine the social and cultural implications for sustainable development and the accessibility of energy for communities in Kogi State as well as the national grid.

II. Literature Review

One of the most reliable and efficient ways to lower CO2 emissions and preserve the finite fossil fuel supplies utilised by conventional power plants is through waste-to-energy technology. Modern combustion and biological methods can be used to recover energy from municipal trash. Three separate processes—thermochemical, biochemical, and physicochemical can turn waste material into energy. Thermochemical processes often work better with lower moisture input and are less picky about products due to their high temperatures and quick conversion rates. On the other hand, biochemical techniques work better when dealing with organically rich, moist wastes.

2.1 Thermochemical Waste to Energy Conversion

Municipal solid waste can be thermo-chemically converted using three major methods: combustion (with excess air), gasification (with reduced air), and pyrolysis (without air). Direct burning is the most often used method for generating heat and power from waste. Cogeneration systems, which can range from small-scale technology to large grid-connected facilities, are far more efficient than systems that only generate energy [4].

Combustion technology is the controlled burning of waste with heat recovery that uses steam turbines to generate energy. As an alternative to incineration, pyrolysis and gasification involve converting waste into gas for use as an energy carrier for a later combustion, like in a boiler or a gas engine. Currently, there is also news about plasma gasification, which entails extremely high temperatures [5].

2.2 Waste Biochemical Conversion

A biochemical process called anaerobic digestion can also provide clean energy in the form of biogas, which can then be used to run a gas engine to power and heat a building. Anaerobic digestion, a typical biological process, transforms organic waste into fertilizer and biogas without the need for oxygen.

Anaerobic digestion is a trustworthy method for handling moist organic waste. Under carefully regulated, oxygen-free conditions, organic waste from various sources biochemically decomposes, generating biogas that can be used to produce both energy and heat.

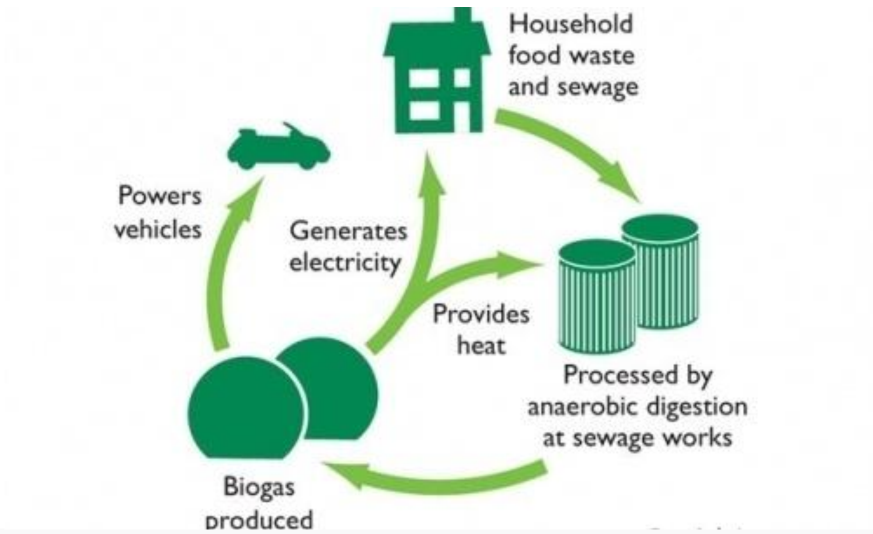

Figure 1:Municipal solid waste organic fraction anaerobic digestion is a dependable process.

Additionally, a variety of fuels, including gaseous fuels like hydrogen and methane as well as liquid fuels like ethanol, methanol, biodiesel, and Fischer-Tropsch diesel, can be produced from waste materials. The primary sources of materials used to generate biofuels are forestry and agricultural resources, industrial processing waste, municipal solid waste, and urban wood waste. The most common use for biofuels are in transportation, heating, and cooking.

2.3 Waste conversion by Physico-chemical processes

The physical and chemical properties of solid waste can be improved using physico-chemical technology. The combustible waste is converted into high-energy fuel pellets that can be used to generate steam. To reduce the high levels of moisture in the trash, it is first dried. The garbage is then compacted and made into pellets after being mechanically separated from grit, sand, and other incombustibles [6].

It has several significant advantages over coal and wood as a fuel pellet, including being cleaner, devoid of incombustibles, having lower ash and moisture contents, as well as being more affordable and environmentally benign [7].

