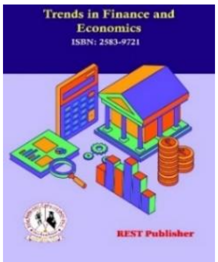
Trends in Finance and Economics

Vol: 3(1), March 2025

REST Publisher; ISSN: 2583-9721 (Online)

Website: https://restpublisher.com/journals/tfe/

DOI: https://doi.org/10.46632/tfe/3/1/11



Evaluating Sustainable Waste Management Options: A Comparative Study Using the Weighted Sum Method

***P. Gobinath, S. Balamurugan**

Poompuhar College (Autonomous), Melaiyur, Tamil Nadu, India.

**Corresponding Author Email: gobijana1989@gmail.com*

Abstract: *We may promote waste reduction, resource conservation, and climate change mitigation practices such as composting, recycling, and waste-to-energy conversion by using the appropriate technologies. Effective waste management practices contribute to the development of a circular economy, which not only protects the environment but also views trash as a resource. The choice of a sustainable waste disposal option is essential due to the expanding problems with global waste management. In view of rising population and consumption patterns, it is imperative to create environmentally friendly solutions that lessen the detrimental consequences of rubbish on ecosystems and human health. The selection process considers a variety of factors, including waste volume, composition, regional regulations, infrastructure accessibility, and environmental considerations. The decision to choose a sustainable waste disposal method has implications for research since it can solve substantial environmental and social problems associated with waste management. In conclusion, what makes sustainable waste disposal technology selection important for study is its ability to address environmental problems, save resources, slow down climate change, improve public health, guide policy development, and promote economic growth. It provides a path to the development of a circular economy, where garbage is viewed as a valuable resource and waste management practices become more reliable and sustainable over time. In this Research we will be using Weighted sum method. Alternate Parameters taken as Criteria, Landfilling, AD, Incineration, Pyrolysis, Plasma, Gasification. Evaluation Parameters taken as investment cost, operation cost, energy recovery, technology accessibility, emission, social acceptance. Showing sustainable waste disposal technology selection using the analysis method in TOPSIS, where Plasma is the first rank and Landfilling is the last rank. The majority of MDO issues are multi-objective, hence the focus of this study is on creating an efficient multi-objective MDO approach. For the design of massive, intricate technical systems like aero planes, the AWSCSSO approach may be used to produce a regularly spaced, broadly dispersed, and smooth Pareto front. The AWSCSSO approach is validated using two numerical examples and a conceptual design challenge for an aero plane. Following are a few conclusions that may be drawn. First, AWSCSSO is useful and effective for resolving multi-objective MDO issues. It covers the whole Paretofront for test difficulties and conceptual design issues with aero planes. Second, for multi-objective MDO issues,*

1. INTRODUCTION

Energy systems are crucial to a person's and a society's capacity to live, and they have altered the topography of the planet. The usage of energy resources based on fossil fuels has made life easier by providing light, heat, and simple transportation. However, it has negative effects on the environment, bringing up concerns about human happiness, welfare, freedom, and equality in addition to challenges with climate change, sea level rise, air pollution, desertification, and forced migration (Jones et al., 2015). By contributing to problems like pollution and global warming on the one hand, and energy poverty and under consumption on the other, energy misuse plays a catalytic role in a number of social and environmental challenges (Wilkinson et al., 2007). The current state of affairs shows how energy systems affect complex social, political, cultural, and moral issues more so than just economic and technical advancements alone (Sovacool et al., 2017). However, it has detrimental impacts on the environment, raising issues with climate change, sea level rise, air pollution, desertification, and forced migration in addition to issues with human happiness, welfare, freedom, and equality (Jones et al., 2015). Energy abuse plays a catalytic role in a variety of social and environmental issues by contributing to issues like pollution and global warming on the one hand, and energy poverty and under consumption on the other (Wilkinson et al., 2007). The state of the world now demonstrates how energy systems have a greater impact on complex social, political, cultural, and moral concerns than solely economic and technological achievements (Sovacool et al., 2017).

