

Sustainability and Mitigation Potential of Municipal Solid Waste Management Systems: A Global City-Level Analysis

¹*Sunil Kumar, ²Rakesh Pradeep Kumar

¹CSIR-National Environmental Engineering Research Institute (CSIR-NEERI), Nehru Marg, Nagpur 440020, Maharashtra, India

²Agriculture University, Jodhpur, Jodhpur, India

*Corresponding author: Sunil Kumar, s_kumar@neeri.res.in

 <https://doi.org/>

Abstract

The management of municipal solid waste (MSW) is a key solution to the development of urban sustainability and increasing the mitigation capacity in the waste sector. This paper analyses the sustainability performance and ability to mitigate the municipal solid waste management systems of over 300 cities in the world using harmonized city-level data. A composite Mitigation Potential Index (MPI) was developed using the recycling levels, composting levels, landfill diversion and reduction of open dumping levels. To investigate the performance differences and determine the most important determinants of sustainability performance, descriptive statistics, correlation, multiple regression modeling, and hierarchical clustering were used. The findings demonstrate that there is a high heterogeneity among cities as the landfill disposal has been the most common mode of treatment in most areas. Increased MPI scores had a significant relationship with the greater coverage of collection, reinforcement of the governance factors, and greater diversion by recycling and composting. Open dumping depicted a high negative effect on sustainability performance. The three typologies of the systems identified by the cluster analysis portray different levels of transition into sustainable waste management. The results indicate that institutional ability, diversion structures and controlled disposal are important in enhancing mitigation potential. The paper gives an international comparative framework to enhance evidence-based policy formulation and strategic planning in sustainable municipal waste management systems.

Keywords: *Municipal solid waste, Sustainability performance, Mitigation potential, Landfill diversion, Urban waste governance*

1. INTRODUCTION

The high rate of urbanization, growth in population, and shift in consumption trends have greatly contributed to a high rate of municipal solid waste (MSW) production across the globe. The ecological impacts of poor waste management systems are especially acute in developing localities whereby the institutional capacity and infrastructure are usually below the pace of waste production. It is also evident that the associated effects of environmental sustainability are problems that are improperly disposed of, such as open dumping and unregulated landfills, which are well documented in the Global South (Abubakar et al., 2022). Such effects are groundwater pollution, greenhouse gases and health hazards to the population, which makes it clear that the municipal waste management systems require systemic change. The history of MSW management has changed towards less focused systems that were disposal oriented instead of more coordinated and sustainability based systems. A multidisciplinary review points to the fact that waste governance has increasingly captured the technological, environmental, and socio-economic aspects in order to enhance the performance of the system (Wang et al., 2021). Although such improvements were introduced, significant gaps between cities can be observed in the area of operational efficiency and sustainability outcomes.

The sustainable solid waste management focuses on waste minimization, recycling, composting, and recovery of resources as an alternative to the reliance on landfills. Composting of organic waste is a promising avenue particularly because in most cases organic fractions are the highest proportion of municipal waste streams. The composting methods not only lower the landfill operations but also help in enhancing the soil and sequestration of carbon (Manea et al., 2024). The growth of such practices is important to increase the mitigation potential of urban waste systems. In an effort to determine the sustainability progress, researchers have continued to come up with the indicator-based frameworks that reflect the environmental, economic and technical aspects of managing the MSW. Structured inter-municipal comparison is made possible through the use of sustainability indicators, and may aid in making evidence-based policies (Jucá et al., 2020). These frameworks allow a baseline on the assessment of mitigation potential not just based on the volume of waste measures.

The commonest waste management technique used in all parts of the world is landfill disposal which has significant environmental consequences. The release of methane gas in the municipal landfills is one of the significant contributors of greenhouse gases in the waste industry. The life-cycle analysis of landfill gases emission shows the great mitigation value of diversion and waste-to-energy programs (Lee et al., 2017). Less reliance on landfill is thus one of the key elements of sustainable MSW systems. The comparative life cycle analyses further demonstrate that other waste management situations like increased recycling or composting can yield significant environmental burdens relative to traditional disposal systems (Richard et al., 2021). These results confirm the necessity of the analysis of mitigation potential in municipal systems through analytical methods. This invention of holistic sensors of sustainable and resilient waste management has become popular in the recent years. In a systematic review of sustainability indicators, there is a sense of integrated measurement of the performance of the diversion, quality of governance, and capacity to operate (Swan et al., 2025). These multidimensional evaluation systems are required in the identification of cities that are progressing towards sustainable waste-to-value systems.