2.4 Conceptual Framework

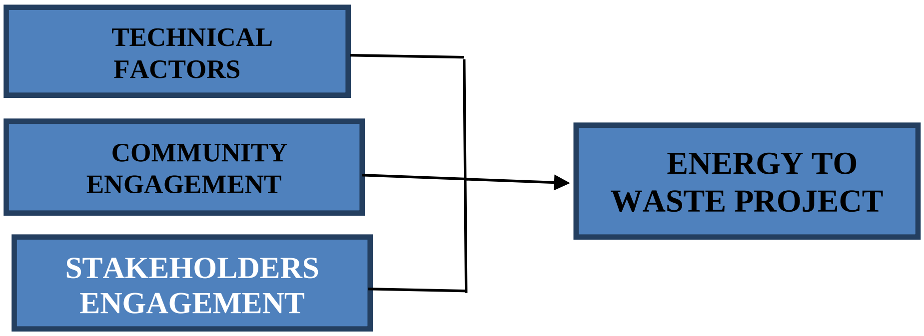

Figure 2: Conceptual framework for the study

III. Methodology

This component of the planned study covers the materials and methods for the research design, data collection, and analytical procedures. It outlines the rationale behind the methods used and how they were carried out. Research methodology, data gathering techniques, sample selection procedures, research procedures, and different types of data analysis.The deductive and survey-based quantitative design elements are used in this study [8]

Data Collection

The survey approach has been utilised to gather quantitative information for this study's primary data collection. Through online surveys with a planned format, the project will gather primary data. Surveys can be used to obtain digital data from the study's participants and are a very appropriate way to collect raw data for the examination of quantifiable factors.

Data Analysis

Results collected from the survey will be collated, screen tested for reliability, and analysed using SPSS. Chronbach's Alpha in SPSS will be used to test reliability, frequency analysis will be carried out on demographic variable, correlation analysis will be carried out using SPSS to check for inernal consistency, while the analysis of variance (ANOVA) test will be used to test hypothesis.

IV. Result and Discussion

4.1 Result

Demographic Variables Analysis

Demographic characteristics were analysed using SPSS 26; the outcomes are depicted in Figures 3 to 5. Gender, age, and respondents' work status are among the testable variables. Figure 3 demonstrates that 44% of respondents are female and 56% are male. The majority of responders, as seen in Figure 4, are between the ages of 25 and 34, followed by 35 and 44. Figures 5 show that the majority of respondents had jobs.

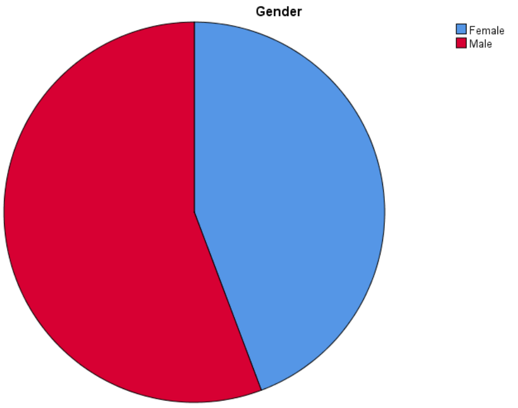

Figure 3: Gender distribution among responders

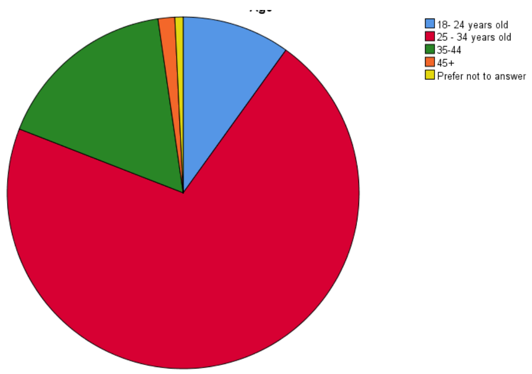

Figure 4: The age distribution of responders.