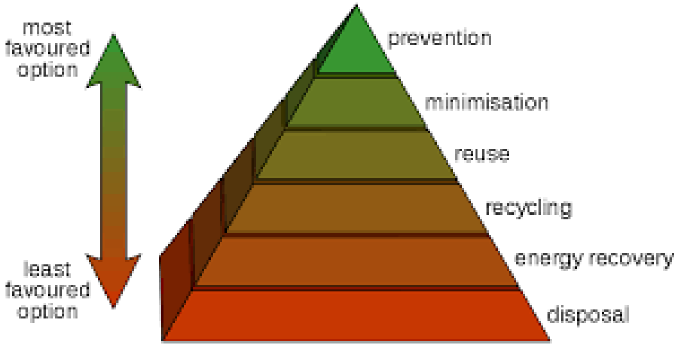


FIGURE 1. Sustainable Waste Disposal Technology Selection

According to a rising body of view, the tools and technology needed to create energy (such as fuel, electricity, and other items) are but one part of an energy system. Due to the interdependence of the technological and physical infrastructure of energy systems with user behaviors, organizations, and lifestyles, they are classified as sociotechnical systems. According to Significant management and planning difficulties emerge from our improved understanding of energy systems. Currently, more energy is being consumed owing to global population growth and economic growth. Over the next 20 years, an increase in energy consumption of 25–34% is anticipated (BP, 2017). It is crucial to take steps towards a long-term sustainable energy supply and low carbon emissions. According to data and polls, fossil fuels significantly contribute to the world's energy usage. This outstanding contribution won't be significantly reduced any time soon. His predictions state that by 2035, non-clean fuels will supply around 80% of the world's energy needs. (IEA, 2016) "Statistical Review of World Energy | Energy economics | BP," date unknown. Energy is one of the requirements for human life. Decisions and actions done to protect the energy supply and reduce carbon emissions shouldn't imperil people's ability to obtain energy (financially or otherwise The "energy trilemma" is the relationship between energy security, energy poverty, and climate change. Although it is clear that each system component's aims conflict with those of the other components, the issues mentioned above may be resolved if plans are made for each component while taking into consideration its requirements and preferences. Planning must include a range of system elements, including production, distribution, and consumption as a single, integrated system, to address the problems with the energy trilemma. In the management and decision-making of these systems, it would seem that a number of frameworks and criteria, including socioeconomic and environmental norms, are inadequate. According to Markowitz and Hariff (2012), these frameworks are unable to handle the complex relationships between energy-related concerns or give a solution to the conflicting needs of energy security, energy efficiency, and renewable energy. poverty, and climate change

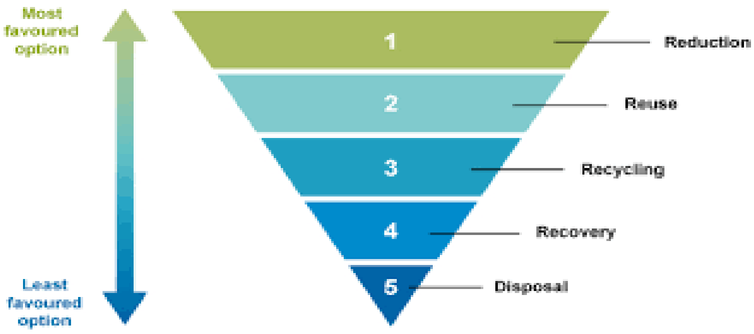


FIGURE 2. Sustainable Waste Disposal Technology Selection

Al-Khateeb et al. (2017) state that "Sustainability is a cornerstone in municipal solid waste management (MSWM) systems to ensure efficient and reliable waste management Environmental managers are motivated to create a sustainable waste management system by the complexity of waste streams with social and environmental problems and the growing amounts of waste generation.

Literature review: Choosing an MSW treatment and disposal approach is a challenging procedure that takes both qualitative and quantitative variables into account The main justification for this is because MCDM issues, which comprise technical, economic, environmental, social, and political elements, have an influence on MSWM, treatment, and disposal. A useful tool for choosing the optimal course of action and convincing people in general that MSWM planning is the best is MCDM. The properties of the MSWM issue are very compatible with MCDM approaches, according to Onut and Soner Regulating metropolitan solid waste (MSW) is presently a top priority for emerging nations. Choosing an MSW treatment and disposal approach is a challenging procedure that takes both qualitative and quantitative variables into account (Soltani et al., 2015). According to Dewi et al. (2010), the procedure is labor-intensive and requires collection, the position of the transfer station, a treatment plan, the location of the treatment plant, and energy recovery. Because of complicated aspects including cost effectiveness and environmental sustainability, decision-making has become more challenging. There is an alarming quantity of solid waste being created in the main cities of emerging countries as a result of rising urbanization, population expansion, and lifestyle changes. As a result, several nations are having significant issues processing and disposing of their waste.