The development of spatial planning and data analytics is transforming the process of waste management decisions. Geographic Information Systems (GIS) have been used in enhancing strategic planning and infrastructure preparedness especially in the developing environment (Tahulela et al., 2025). The decision models which are spatially informed are able to make the work of these activities much more efficient and assist in the optimal allocation of the collection and treatment facilities. Systemic transitions of municipal waste management have also been assessed using material flow analysis and life cycle assessment. The combination of these approaches gives a complete picture of resource transfers and environmental trade-offs of the various management connotations (Wang et al., 2020). This type of policy-based sustainability assessment is solidified by such analytical integration. Simultaneously, the machine learning methods have been implemented to predict waste, plan routes, and enhance recycling. The use of artificial intelligence in MSW management proves that it can be used to increase prediction and performance (Xia et al., 2022). The general modernization of municipal waste systems is aided by these technological developments.

Institutional performance and economic efficiency are also important factors that contribute to sustainability results beyond technological solutions. The empirical study of municipal waste systems in Chile indicates that there are meaningful differences in technical and environmental efficiency indicating that the governance structures and the design of the operations are significant factors in determining the performance in terms of sustainability (Sala-Garrido et al., 2022). These results highlight the relevance of analyzing both environmental and management aspects of MSW. Recycling initiatives can also be used as revenue mobilization and economic inclusion mechanisms in the context of the developing countries. The evidence of cases in Ghana proves that well-organized recycling initiatives could lead, at the same time, to the alleviation of the environmental load and the creation of

the economic benefits at the local level (Awafo et al., 2023). The connection of the sustainability objectives with the economic benefits increases the sustainability of the municipal waste systems. Comparative analysis of air emissions of disposal technologies suggests that the beneficial effect of composting and controlled waste-to-energy technology can produce less environmental effect compared to uncontrolled landfilling (Delkash, 2025). The relations made of such comparisons support the significance of the diversion-oriented strategies in the delivery of mitigation goals. Municipal solid waste, life cycle assessment strategies in developing metropolitan areas also confirm that integrated management systems are more effective in environmental performance than landfill-based management systems (Ramalho et al., 2025). This evidence advocates the necessity of comparative analysis on a global level in order to find directions toward waste management at a sustainable and mitigation-focused level at the municipal level.

The main aim of the research is to analyze the sustainability performance and mitigation potential of the municipal solid waste management systems in the global city scale. In particular, the research (i) develop a composite Index of Mitigation Potential grounded on diversion-focused and treatment-focused practices, (ii) provide comparative sustainability performance across cities through standardized measures, and (iii) determine the operation-linked, compositional-linked, and governance-linked issues that play a vital role in the achievement of mitigation-oriented outcomes in the municipal waste systems.

2. METHODOLOGY

2.1 Study Design and Data Source

This is a quantitative cross-sectional research study that aims at assessing the sustainability performance and mitigation capability of municipal solid waste (MSW) management systems at the city level. The discussion relies on the World Bank What a Waste dataset of global city-level, which offers harmonized information on more than 300 cities around the globe (Mannmann, 2025). The data covers waste production and waste generation per capita, waste composition, practices in treatment and disposal, the coverage of collection, and the indicators of governance and financial practices chosen. The city is the unit of analysis, and the global comparative analysis of the municipal waste system can be conducted. Some of the cities, whose core variables, i.e. waste generation, shared treatment, and coverage of collection, had full information, were retained to guarantee uniformity in the analysis. Before analyzing the data further, it was tested to ensure the distributions of variables, measurement units, and structural consistency.

2.2 Variable Selection and Operational Definitions

The choice of variables was informed by their significance in sustainable practices of solid waste management and performance of the system based on mitigation. Mitigation Potential Index (MPI) was the key outcome variable which was formulated to reveal the preferred waste management strategies which are environmentally friendly. As the dataset lacks direct measures of greenhouse gas emissions, the potential of mitigation was operationalized by the treatment and diversion features that are generally considered to reduce the environmental burden. The MPI makes use of the rates of recycling, composting, landfill diversion, and open dumping reduction. The increased recycling and composting shares were considered as positive contributors whereas open dumping was considered as negative sustainability indicator. Operational factors like waste generation per capita and coverage of collection, composition factors like the percentage of organic waste, and a governance-related aspect like the cost recovery mechanisms and the structure of institutional responsibility are all independent variables. The socioeconomic factors like population size of the cities and the classification of these regions were also taken into consideration in order to explain the differences in contexts.