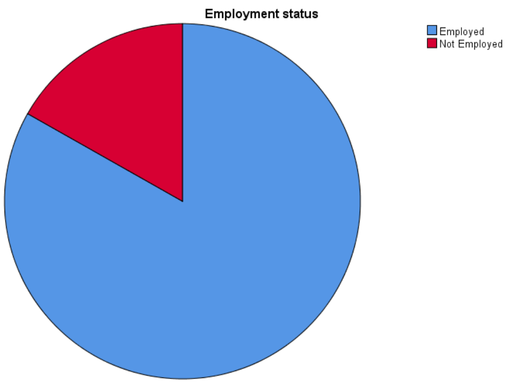

Figure 5: The percentage of respondents who are employed

Reliability Analysis using SPSS

For this study's reliability test, Cronbach's alpha in SPSS was employed, and the results are displayed in Table 1.

Table 1: Cronbach's alpha-based reliability analysis

Statistics of Reliability

Cronbach's Alpha	On the Basis of Standardized Items, Cronbach's Alpha	N of Items
.748	.753	18

Correlation Analysis

In order to ascertain the link between the variables, correlation analysis was performed in SPSS. In Table 2, this is displayed.

Table 2: Correlation Analysis in SPSS

Correlations

		FD	FAA	SME
FD	Correlation by Pearson	1	.437**	.326**
	Sig. (2-tailed)		.000	.000
	N	131	131	131
FAA	Correlation by Pearson	.437**	1	.428**
	Sig. (2-tailed)	.000		.000
	N	131	131	131
SME	Correlation by Pearson	.326**	.428**	1
	Sig. (2-tailed)	.000	.000	
	N	131	131	131

**. Correlation is impotant at the 0.01 level (2-tailed).

4.2 Analysis and Interpretation of Results

Interpreting Demographic Variables

Based on the outcomes displayed in the result section, it shows that the sample size has a fairly balanced distribution of gender. Male respondents make up 56% of the sample, while female respondents make up 44%. The even distribution of the sexes suggests that the study's data collection and choice of sample size should be sensitive to gender. The bulk of responses are also between the ages of 25 and 34, followed by 35 and 44. The majority of responders have jobs. There were no responses from those under the age of 18, which indicates that all of the respondents are of legal drinking age. Similar to this, the majority of responders have jobs. As a result, they have access to their own funds and the means to make purchases during the Covid-19 pandemic.

Interpretation of Reliability Testing in Cronbach's Alpha using SPSS

The reliability coefficient or internal consistency of a dataset is quantified by the Cronbach's alpha. It is often referred to as the "Coefficient alpha" test, which examines the degree to which latent and observable variables in a Likert scale survey dataset are related to one another [9].. A suitable Cronbach's alpha score is shown in Table 3.
Cronbach's alpha reliability score generalizations are shown in Table 3.

Cronbach's alpha score	Reliability level
>0.80 – 1.00	Very reliable
>0.60 – 0.80	Reliable
>0.40 – 0.60	Quite Reliable
>0.20 – 0.40	Rather reliable
>0.0 – 0.20	Less reliable

According to the cutoff score established by Cronbach's alpha, the variables in this study have a Cronbach's alpha score of 0.753, which is reliable [10].
Interpretation of Correlation Analysis
The correlation coefficient demonstrates how strongly two variables are related. This statistic evaluates the strength of the relationship between two variables. There is a chance that a variable with a positive trend and a variable with a nearly identical trend will have a positive association, leading to a positive correlation coefficient. In contrast, if a variable with a negative trend and a nearly identical trend has a negative association, leading to a negative correlation coefficient.
A link is deemed statistically significant if the correlation coefficient (R) is more than or equal to 3.5 or less than or equal to -3.5 [11].
The study's variables had equivalent p-values of 0.00, or 0.05, and had Pearson correlation coefficients of 0.326, 0.437, and 0.428, respectively.
These figures show strong statistical significance and reveal a strong correlation between the variables in the dataset.

4.3 Hypothesis Testing

In this study, the hypothesis is tested using the One Sample T-Test and the ANOVA (Analysis of Variance) test.
Test of Hypothesis 1: - Technical Factors put a direct impact on effective waste management programme.
One Sample T-test
One-Sample T-Test on Impact of technical factor on effective waste management programme is carried out as shown in Table 4:

Table 4: T-Test on impact of technical factor on effective waste management programme.

One-Sample Test						
	Test Value = 4					
					95% Confidence Interval of the Difference	
	T	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
FD	12.510	130	.000	.39149	.3296	.4534

The T-test is used in this study to test the hypothesis. Based on the questionnaire design, the mean test score for the construct is 4 (which corresponds to the Likert scale of "Agree") In this result from the inferential statistics report table, the p-value for the computed observed variable is 0.0, and the t-score is 12.510. This study has 130 degrees of freedom. Compared to the mean, the t value, the p-value, as well as the critical interval are statistically significant. Hypothesis 1 is therefore accepted.

