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stakeholders assess various waste management options based on a range of environmental, economic, social, and technical criteria. ese methods are particularly useful because they allow decision-makers to consider both quantitative and qualitative factors.

Some of the common MCDM methods used in sustainable waste management include:

A **(A):** AHP is a widely used MCDM method that helps prioritize alternatives by breaking down complex decisions into a hierarchy of criteria and sub-criteria. It involves pairwise comparisons of criteria to assign relative weights, which are then used to rank the alternatives.

( ): TOPSIS evaluates alternatives based on their distance from an ideal solution (the best possible option) and a negative ideal solution (the worst possible option). Alternatives are ranked based on their relative closeness to the ideal solution.

( ): ELECTRE is a family of outranking methods that compare alternatives based on their performance in relation to criteria. It identi es alternatives that outperform others in most criteria and eliminates those that perform poorly.

(A): MAUT evaluates alternatives based on the utility or satisfaction they provide with respect to di erent criteria. Each alternative is assigned a utility score based on how well it satis es the criteria.

: Fuzzy logic-based MCDM methods are used when there is uncertainty or imprecision in the criteria or alternatives. ese methods apply fuzzy sets and membership functions to evaluate alternatives in scenarios with incomplete or ambiguous data.

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MCDM methods are highly versatile and can be applied to various stages of the waste management decision-making process, including waste collection, treatment, and disposal. Here's how MCDM can be applied to assess eco-friendly municipal solid waste management options:

e rst step in applying MCDM is to de ne the objectives and criteria for decision-making. In sustainable MSWM, common objectives might include reducing land ll waste, minimizing greenhouse gas emissions, lowering operational costs, and promoting resource recovery.

: Greenhouse gas emissions, energy consumption, resource recovery rate, reduction in land use for land lls, etc.

: Capital costs, operational and maintenance costs, revenue from recycled materials, etc.

: Public health impact, job creation, social acceptance, etc.

: Reliability, scalability, adaptability to local conditions, etc.

Next, di erent waste management alternatives are identi ed and evaluated against the criteria. Common eco-friendly alternatives include:

: Sorting and processing recyclable materials to divert them from land lls.

: Organic waste is processed to create compost or biogas, which can be used as fertilizer and energy, respectively.

( ): Technologies like incineration, gasi cation, or pyrolysis convert waste into energy, thereby reducing the volume of waste sent to land lls and generating electricity or heat.

: Promoting waste reduction at the source by encouraging minimal packaging, reusable containers, and repair of goods.

Each alternative is assessed based on the previously de ned criteria using the selected MCDM method. For example, AHP could be used to rank alternatives based on their environmental and economic performance, while TOPSIS could compare the alternatives' distance from the ideal scenario of sustainability. Ranking and Selecting the Optimal Solution. Once the alternatives are evaluated, MCDM methods provide a ranking that helps decision-makers identify the most sustainable waste management option. e alternative that best satis es the criteria and achieves the highest ranking is recommended for implementation.

One of the key advantages of MCDM methods is the ability to conduct sensitivity analysis. is allows decision-makers to assess how changes in the weight or importance of criteria a ect the ranking of alternatives. For example, if public health impacts are given higher importance, the ranking of waste management options may change, leading to a di erent optimal solution.

Sustainable municipal solid waste management is essential for addressing the environmental and social challenges posed by urbanization and increasing waste generation. Multi-criteria decision-making (MCDM) methods provide a robust framework for evaluating and selecting eco-friendly waste management options. By systematically analyzing di erent waste management alternatives based on environmental, economic, social, and technical criteria, MCDM helps local authorities make informed and balanced decisions that promote sustainability and public welfare. As cities continue to grow, adopting MCDM approaches in waste management will be crucial for achieving long-term sustainability goals.

1. Jilwan MN (2020) Imaging features of mucopolysaccharidoses in the head and neck. Int J Pediatr Otorhinolaryngol 134: 110022.
2. Grabowski GA (2012) Gaucher disease and other storage disorders. Am Soc Program 2012: 13-8.
3. Murugesan V, Chuang WL, Liu J, Lischuk A, Kacena K, et al. (2016) Glucosylsphingosine is a key biomarker of Gaucher disease. Am J Hematol 11: 1082-1089.
4. Bultron G, Kacena K, Pearson D, Boxer M, Yang M, et al. (2010) The risk of Parkinson's disease in type 1 Gaucher disease. J Inherit Metab Dis 33: 167-173.
5. Horowitz M, Wilder S, Horowitz Z, Reiner O, Gelbart T, et al. (1989) The human glucocerebrosidase gene and pseudogene: structure and evolution. BMC research notes 4: 87-96.

6. Winýeld SL, Tayebi N, Martin BM, Ginns EI, Sidransky E et al. (1997) Identiýcation of three additional genes contiguous to the glucocerebrosidase locus on chromosome 1q21: implications for Gaucher disease. Genome Res 7: 1020-1026.

7. Koprivica V, Stone DL, Park JK, Callahan M, Frisch A, et al. (2000) Analysis and classiýcation of 304 mutant alleles in patients with type 1 and type 3 Gaucher disease. Am J Hum Genet 66: 1777-1786.

8. Zhang J, Chen H, Kornreich R, Yu C (2019) Prenatal Diagnosis of Tay-Sachs Disease