2.3 Data Cleaning and Preprocessing

The data was first systematically preprocessed before statistical analysis. Duplication of records was eliminated and all the percentages variables were changed to standard numeric values. The unavailability of value of core treatment and generation variables resulted in the case-wise exclusion to maintain the integrity of analysis. In the non-core variables of governance, it was limited to imputing on regional median where necessary. The outliers were evaluated based on standardized z-scores and extreme values were checked through plausibility. In all cases where it was done, there was mild winsorization to decrease the effects of extreme observations without distorting overall distributional properties. To make all the variables included in the construction of composite indices comparable across different measurements, Min-max scaling was applied to all the variables.

2.4 Construction of the Mitigation Potential Index

A composite Mitigation Potential Index was created to assess a sustainability-oriented mitigation performance. The index is a combination of normalized indicators of recycling, composting, landfill diversion and elimination of open dumping. Equal weight was originally used so that prioritization of

components could not be subjective. The composite score gives a standardized measure of the relative performance of each of the cities in terms of mitigation-oriented activities in the sample. In order to make the index structure robust, Principal Component Analysis (PCA) was performed to investigate existing dimensionality and ensure that the indicators that were selected loaded together on a shared sustainability dimension. A sensitivity analysis was conducted using equal-weight and PCA-based weighting scheme, so that city ranking is not guided by the artifact of the methodology.

2.5 Descriptive and Comparative Statistical Analysis

To describe current trends in municipal waste management systems in the world, descriptive statistics were computed. It involved means, medians, standard deviation, and interquartile ranges of waste generation, treatment shares, and collection covers. Comparisons across the regions were done to establish geographical differences in the performance of sustainability. Interrelationships between waste generation levels, treatment practices, governance characteristics and mitigation potential scores were analyzed on the basis of correlation analysis. These initial analyses gave a clue on the associations at the structural level and guided the subsequent multivariate modelling.

2.6 Multivariate Regression Modeling

As the dependent variable, the Mitigation Potential Index, multiple linear regression models were estimated to determine determinants of sustainability and mitigation potential. The independent variables were: collection coverage, waste production per capita, organic waste fraction and indicators of governance. This kind of modeling allowed assessing the impact of operational efficiency, waste composition, and institutional capacity on the sustainability performance of systems. The statistical validity was achieved by carrying out model diagnostics. The criteria of Multicollinearity were evaluated with the help of the variance inflation factors and the heteroskedasticity was mitigated with the robust standard errors. Adjusted R² values and F-statistic were analyzed to assess explanatory and general model importance.

2.7 Cluster Analysis and System Classification

In order to examine the similarities in the structures between cities further, hierarchical cluster analysis was conducted in terms of normalized sustainability indicators. This approach categorised cities into high-performance, transitional and low-performance waste management systems clusters. The linkage method used by Ward was to reduce the within-cluster variance and the silhouette statistics were used to evaluate the cluster validity. The classification offers a comparative system of how to understand various sustainability pathways and what resembles related features of high-performing municipal systems.

2.8 Robustness and Sensitivity Testing

Several robustness checks were undertaken in order to determine stability of findings. Other index weighting schemes were experimented with and regression estimates re-run with other subsets of variables. To explain the structural geographic heterogeneity, the introduction of regional fixed effects was determined. The fact that the coefficient signs and significant level remained the same in all specifications demonstrated the stability of the analytical model.

3. RESULTS

3.1 Descriptive Characteristics of Municipal Solid Waste Systems

The ultimate analytical sample comprised of 300+ cities that had all the available data regarding waste collection, treatment quotas, and coverage of the collection. The average daily production of the municipal solid waste amounted to about 0.74 kg/capita/day with a wide variation across cities. In general, there was a high level of collection coverage in the upper-income areas and a significant difference in the lower-income environments. Municipal waste streams that included organic waste comprised of the greatest proportion, then plastics, and paper. Landfill disposal has dominated the practice of treatment and recycling and composting rates are significantly different in different regions. Infrastructure and governance gaps were manifest through open dumping that was still common in a section of cities. Table 1 displays the descriptive statistic of the main variables to be used in the analysis to give a comprehensive overview of the central tendencies and dispersion of the waste generation, treatment shares, and the composition indicators of the sampled cities.