ANOVA

Table 5 shows the ANOVA analysis carried out to determine the impact of technical factor on effective waste management programme. Figure 6 also shows the ANOVA mean for when effective waste to energy programme is the dependent variable and computed responses on technical factor is the measurement factor.

Table 5: ANOVA table for impact of technical factor on effective waste management programme

ANOVA
BB

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	7.245	12	.604	20.408	.000
Within Groups	3.491	118	.030		
Total	10.735	130			

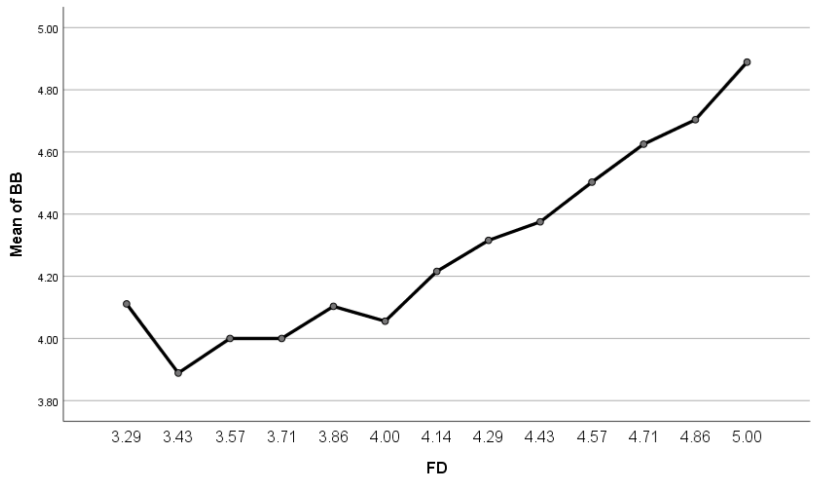

Figure 6: ANOVA mean relationship between technical factor and effective waste to energy management programme

The ANOVA table shows that the F value of 20.408 has a p-value of 0.00 which is statistically significant. Similarly, the plot indicates a high impact of technical factor on effective waste to energy management programme. Therefore, hypotheses 1 is accepted

Test of Hypothesis 2: - Community engagement puts a direct impact on effective waste to energy projects

One-Sample T-Test

One-Sample T-Test on Impact of community engagement on effective waste to energy management project is carried out as shown in Table 6.

Table 6: T-Test on the impact of community engagement on effective waste to energy management project

One-Sample Test

	Test Value = 4					
					95% Confidence Interval of the Difference	
	T	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
FAA	14.255	130	.000	.43075	.3710	.4905

The T-test is used in this study to test the hypothesis. Based on the questionnaire design, the mean test score for the construct is 4 (which corresponds to the Likert scale of "Agree"). In this result from the inferential statistics report table, the p-value for the computed observed variable is 0.0, and the t-score is 14.255. This study has 130 degrees of freedom. Compared to the mean, the t value, the p-value, as well as the critical interval are statistically significant. Hypothesis 2 is therefore accepted.

ANOVA

Table 7 shows the ANOVA analysis carried out to determine the impact of community engagement on effective waste to energy management project. Figure 7 also shows the ANOVA mean for when successful waste management programme is the dependent variable and computed responses on community engagement is the factor for measurement.

Table 7: ANOVA table for impact of community engagement on effective waste to energy management project

ANOVA

BB

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	7.646	11	.695	26.777	.000
Within Groups	3.089	119	.026		
Total	10.735	130			