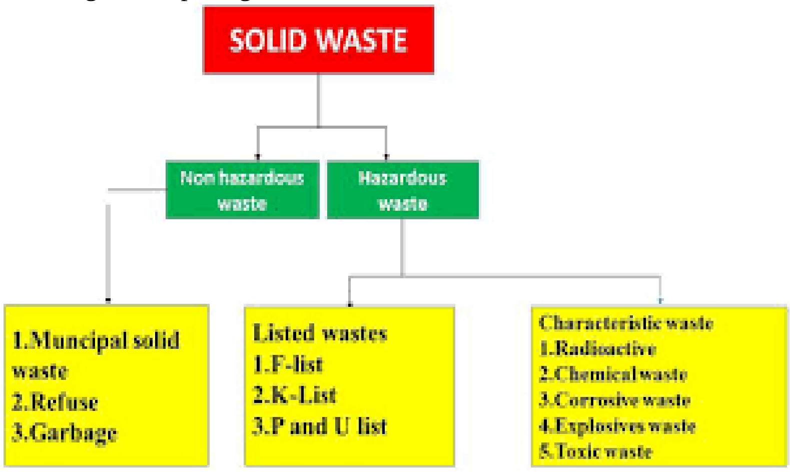


FIGURE 3. Sustainable Waste Disposal Technology Selection

Choosing an MSW treatment and disposal approach is a difficult procedure that takes into consideration both qualitative and quantitative needs (Soltani et al., 2015).The development and implementation of a sustainable plan to manage MSW that contains ideas that will lead to the best workable solution is highly valued by decision-makers today. Making the right choices is challenging due to trade-offs among several stakeholders, each of whom has a unique set of interests and viewpoints. Therefore, it is necessary to take into account relevant technological, economic, environmental, and social problems. These problems can be found using mixed, quantitative, or qualitative techniques. Choosing an MSW treatment and disposal approach is a challenging procedure that takes both qualitative and quantitative variables into account (Soltani et al., 2015). As a result, MCDM may consider MSW management to be a problem. Vermicomposting, aerobic composting, and anaerobic composting are only a few of the several composting methods. A difficult process that takes into consideration both qualitative and quantitative criteria is choosing an MSW treatment and disposal strategy (Sultana et al., 2015). The environment may be improved through reducing greenhouse gas emissions, improving soil quality, and using fewer fossil fuels. Utilising biogas and biofuels can balance off the expenses of using traditional waste disposal techniques, lower health care costs due to efficient waste management, and lower energy prices. These fuels might reduce the cost of energy and possibly replace some traditional fuels. A difficult process that takes into consideration both qualitative and quantitative criteria is choosing an MSW treatment and disposal strategy (Soltani et al., 2015). Wastewater treatment operations must manage sewage sludge correctly both during and after removal from the treatment plant in order to achieve these aims for 50% of all operational costs at the wastewater treatment plant, even though it only constitutes a minor portion of the total volume of wastewater processed (U.S. EPA, 2008 However, it is necessary to collect and manage enormous amounts of sewage sludge from wastewater treatment plants. Usually, 97-98% of this "raw" sludge is made of water. It must thus be carefully handled in order to be used as a viable bio solid. The suggested new/improved technology must provide complete organic matter recycling and a decrease in the possible risk brought on by the presence of contaminants. The expenses related to treating The management techniques for the long-term and economical use of sewage sludge are summarized in this study.

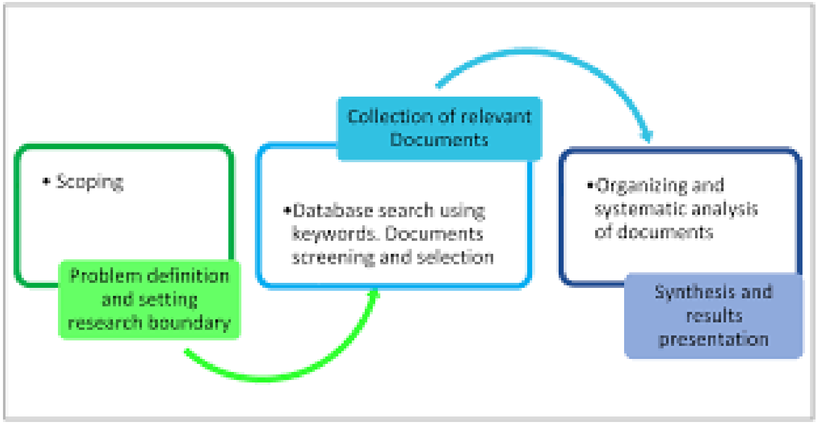


FIGURE 4. Sustainable Waste Disposal Technology Selection

Situation analysis: Asia is an area that defies classification due to its width and variety. There are emerging economies like South Korea, China, and India in addition to highly established countries like Japan and Indonesia. The majority of solid trash is produced by cities, and each municipality is responsible for processing it. These services are accessible to the steadily growing urban population in the majority of Asian nations. In this case, evaluating the urban environment and anticipating future trends would be acceptable.

Urbanisation in Asia: Over the past 50 years, a number of Asian countries have had exceptionally rapid economic expansion and social development, which has had a significant influence on urban life. Six of the top 10 most populous countries on earth are in Asia: China, India, Indonesia, Pakistan, Bangladesh, and Japan. Three-fifths of the world's population, or 3.7 billion people, reside in this continent. 1.38 billion of these 3.7 billion people live in cities, according to Brunner (2013), environmental pollution of the air, land, and water is intimately tied to the production of solid waste. Due to the ongoing flow of metals and other hazardous materials, MSW leachate has seriously polluted surface water, groundwater, and soil. Al-Wabel et al. (2011) found that the landfill leachate in the city of Riyadh had significant COD (13,900-22,350 mg L-1), are essentially three basic types of landfills in Taiwan. Between the three distinct types of landfills (closed landfill, direct MSW load landfill, and mixed MSW and burnt bottom ash load landfill), there were observable changes in the leachate concentration.