Table 1. Descriptive Statistics of Key Variables

Variable	Mean	Std. Dev.	Min	Max
Waste generation (kg/cap/day)	0.74	0.39	0.11	4.54
Collection coverage (%)	84.6	21.3	12.0	100
Recycling rate (%)	18.2	16.5	0	65
Composting rate (%)	9.7	12.8	0	60
Landfill share (%)	54.8	28.7	0	100

Open dumping (%)	12.4	18.9	0	90
Organic fraction (%)	46.3	14.2	18	72

The statistics indicate that there is a huge heterogeneity regarding treatment practices and waste properties and this explains why a comparative sustainability index is required to evaluate the performance of cities with regard to mitigation. In order to graphically depict the relative pre-eminence of various treatment approaches in the sample, the mean portion of landfill, recycling, composting and open dumping is shown in Figure 1.

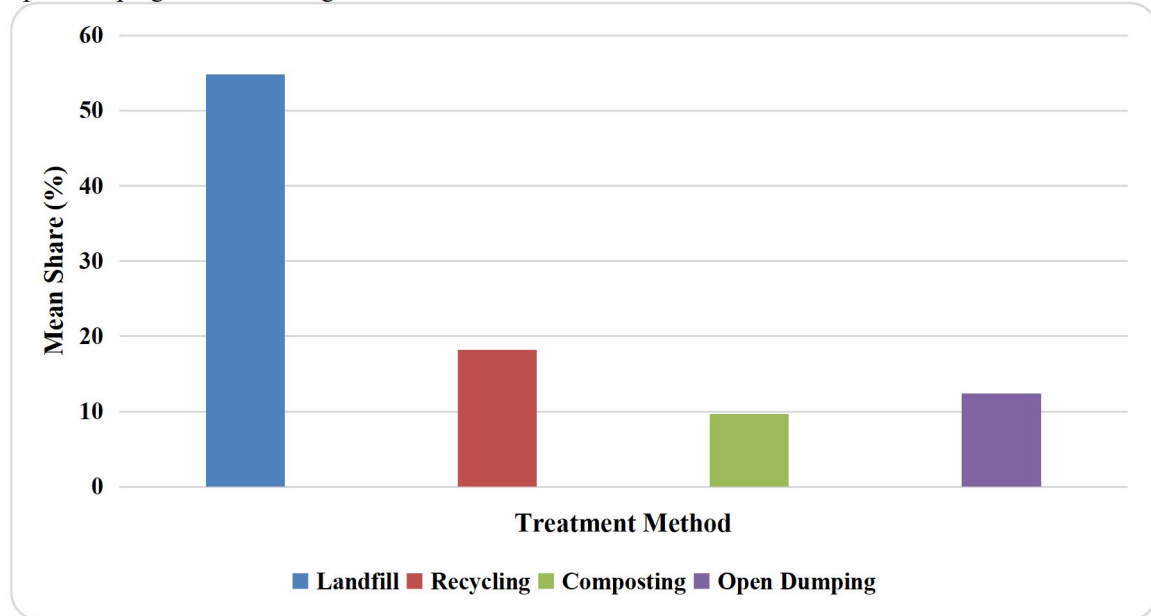


Figure 1. Distribution of Waste Treatment Methods Across Cities

The figure actually shows the high rate of landfill disposal as compared to the methods that rely on diversion, which offers a visual reinforcement of the descriptive trends mentioned above. The prevalence of landfill disposal (mean 55) shows that the potential of the mitigation via diversion is still under-exploited in most municipal systems.

3.2 Mitigation Potential Index (MPI) Outcomes

The Mitigation Potential Index (MPI) was calculated with the help of the normalized values of recycling, composting, diversion, and open dumping. There were a range of 0.08 to 0.82 scores in MPI which suggests there were great differences among sustainability-oriented system performance. The cities with the top 25 percent of the recycling and composting shares and low open dumping shares turned out to be cities in the upper quartile, and the cities at the bottom quartile had high levels of landfill reliance and low levels of the diversion infrastructure. In order to make performance levels comparative, cities were divided into quartiles according to the MPI scores, as is the case in Table 2.

Table 2. Quartile Classification of Mitigation Potential Index

MPI Range	Key Characteristics
0.08 – 0.29	High landfill dependence, low recycling, frequent open dumping
0.30 – 0.44	Moderate collection, limited composting
0.45 – 0.62	Expanding recycling and controlled disposal
0.63 – 0.82	Strong diversion systems, minimal dumping

The quartile typology indicates that performance on sustainability is highly stratified and considerable distances exist between the high- and low-performing municipal systems. Figure 2 further gives the distributional features of the scores of MPI in all the cities.