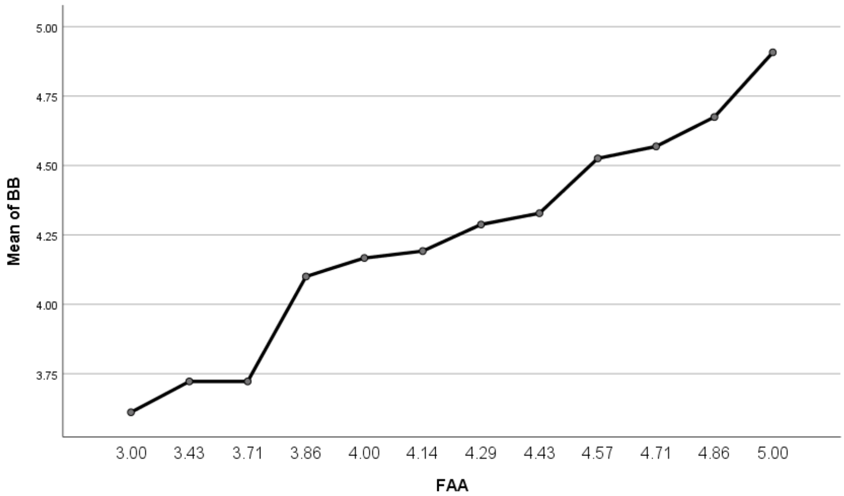

Figure 7: ANOVA mean relationship between community engagement and successful waste to energy management.

The ANOVA table shows that the F value of 26.777 has a p-value of 0.00 which is statistically significant. Similarly, the plot indicates a high impact of community engagement on effective waste to energy management project. Therefore, hypothesis 2 is accepted.

Test of Hypothesis 3: Stakeholder engagement puts a positive impact on sustainable waste to energy programme

One-Sample T-Test

One-Sample T-Test on Impact of stakeholder engagement on sustainable waste to energy programme is carried out as shown in Table 8.

Table 8: T-Test on the impact of stakeholder engagement on sustainable waste to energy programme

One-Sample Test

	Test Value = 4					
					95% Confidence Interval of the Difference	
	T	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
FAA	14.255	130	.000	.43075	.3710	.4905

The T-test is used in this study to test the hypothesis. Based on the questionnaire design, the mean test score for the construct is 4 (which corresponds to the Likert scale of "Agree") In the result from the inferential statistics report table, the p-value for the computed observed variable is 0.0, and the t-score is 14.255. This study has 130 degrees of freedom. Compared to the mean, the t value, the p-value, as well as the critical interval are statistically significant. Hypothesis 3 is therefore accepted.

ANOVA

Table 9 shows the ANOVA analysis carried out to determine the impact of stakeholder engagement on sustainable waste to energy programme. Figure 8 also shows the ANOVA mean for when sustainable waste to energy programme is the dependent variable and stakeholder engagement is the factor for measurement.

Table 9: ANOVA table for the impact of stakeholder engagement on sustainable waste to energy programme

ANOVA
BB

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	5.475	9	.608	13.994	.000
Within Groups	5.260	121	.043		
Total	10.735	130			

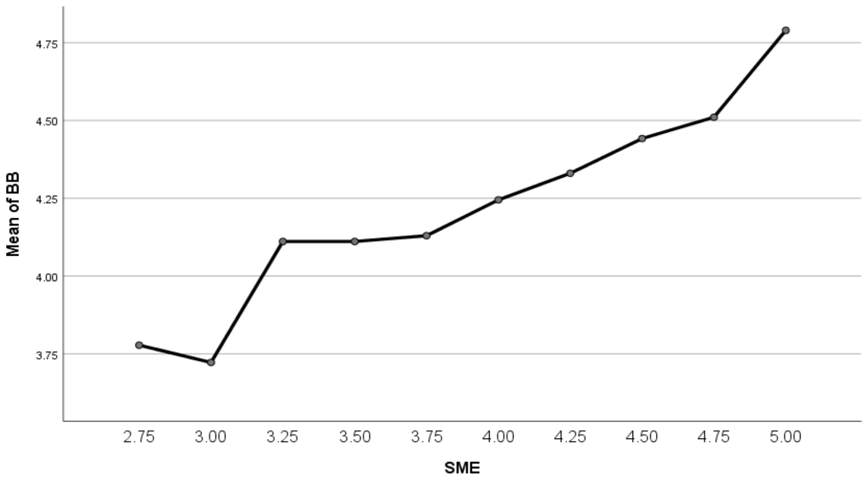

Figure 8 ANOVA mean relationship between stakeholder engagement and sustainable waste to energy programme.