2. MATERIALS AND METHOD

TOPSIS Method: The long-term effects of high-quality decisions on overall organizational performance have come to the fore in recent years, drawing more attention to MCDM techniques. A finite collection of criteria is evaluated qualitatively or quantitatively in multi-criteria (or attribute) decisions. By giving preference information in terms of a precise numerical number, the desired alternative may be picked. However, given hazy or inaccurate understanding, preference information in real-world situations can be evaluated qualitatively. This discovery provided researchers with strong impetus to expand MCDM approaches in fuzzy environments. It is crucial to appropriately outline the problem and specifically examine a number of factors when the stakes are high. Making sound judgements requires properly structuring complicated situations and specifically taking into account many factors. The long-term effects of high-quality decisions on overall organizational performance have come to the fore in recent years, drawing more attention to MCDM techniques. A finite collection of criteria is evaluated qualitatively or quantitatively in multi-criteria (or attribute) decisions. By giving preference information in terms of a precise numerical number, the desired alternative may be picked. However, given hazy or inaccurate understanding, preference information in real-world situations can be evaluated qualitatively. This discovery provided researchers with strong impetus to expand MCDM approaches in fuzzy environments.

Literature Review: Downloaded on May 13, 2016, from Nanyang Technological University, TOPSIS Method Development 647 International Journal of Information Technology December Mak. just for personal use. Saaty47 conducted a detailed investigation of the AHP. Later, Saaty48 released a study on the development of the analytical network process (ANP) methodology. Zeleny and Cochrane49 published a book that uses compromise theory to solve the problem. Hwang and Lin50 published a study on group decision-making under several conditions. The details of the ELECTRE group approach were summarized by Roy51. The studies from Belton and Stewart, 52, Gal et al., 53, and Miettinen, 54, 55 laid the groundwork for the creation of the MOORA and MULTIMOORA techniques. Modular and hybrid method development has lately become more significant.

They are founded on methods that have been developed before and are widely used, such as TOPSIS,33SAW,56 AHP,47 ANP,48 VIseKriterijumska Optimizacija i KOmpromisno Resenje(VIKOR),57,58 Decision Making Trial and Evaluation Laboratory (DEMATEL),59,69Data Envelopment Analysis (DEA),60,61 PROMETHEE,62 ELECTRE63-66. and their modification using the concepts of fuzzy and grey numbers.

3. RESULTS AND DECISIONS

TABLE 1. Data set

Criteria	investment cost	operation cost	energy recovery	technology accessibility	emission	social acceptance
Landfilling	0.059	0.071	0.081	0.243	0.179	0.111
AD	0.118	0.107	0.135	0.216	0.25	0.167
Incineration	0.147	0.107	0.162	0.189	0.214	0.139
Pyrolysis	0.206	0.214	0.189	0.081	0.143	0.194
Plasma	0.265	0.25	0.243	0.135	0.071	0.222
Gasification	0.206	0.25	0.189	0.135	0.143	0.167

Table 1 Showing sustainable waste disposal technology selection using the analysis method in TOPSI Alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference: Criteria, Landfilling, AD, Incineration, Pyrolysis, Plasma, Gasification.

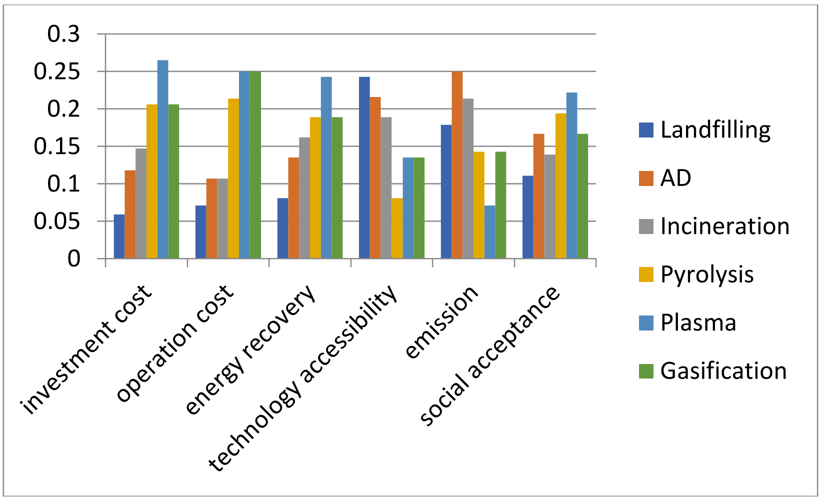


FIGURE 1. Data set

Figure 1 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference : Criteria , Landfilling , AD , Incineration , Pyrolysis , Plasma , Gasification

TABLE 2. Normalized Data

Normalized Data					
0.1515	0.1924	0.2121	0.5960	0.4396	0.2901
0.3030	0.2899	0.3536	0.5298	0.6139	0.4364
0.3775	0.2899	0.4243	0.4636	0.5255	0.3632
0.5289	0.5798	0.4950	0.1987	0.3512	0.5069
0.6804	0.6773	0.6364	0.3311	0.1744	0.5801

Table 2 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference: Criteria, Landfilling , AD , Incineration , Pyrolysis , Plasma , Gasfication.