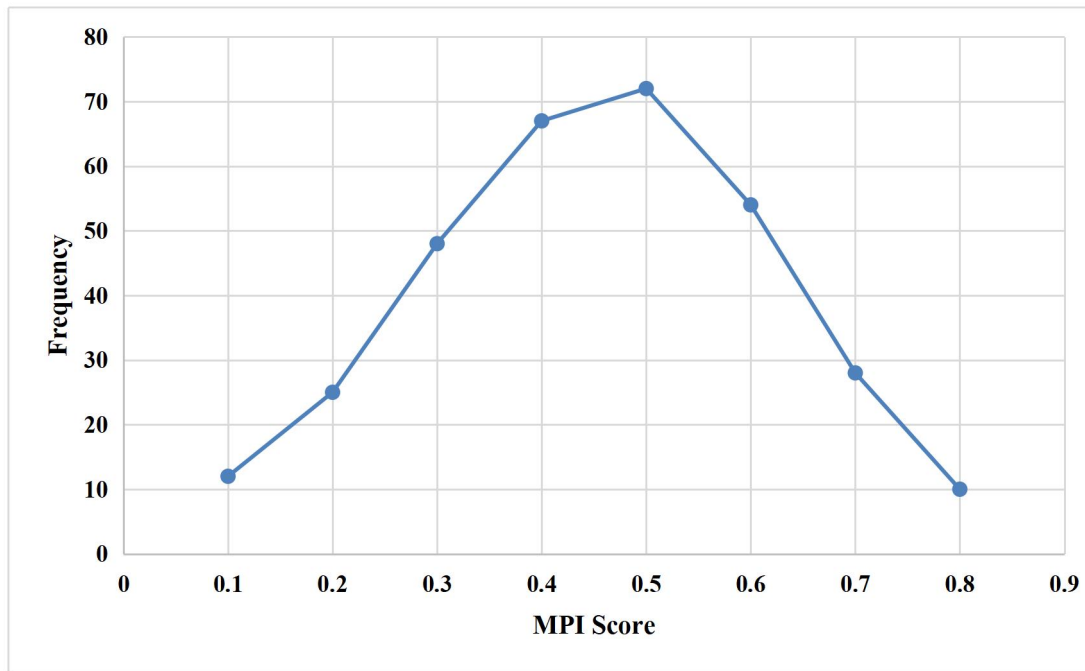


Figure 2. Global Distribution of Mitigation Potential Index Scores

The concentration of the range of mid-performance with less number of cities with very high range of mitigation potential indicates that there is uneven global developments and achievements of sustainable waste management measures. Distribution shows that some cities have developed sustainable systems but a large percentage of the cities are still at the transitional stages.

3.3 Correlation Analysis

The Pearson correlations analysis showed that there are significant relationships between the sustainability indicators. The rates of recycling and composting showed a positive correlation with a strong relationship ($r = 0.58$) which indicated the diversion systems were integrated. Open dumping had a high negative relationship with MPI ($r = -0.71$), which validated its negative impact on sustainability performance. There were moderate positive correlations of collection coverage with MPI ($r = 0.42$), which shows that operational capacity helps to achieve better mitigation potential. There was a weak correlative relationship between waste generation per capital and MPI, which indicated that system design and governance are important factors, as opposed to the volume of waste. Table 3 illustrates the correlation of the main variables that were incorporated in the research to analyze the magnitude and the direction of these relationships in more detail.

Table 3. Correlation Matrix of Key Variables

Variable	MPI	Recycling	Composting	Collection	Open Dumping
MPI	1.00	0.74	0.69	0.42	-0.71
Recycling	0.74	1.00	0.58	0.36	-0.54
Composting	0.69	0.58	1.00	0.28	-0.49
Collection	0.42	0.36	0.28	1.00	-0.45
Open Dumping	-0.71	-0.54	-0.49	-0.45	1.00

The theoretical basis of the composite index and the fact that the diversion-oriented practices are directly correlated with higher sustainability performance is proved by the correlation structure. These findings affirm that there is structural consistency between the composite index and it is acceptable in further modelling.

3.4 Determinants of Mitigation Potential

The use of multiple regression analysis under MPI as the dependent variable was made. The model was found to be very explanatory (Adjusted $R^2 = 0.56$). The predictors identified as statistically significant and positive predictors of mitigation potential included collection coverage and recycling rate. There was a negative correlation between open dumping. The positive impact of organic waste fraction was rather small, and it means that cities that have more organic structure can have more opportunities to develop composting as a mitigation measure in case the systems are established. Table 4 shows the estimated values of coefficients, standard errors, and statistical significance values.