The ANOVA table shows that the F value of 13.994 has a p-value of 0.00 which is statistically significant. Similarly, the plot indicates a high impact of stakeholder engagement on sustainable waste to energy programme. Therefore, hypotheses 3 is accepted

2.4 Discussion of Findings

Waste to Energy Projects

The most important step in the development of these projects and assuring their success is to identify, investigate, and compartmentalise several aspects that are crucial for the success of the Waste to Energy projects in general. In order to enable the current study identify its Critical Success Factor for the waste-to-energy incineration projects, this section of the study examines the prior verifiable studies based on Critical Success Factor and delves deeply into their specific analysis. Economic viability [12], has been identified as a favourable business climate, a dependable concessionaire consortium with strong technical capabilities, a solid financial package, and appropriate risk allocation with dependable contractual terms. In the study, the researcher used an interaction session with PPP experts and accomplishers to identify the Critical Success Factors by asking the experts for their opinions on what they believed to be the critical factors [12].

Economic profitability:

The financial viability of every enterprise is essential to its success. In terms of municipal solid waste management, Waste to energy incineration projects can bring about a number of consequential economic advantages, such as long-term savings on tipping fees for waste disposal, the avoidance of waste management costs, the production of sustainable energy and power, and the creation of new job opportunities [13]. According to a department of environmental, food, and rural affairs report, the UK burned 34% of all municipal solid trash produced, producing 3.94TWh of power, which was also equivalent to 1.1% of the country's entire energy supply [14]. Additionally, the thermal recovery rate for waste-to-energy incineration is high and can account for 65 to 80% of the energy generated from organic matter [15]. The use of 1000 tonnes of waste allows waste to energy, to produce 1430 MWh of heat and 480 MWh of electricity per day, resulting in a 287% economic gain and preventing the generation of 2250 tonnes of carbon dioxide that would otherwise be produced if another option were chosen These statistics show the enormous potential for energy generation offered by waste to energy projects, further paving the way for an economically advantageous replacement. The cost of the waste to energy incineration project, effective management, the absence of significant competition from other projects, and electricity generation are only a few of the aspects that are taken into account for this study as sub success criteria.

Environmental benefits:

The waste to energy incinerator projects have endured a great deal of opposition from society over the years. Its potential drawbacks frequently outweigh its advantages, and opposition to these programmes grows. Therefore, it is essential to talk about the numerous environmental benefits of waste to energy incineration in order to change people's perspectives and to assure the success of these initiatives. The environmental advantages that waste-to-energy incinerators could have over conventional garbage disposal techniques like chemical treatment and landfill are highlighted. Benefits of waste-to-energy [16], include pollution reduction and effective waste management, but the prevention of methane gas production and the eradication of chemicals and germs are two of the most important environmental advantages of waste-to-energy incinerators. Methane should be a top concern in any waste disposal method since it is an exceptionally powerful greenhouse gas with a potential for 25 times more global warming than carbon dioxide [17]. The incineration process [18] requires high temperatures, which kill hazardous microorganisms, making it the most effective method for destroying medical waste. Waste to energy reduces carbon dioxide production by up to 50 million tonnes compared to landfilling [19], which would otherwise occur. The introduction makes it abundantly evident that municipal solid waste management is crucial to attaining sustainable urban growth in both small and large cities. Since the bulk of issues with municipal waste disposal are connected to the increased amount of waste and CO_2 emissions, this study uses these variables as the SSFs for the environmental benefits. It increases the environmental benefits of the waste to energy incineration.

Technical factors

Technical aspects are cited as a crucial requirement [20] in order to achieve the project's overall success. They said, "Projects are destined to function smoothly toward the end aim if they satisfy the technical desideratum to be fulfilled and if there is an establishment of a high acceptability for the project outputs between the researcher/project manager and the parent company." There are a number of technical requirements for the waste to energy incineration process in this study that must be taken into account. One of the technical requirements that must be taken care of to guarantee a high power output is the calorific value of the waste. Various studies suggest that for the waste to energy incineration facility to recover energy, the calorific value must have an average value of 7000 KJ/Kg and should never go below 6000 KJ/Kg [20]. Low Calorific Value ultimately indicates that the garbage supplied to the incinerator is non-combustible and will ultimately have an undesirable end because Calorific Value influences the revenue stream of the waste to energy incineration facility (Liu and Nishiyama, 2020). Variables like technical task, technological complexity, task segregation, quality evaluation, and low calorific value are chosen as the SSFs for this work by drawing inspiration from Maqbool's (2018) study in which he addresses the aspects affecting renewable energy projects. The technical factor is an important critical success factor that has a significant impact on many different researchers' studies and projects and has been discussed extensively in the literature [21] [22].