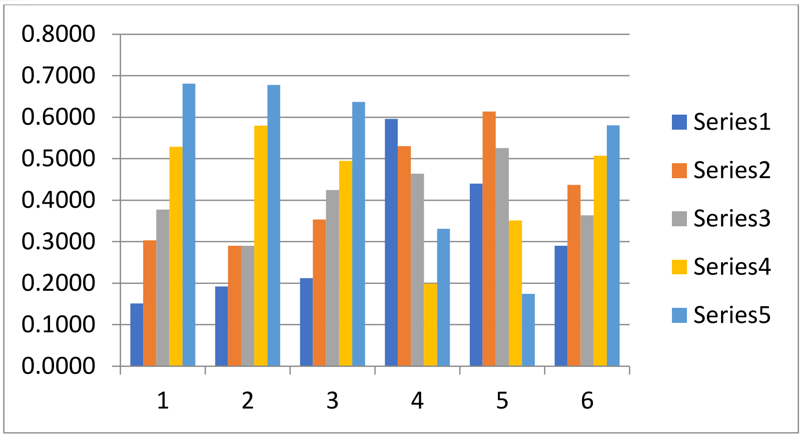


FIGURE 2. Normalized Data

Figure 2 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference : Criteria , Landfilling , AD , Incineration , Pyrolysis , Plasma , Gasification.

TABLE 3. Weight

Weight					
0.17	0.17	0.17	0.17	0.17	0.17
0.17	0.17	0.17	0.17	0.17	0.17
0.17	0.17	0.17	0.17	0.17	0.17
0.17	0.17	0.17	0.17	0.17	0.17
0.17	0.17	0.17	0.17	0.17	0.17

TABLE 3 Showing weights sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference: Criteria, Landfilling, AD, Incineration, Pyrolysis, Plasma, Gasification

TABLE 4. Weighted normalized decision matrix

Weighted normalized decision matrix					
0.0252	0.0321	0.0354	0.0993	0.0733	0.0483
0.0505	0.0483	0.0589	0.0883	0.1023	0.0727
0.0629	0.0483	0.0707	0.0773	0.0876	0.0605
0.0882	0.0966	0.0825	0.0331	0.0585	0.0845
0.1134	0.1129	0.1061	0.0552	0.0291	0.0967

TABLE 4 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference : Criteria , Landfilling , AD , Incineration , Pyrolysis , Plasma , Gasification.

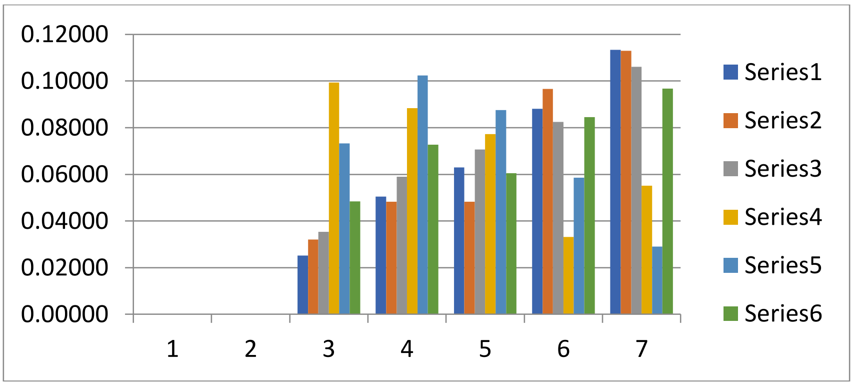


FIGURE 3. Weighted normalized decision matrix

Figure 4 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference : Criteria , Landfilling , AD , Incineration , Pyrolysis , Plasma , Gasfication

TABLE 5. Positive Matrix

Positive Matrix					
0.1134	0.1129	0.1061	0.0993	0.1023	0.0967
0.1134	0.1129	0.1061	0.0993	0.1023	0.0967
0.1134	0.1129	0.1061	0.0993	0.1023	0.0967
0.1134	0.1129	0.1061	0.0993	0.1023	0.0967
0.1134	0.1129	0.1061	0.0993	0.1023	0.0967

table 5 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference: Criteria, Landfilling, AD, Incineration, Pyrolysis, Plasma, Gasification.