Table 4. Regression Results for Mitigation Potential Index

Variable	Coefficient (β)	Std. Error	p-value
Collection coverage	0.0038	0.0009	<0.001
Waste generation	0.021	0.014	0.12
Organic fraction	0.0026	0.0011	0.02
Governance indicator	0.041	0.018	0.03
Open dumping	-0.0052	0.0008	<0.001

The regression estimates reveal that institutional capacity and controlled diversion mechanisms are determining factors towards the promotion of mitigation potential. Open dumping had the highest marginal effect, which highlights the need to do away with unregulated dumping activities. In order to provide more evidence on the positive association between mitigation performance and operational capacity, partial regression association between mitigation performance and the coverage of collection is presented in Figure 3.

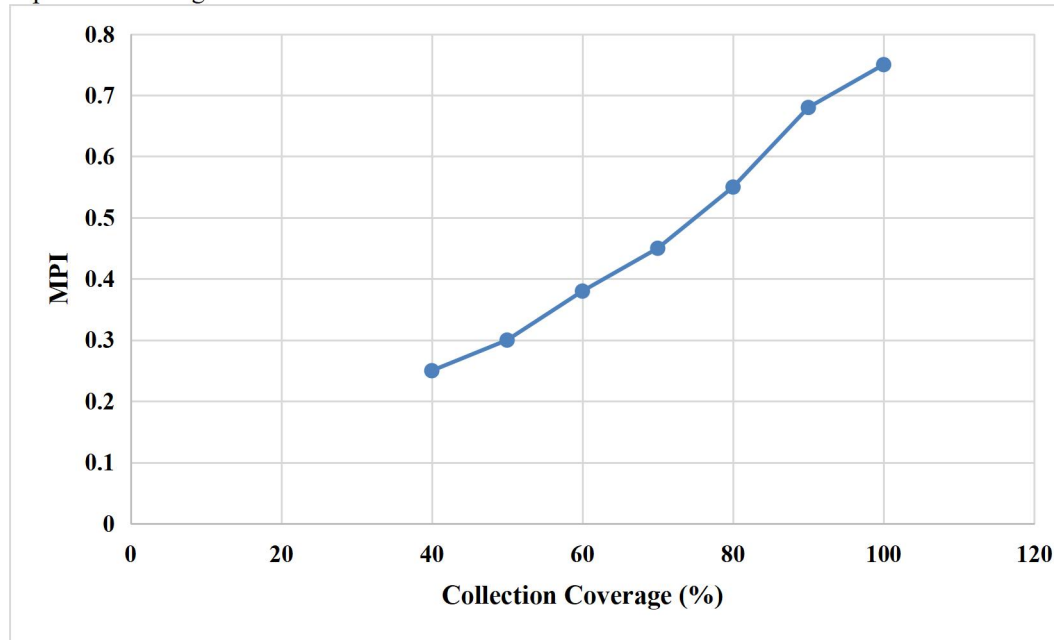


Figure 3. Partial Regression Plot of Collection Coverage and MPI

The positive regression line shows that expanded collection services make a statistically significant positive contribution to the sustainability outcomes.

3.5 Cluster-Based Classification of Waste Management Systems

Hierarchical analysis of clustering resulted in determining three typologies of municipal waste management: a High-Performance Cluster typology which is characterized by high diversion, near-universal collection, and little open dumping; a Transitional Cluster typology with moderate recycles and improving infrastructure; and a Low-Performance typology with addictive reliance on landfills, high open dumping and poor governance. High-performance group registered a mean of MPI scores more than 0.65 and low-performance systems registered less than 0.30. Figure 4 shows the hierarchical classification of the cities.