Community engagement

Since the last 30 years, a research interest in the public's approval of waste-to-energy projects has been sparked by the general public's tendency to oppose such programmes [23]. The public's acceptance generally depends on three things: the financial gains, the public's confidence in the government in power, and the investment climate, which can also be supported [24]. Furthermore, literature demonstrates that community involvement is a crucial element in changing people's perspectives on waste-to-energy incineration and boosting public acceptance. The normative, substantive, and instrumental justifications for greater public participation in environmental-related issues [25]. These justifications offer a thorough grasp of how people's perceptions of environmental challenges differ from reality and offer solutions. Community involvement has enormous potential to establish fairness, expand people's knowledge horizons, and boost the validity of these projects while also giving local inhabitants a more comprehensive image [26]Therefore, research reveal that transparency and compensation are two key factors that need to be taken into account in order to achieve a robust community engagement. Additionally, carrying out a successful Environmental Impact Assessment (EIA) and compensating nearby communities are two key elements that favourably affect community involvement[27]. (Cui et al., 2020).

V. Conclusion and REcommendations

Conclusion

The management of wastes must be both environmentally responsible and economically viable in order to maintain the sustainability of contemporary society. Due to the accessibility of waste-to-energy feedstock for municipal solid waste, crop residues, and agro-industrial waste, Lokoja, Kogi State is well positioned for the development of waste-to-energy.

By introducing cutting-edge waste-to-energy conversion technologies, the Lokoja urban region may significantly lessen the environmental effects of waste disposal. These technologies can be used to safely dispose of solid and liquid wastes as well as to produce heat, power

Recommendation

This study recommends the following:

1. Further research on modelling of waste to energy instrument to better simulate the process.
2. Commitment on the government to invest in energy project that would boost the national grid.

Acknowledgment

I want to sincerely appreciate tetfund for funding this research work

References

[1]. Kothari, R., Tyagi, V.V. and Pathak, A. (2010) Waste-to-energy: A way from renewable energy sources to sustainable development. Renewable and Sustainable Energy Reviews, 14(9), pp.3164-3170.

[2]. Brunner, P. H., & Rechberger, H. (2015). Waste to energy–key element for sustainable waste management. Waste management, 37, 3-12.

[3]. Malinauskaite, J., Jouhara, H., Czajczyńska, D., Stanchev, P., Katsou, E., Rostkowski, P., ... & Spencer, N. (2017). Municipal solid waste management and waste-to-energy in the context of a circular economy and energy recycling in Europe. Energy, 141, 2013-2044.

[4]. Korai, M. S., Mahar, R. B., & Uqaili, M. A. (2016). Optimization of waste to energy routes through biochemical and thermochemical treatment options of municipal solid waste in Hyderabad, Pakistan. Energy Conversion and Management, 124, 333-343.

[5]. Moya, D., Aldás, C., Jaramillo, D., Játiva, E., & Kaparaju, P. (2017). Waste-To-Energy Technologies: an opportunity of energy recovery from Municipal Solid Waste, using Quito-Ecuador as case study. Energy Procedia, 134, 327-336.

[6]. Goswami, R., Chattopadhyay, P., Shome, A., Banerjee, S.N., Chakraborty, A.K., Mathew, A.K. and Chaudhury, S. (2016) An overview of physico-chemical mechanisms of biogas production by microbial communities: a step towards sustainable waste management. 3 Biotech, 6(1), pp.1-12.

[7]. Canopoli, L., Fidalgo, B., Coulon, F., & Wagland, S. T. (2018). Physico-chemical properties of excavated plastic from landfill mining and current recycling routes. Waste management, 76, 55-67.

[8]. Ramseook-Munhurrun, P. and Durbarry, R. (2017) Mixed methods and triangulation. In Research methods for tourism students (pp. 114-120). Routledge.

[9]. Cassell, C., Cunliffe, A. L., & Grandy, G. (Eds.). (2017). The SAGE handbook of qualitative business and management research methods. Sage.

[10]. Gong, Y., Zhou, H., Zhang, Y., Zhu, X., Wang, X., Shen, B., Xian, J. and Ding, Y. (2021) Validation of the 7-item Generalized Anxiety Disorder scale (GAD-7) as a screening tool for anxiety among pregnant Chinese women. Journal of affective disorders, 282, pp.98-103.

[11]. Wang, M., Wang, Z., Geng, Y. and Lin, B. (2022) Interpreting the neural network model for HVAC system energy data mining. Building and Environment, 209, p.108449.