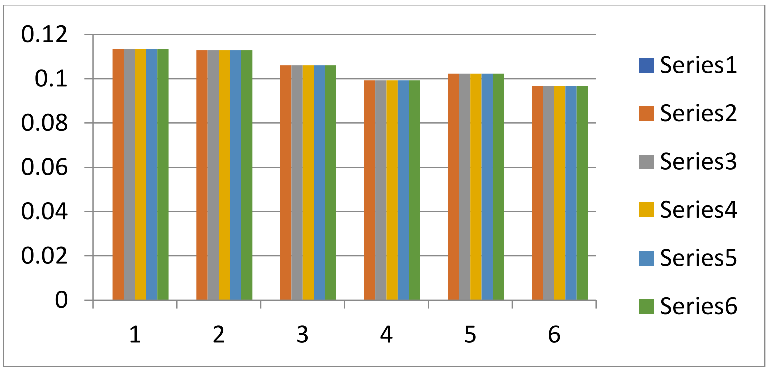


FIGURE 4. Positive Matrix

Figure 5 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference : Criteria , Landfiling , AD , Incineration , Pyrolysis , Plasma , Gasfication

TABLE 6. Negative matrix

Negative matrix					
0.0252	0.0321	0.0354	0.0331	0.0291	0.0483
0.0252	0.0321	0.0354	0.0331	0.0291	0.0483
0.0252	0.0321	0.0354	0.0331	0.0291	0.0483
0.0252	0.0321	0.0354	0.0331	0.0291	0.0483
0.0252	0.0321	0.0354	0.0331	0.0291	0.0483

TABLE 6 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference : Criteria , Landfiling , AD , Incineration , Pyrolysis , Plasma , Gasfication

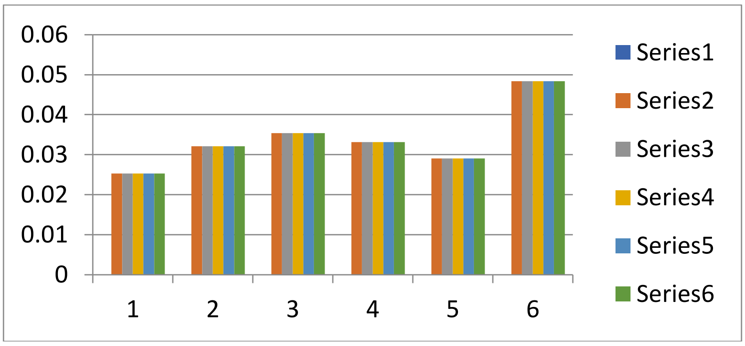


FIGURE 5. Negative matrix

Figure 6 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference : Criteria , Landfiling , AD , Incineration , Pyrolysis , Plasma , Gasfication

TABLE 7. SI Plus,Si Negative, Ci

SI Plus	Si Negative	Ci
0.1500	0.0796	0.3468
0.1051	0.0993	0.4860
0.0999	0.0911	0.4771
0.0889	0.1059	0.5436
0.0855	0.1407	0.6219

Table 7 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference : Criteria , Landfiling , AD , Incineration , Pyrolysis , Plasma , Gasfication

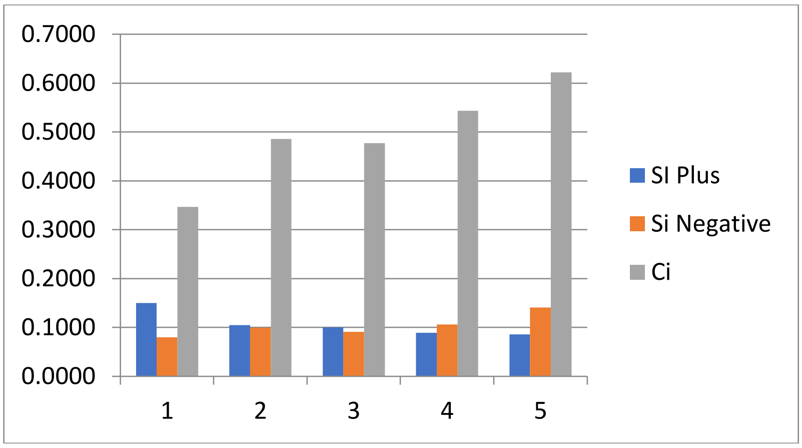


FIGURE 6. SI Plus,Si Negative, Ci

Figure 7 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference: Criteria, Landfiling , AD , Incineration , Pyrolysis , Plasma , Gasfication

TABLE 8. Rank

Landfilling	6
AD	5
Incineration	3
Pyrolysis	4
Plasma	2
Gasification	1

Table 8 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference: Criteria, Landfiling, AD , Incineration , Pyrolysis , Plasma , Gasfication