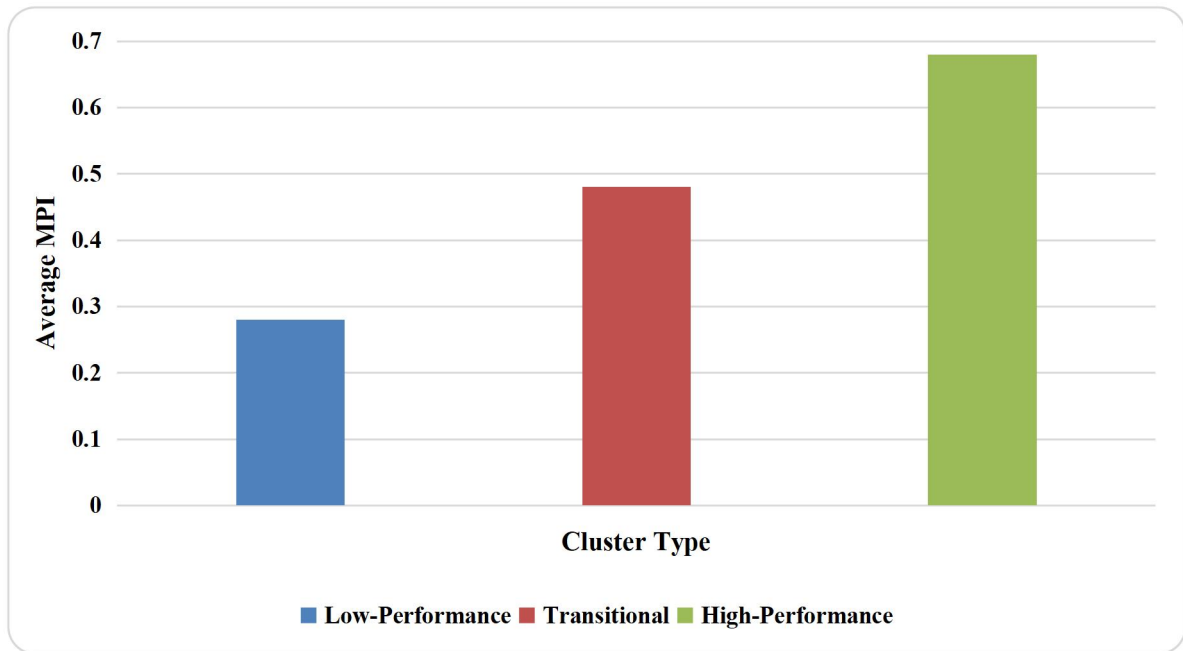


Figure 4. Dendrogram of City-Level Sustainability Clusters

The dendrogram shows that there is a clear division within system typologies, which further confirms the presence of structurally distinct sustainability trajectories. The cluster analysis proves large heterogeneity in the world municipal systems and brings out the transition pathways in sustainability.

3.6 Robustness and Sensitivity Analysis

Other MPI weighting schemes also gave similar city rankings and the rank correlation coefficients were more than 0.88 across all specifications. The re-estimation of regression models with the use of diversion-based indicators alone produced similar signs of the coefficients and the significance. Incorporation of the fixed effects of regions did not change core results significantly. Such robustness tests assert that the relationships being observed are structural and not as a result of model specification.

4. DISCUSSION

The results of the current study indicate the high degree of heterogeneity of sustainability performance among the municipal solid waste management systems, which represent the greater global inequalities in the production of waste and the capacity of the system. The further rise of the municipal waste production puts more and more pressure on updating the infrastructure and shift to the diversion-oriented systems of municipalities. Recent reviews of the world waste production highlight the view that the quantity of urban waste is commonly undercalculated, which makes it challenging to plan and develop sustainability indicators (Maalouf and Mavropoulos, 2023). In this regard, it is important to note that the difference between the Mikitation Potential Index (MPI) in the different cities highlights the dire need to intensify the system level response to the growing amounts of waste. Preponderance of landfills in the findings is also in line with the trends in the world, where disposal is the common strategy regardless of the known impacts on the environment. Landfill emissions can be a significant climate cost, and a better landfill management practice can considerably lower the intensity of emission (Scharff et al., 2024). The negative relationship observed between the open dumping and MPI in this study is strong and supports the significance of the environment in adopting the controlled disposal and diversion systems.

The cluster analysis showed there were typologies in municipal waste systems, which included landfill-based and high-diversion systems. This stratification is indicative of the larger trends of evolutionary patterns in the governance of waste. Historical evaluations of the municipal waste management in North America indicate that the shift of the system may be slow, commonly achieved via regulatory reform, infrastructure investment, and community engagement procedures (Ross and Law, 2023). The presence of transitional clusters in the given research implies that a great number of cities are finding themselves moving through the same paths of transformation. The life cycle frameworks based on scenarios are some of the tools that offer viable solutions to assess these transition processes. Integrated scenario modeling allows policymakers to trade-off between environmental factors of either landfill expansion, recycling improvement, and compost development (Istrate et al., 2021). The findings of the regression that was conducted in this research, in which collection cover and signs of governance are

identified as important predictors of mitigation capacity, confirm the perception that structural planning and assessment of long-term scenarios are critical to sustainable transitions.