[12]. Nguyen, P.T., Likhitruangsilp, V. and Onishi, M. (2020) Success factors for public-private partnership infrastructure projects in Vietnam. International Journal on Advanced Science, Engineering and Information Technology, 10(2), pp.858-865.

[13]. Kenter, J.O., O'Brien, L., Hockley, N., Ravenscroft, N., Fazey, I., Irvine, K.N., Reed, M.S., Christie, M., Brady, E., Bryce, R. and Church, A., (2015) What are shared and social values of ecosystems?. Ecological economics, 111, pp.86-99.

[14]. Sinars, D.B., Sweeney, M.A., Alexander, C.S., Ampleford, D.J., Ao, T., Apruzese, J.P., Aragon, C., Armstrong, D.J., Austin, K.N., Awe, T.J. and Baczewski, A.D. (2020) Review of pulsed power-driven high energy density physics research on Z at Sandia. Physics of Plasmas, 27(7), p.070501.

[15]. Madhavi, V., Vijaya Bhaskar Reddy, A. and Madhavi, G. (2021) Synthesis, characterization, and properties of carbon nanocomposites and their application in wastewater treatment. Environmental Remediation Through Carbon Based Nano Composites, pp.61-83.

[16]. Barua, P., and Hossain, N. (2021). Waste to energy: an overview by global perspective. Advanced Technology for the Conversion of Waste into Fuels and Chemicals, 1-49.

[17]. Sovacool, B.K., Griffiths, S., Kim, J. and Bazilian, M. (2021) Climate change and industrial F-gases: A critical and systematic review of developments, sociotechnical systems and policy options for reducing synthetic greenhouse gas emissions. Renewable and sustainable energy reviews, 141, p.110759.

[18]. Phua, Z., Giannis, A., Dong, Z.L., Lisak, G. and Ng, W.J., 2019. Characteristics of incineration ash for sustainable treatment and reutilization. Environmental Science and Pollution Research, 26, pp.16974-16997.

[19]. Dastjerdi, B., Strezov, V., Kumar, R. and Behnia, M. (2019) An evaluation of the potential of waste to energy technologies for residual solid waste in New South Wales, Australia. Renewable and Sustainable Energy Reviews, 115, p.109398.

[20]. He, J., Hong, Y., Kong, L., Dan, Z., Lv, X., Chen, G., Tang, O. and Chen, D. (2022) Spatial distribution and management of the energy potential of municipal solid waste incineration: A case study of Lhasa, China. Journal of Environmental Management, 322, p.116094.

[21]. Rahman, H.U., Raza, M., Afsar, P., Khan, H.U. and Nazir, S. (2020) Analyzing factors that influence offshore outsourcing decision of application maintenance. IEEE Access, 8, pp.183913-183926.

[22]. Athaya, H., Nadir, R.D.A., Indra Sensuse, D., Kautsarina, K. and Suryono, R.R. (2021) September. Moodle Implementation for E-Learning: A Systematic Review. In 6th International Conference on Sustainable Information Engineering and Technology 2021 (pp. 106-112).

[23]. Zhang, Y., Liu, Y. and Zhai, K. (2021) Identifying the Predictors of Community Acceptance of Waste Incineration Plants in Urban China: A Qualitative Analysis from a Public Perspective. International Journal of Environmental Research and Public Health, 18(19), p.10189.

[24]. Segreto, M., Principe, L., Desormeaux, A., Torre, M., Tomassetti, L., Tratzi, P., Paolini, V. and Petracchini, F. (2020) Trends in social acceptance of renewable energy across Europe—A literature review. International Journal of Environmental Research and Public Health, 17(24), p.9161.

[25]. Barat-Auleda, O. and Domenech, M. (2022) Stop burning garbage! Exploring an anti-waste-to-energy social movement and its effects on local politics in Spain. Energy Research & Social Science, 92, p.102772.
[26]. Van Der Waal, E.C. (2020) Local impact of community renewable energy: A case study of an Orcadian community-led wind scheme. Energy Policy, 138, p.111193.
[27]. Irarrazaval, F., Stamm, C., Madariaga, A., Maillet, A. and Franetovic, G. (2023) Examining the effects of social protest on the environmental impact assessment process in Chile. Environmental Impact Assessment Review, 99, p.107044.
[28]. Article submitted 06 February 2023. Published as resubmitted by the authors 06February 2023.