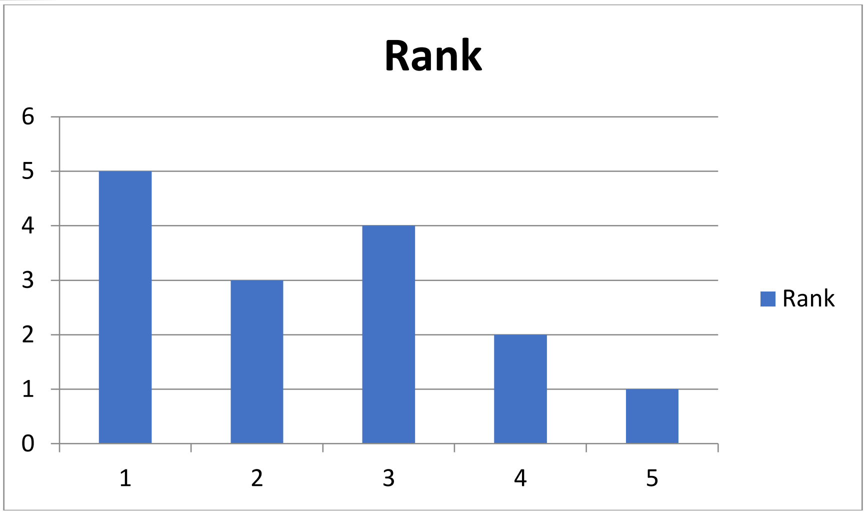


FIGURE 7. Rank

Figure 8 Showing sustainable waste disposal technology selection using the analysis method in TOPSIS alternative in use % Energy Recovery % technology accessibility % emission % social acceptance % investment cost % operation cost % Evaluation Preference: Criteria, Landfilling, AD, Incineration, Pyrolysis , Plasma , Gasification where Plasma is the first rank and Landfilling is the last rank.

4. CONCLUSION

After careful analysis and consideration of various sustainable waste disposal technologies, the following conclusion can be drawn: Trash-to-Energy (WtE) Plants: WtE plants are a practical method for disposing of trash in a sustainable manner. They transform garbage into energy using cutting-edge combustion or gasification procedures, usually WtE facilities offer the benefit of producing renewable energy and lowering landfill trash. To lessen environmental effects, however, thorough emission monitoring is crucial. Recycling and resource recovery are important parts of sustainable waste management. Comprehensive recycling programmes may drastically cut down on the quantity of garbage dumped in landfills. Sorting and processing waste materials are required to recover useful resources for reusing. Recycling has to be prioritised for items with great potential for recycling, such as paper, plastic, glass, and metal Composting: Composting is a naturally occurring process that creates nutrient-rich compost from organic waste, including leftover food and yard trash. It is a sustainable technique that lowers greenhouse gas emissions and helps prevent organic waste from ending up in landfills. Composting can be done on a local or big scale at municipal composting facilities or backyard bins. Anaerobic Digestion: Organic waste is converted into biogas and nutrient-rich dig estate through the biological process of anaerobic digestion.

REFERENCES

[1]. Torkayesh, Ali Ebadi, Behnam Malmir, and Mehdi Rajabi Asadabadi. "Sustainable waste disposal technology selection: The stratified best-worst multi-criteria decision-making method." *Waste Management* 122 (2021): 100-112.

[2]. Fetanat, Abdolvahhab, Hossein Mofid, Mojtaba Mehrannia, and Gholamreza Shafipour. "Informing energy justice based decision-making framework for waste-to-energy technologies selection in sustainable waste management: a case of Iran." *Journal of Cleaner Production* 228 (2019): 1377-1390.

[3]. Mousavi, Seyedeh Anahita, Ashkan Hafezalkotob, Vahidreza Ghezavati, and Farshid Abdi. "An integrated framework for new sustainable waste-to-energy technology selection and risk assessment: An R-TODIM-R-MULTIMOOSRAL approach." *Journal of Cleaner Production* 335 (2022): 130146.

[4]. Sondh, Sidhartha, Darshit S. Upadhyay, Sanjay Patel, and Rajesh N. Patel. "A strategic review on Municipal Solid Waste (living solid waste) management system focusing on policies, selection criteria and techniques for waste-to-value." *Journal of Cleaner Production* (2022): 131908.

[5]. Kharat, Manoj Govind, Shankar Murthy, Sheetal Jaisingh Kamble, Rakesh D. Raut, Sachin S. Kamble, and Mukesh Govind Kharat. "Fuzzy multi-criteria decision analysis for environmentally conscious solid waste treatment and disposal technology selection." *Technology in Society* 57 (2019): 20-29.

[6]. Kharat, Manoj Govind, Rakesh D. Raut, Sachin S. Kamble, and Sheetal Jaisingh Kamble. "The application of Delphi and AHP method in environmentally conscious solid waste treatment and disposal technology selection." *Management of Environmental Quality: An International Journal* (2016).