In the empirical study, structures of governance became significant predictors of sustainability performance. The infrastructure effectiveness and the diversion rates are dependent on institutional quality and regulatory frameworks. The avenues of urban governance leading to the adoption of the circular economy have been noted to be key facilitators of sustainable waste transformation especially in fast-urbanizing areas (Hossain and Haque, 2026). The correlation between the governance indicators and the MPI in this paper is in line with the perception that well coordinated policy frameworks improve the system level mitigation performance. The problems of waste management are not purely technical issues, but they are firmly rooted in the socio-economic system. The holistic view implies the combination of the environmental goals with economic viability and institutional responsibility (Garg and Arora, 2025). The identified differences in the mitigation potential of cities demonstrate that they should implement the context-sensitive strategies, where the environmental ambitions and administrative capacities would be balanced.

Municipal waste streams in the dataset contained organic waste, which was a considerable portion of the total waste, and its management has a strong impact on the overall level of sustainability. The opportunities of composting systems encourage avoiding methane and recovering the nutrients, yet the implementation issues have been challenging, especially in developing settings. The sources on the biowaste composting systems reviews note that the level of environmental performance is closely tied to the control of contamination and operational efficiency (Oviedo-Ocaña et al., 2023). The small positive correlation in this paper between organic waste fraction and MPI implies that cities having a greater organic content can achieve significant mitigation benefits provided that composting facilities are well implemented. The positive environmental impacts of the diversion strategies over landfill disposal are also supported by the life cycle assessment studies. Thorough investigations can confirm that recycling and composting methods are generally more efficient in greenhouse gases reduction and resource saving, compared to traditional disposal (Zhang et al., 2021). These findings are consistent with the results of the MPI since the cities with diversion practices increased exhibit higher sustainability scores.

Although the production per capita of waste had a limited effect on MPI in the regression model, it makes sense that wider economic factors are still applicable. The cross-country surveys conducted in the OECD economies show that the rates of income, consumption trends, and price elasticity play a significant role in shaping the patterns of waste generation (Sinha et al., 2022). The weak correlation in this study is however an indication that management structure and governance are more likely influencers of mitigation potential rather than the volume of waste. The methodological developments in life cycle assessment have enhanced the capacity to estimate alternative ways of managing waste. It is noted in the critical reviews that clear assumptions, the system boundary, and uniform functional units are vital in determining the sustainability of municipal waste (Khandelwal et al., 2019). The composite index methodology which is followed in the study is a complement of the life cycle perspectives which gives a relative measure which is concerned with the performance of diversion and governance.

The findings indicate that the core elements of improving mitigation prospect in the municipal waste systems are the coverage of collection, open dumping, and the reinforcement of institutional frameworks. The idea of investment into composting and recycling infrastructure seems to have a significant effect on enhancing sustainability results. A special policy intervention in cities in the transitional cluster can be useful to boost diversion-oriented reforms and remain operationally efficient. Besides, the alignment of municipal waste strategies with the core concepts of the circular economy can increase the level of resource recovery and decrease the environmental impact. Enforcement of better governance structures, better landfill management, and systematic assessment system of scenarios offer viable avenues towards the enhancement of sustainable waste management systems. The diversity that can be seen within cities means that the policy solutions should be context-sensitive and adaptive instead of standardized.

5. CONCLUSION

The viability and adaptability of municipal solid waste management systems to global cities through a composite mitigation potential Index (MPI). The results show that there is a significant heterogeneity of the system performance where landfill disposal is still the most popular mode of treatment in most of the municipalities. Cities with increased rates of diversion as indicated by recycling and composting, good coverage of collection and low open dumping scored considerably higher on MPI. These findings highlight the high importance of operational effectiveness and governance ability in accentuating mitigation-focused results. The analysis also reveals that the volume

of waste generation is not a sole determinant of sustainability performance but to the extent, institutional structures, diversion infrastructure, and controlled disposal practices are the determinants. The classification in clusters emphasizes different systems typologies, and in this regard, it is argued that different cities have different transition strategies leading to sustainable waste management. On the whole, the reinforcement of diversion efforts, the increase of collection services, and the reduction of uncontrolled dumping and enhancement of governance structures are the key elements of enhancing sustainability of municipal waste. This study is important in offering empirical evidence to the policy-driven shifts towards environmentally responsible and mitigation-oriented waste management systems by offering a comparative assessment of urban areas in the world, at the city level.

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