[7]. Soltani, Atousa, Rehan Sadiq, and Kasun Hewage. "Selecting sustainable waste-to-energy technologies for municipal solid waste treatment: a game theory approach for group decision-making." *Journal of Cleaner Production* 113 (2016): 388-399.
[8]. Kacprzak, Małgorzata, Ewa Neczaj, Krzysztof Fijałkowski, Anna Grobelak, Anna Grosser, Małgorzata Worwag, Agnieszka Rorat, Helge Brattebo, Åsgeir Almås, and Bal Ram Singh. "Sewage sludge disposal strategies for sustainable development." *Environmental research* 156 (2017): 39-46.
[9]. Zurbrügg, Christian, Marco Caniato, and Mentore Vaccari. "How assessment methods can support solid waste management in developing countries—A critical review." *Sustainability* 6, no. 2 (2014): 545-570.
[10]. Farooq, Ahsan, Piyanon Haputta, Thapat Silalertruksa, and Shabbir H. Gheewala. "A framework for the selection of suitable waste to energy technologies for a sustainable municipal solid waste management system." *Frontiers in Sustainability* 2 (2021): 27.
[11]. Kerdsuwan, Somrat, Krongkaew Laohalidanond, and Woranuch Jangsawang. "Sustainable development and eco-friendly waste disposal technology for the local community." *Energy Procedia* 79 (2015): 119-124.
[12]. Chen, Xiaohong, Jiong Lin, Xihua Li, and Zhiyong Ma. "A novel framework for selecting sustainable healthcare waste treatment technologies under Z-number environment." *Journal of the Operational Research Society* 72, no. 9 (2021): 2032-2045.
[13]. Sakcharoen, Thammananya, Chavalit Ratanatamskul, and Achara Chandrachai. "Factors affecting technology selection, techno-economic and environmental sustainability assessment of a novel zero-waste system for food waste and wastewater management." *Journal of Cleaner Production* 314 (2021): 128103.
[14]. Li, Hao, Jinlin Li, Zengbo Zhang, Xueli Cao, Jingrong Zhu, and Wenjia Chen. "Establishing an interval-valued fuzzy decision-making method for sustainable selection of healthcare waste treatment technologies in the emerging economies." *Journal of Material Cycles and Waste Management* 22 (2020): 501-514.
[15]. Belhadi, Amine, Sachin S. Kamble, Syed Abdul Rehman Khan, Fatima Ezahra Touriki, and Dileep Kumar M. "Infectious waste management strategy during COVID-19 pandemic in Africa: an integrated decision-making framework for selecting sustainable technologies." *Environmental Management* 66 (2020): 1085-1104.
[16]. Marler, R. Timothy, and Jasbir S. Arora. "The weighted sum method for multi-objective optimization: new insights." *Structural and multidisciplinary optimization* 41 (2010): 853-862.
[17]. Kim, Il Yong, and Oliver L. De Weck. "Adaptive weighted-sum method for bi-objective optimization: Pareto front generation." *Structural and multidisciplinary optimization* 29 (2005): 149-158.
[18]. San Cristóbal Mateo, José Ramón, and José Ramón San Cristóbal Mateo. "Weighted sum method and weighted product method." *Multi criteria analysis in the renewable energy industry* (2012): 19-22.
[19]. Kim, Il Yong, and O. L. De Weck. "Adaptive weighted sum method for multiobjective optimization: a new method for Pareto front generation." *Structural and multidisciplinary optimization* 31, no. 2 (2006): 105-116.
[20]. Stanimirovic, Ivan P., Milan Lj Zlatanovic, and Marko D. Petkovic. "On the linear weighted sum method for multi-objective optimization." *Facta Acta Univ* 26, no. 4 (2011): 49-63.
[21]. Wang, Rui, Zhongbao Zhou, Hisao Ishibuchi, Tianjun Liao, and Tao Zhang. "Localized weighted sum method for many-objective optimization." *IEEE Transactions on Evolutionary Computation* 22, no. 1 (2016): 3-18.
[22]. Hazelrigg, George A. "A note on the weighted sum method." *Journal of Mechanical Design* 141, no. 10 (2019).
[23]. Stanujkic, Dragisa, and Edmundas Kazimieras Zavadskas. "A modified weighted sum method based on the decision-maker's preferred levels of performances." *Studies in Informatics and Control* 24, no. 4 (2015): 461-470.
[24]. Madsen, Bo Eskerod, and Sharon R. Browning. "A groupwise association test for rare mutations using a weighted sum statistic." *PLoS genetics* 5, no. 2 (2009): e1000384.
[25]. Madsen, Bo Eskerod, and Sharon R. Browning. "A groupwise association test for rare mutations using a weighted sum statistic." *PLoS genetics* 5, no. 2 (2009): e1000384.
[26]. Weeraddana, Pradeep Chathuranga, Marian Codreanu, Matti Latva-aho, Anthony Ephremides, and Carlo Fischione. "Weighted sum-rate maximization in wireless networks: A review." *Foundations and Trends® in Networking* 6, no. 1–2 (2012): 1-163.
[27]. Modest, Michael F. "The weighted-sum-of-gray-gases model for arbitrary solution methods in radiative transfer." (1991): 650-656.