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# HOUSEHOLD SATISFACTION AND PERCEIVED SERVICE QUALITY IN MUNICIPAL SOLID WASTE MANAGEMENT SERVICES: EVIDENCE FROM SERVPERF FRAMEWORK

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## ABSTRACT

*This study examines municipal solid waste management by assessing service-related factors, household readiness, and levels of satisfaction that influence household participation in waste management initiatives. The increasing generation of solid waste in urban areas necessitates systematic collection, recycling, treatment, and disposal to maintain hygienic living environments for households. However, many urban local bodies face growing challenges in managing solid waste effectively due to rapid urban expansion, limited technical and financial capacity, and inadequate policy prioritisation. The empirical analysis is based on data collected from 216 households selected using a stratified random sampling method, ensuring representation across all 14 municipalities in the state of Goa, India. The research takes a quantitative, descriptive, and explanatory research design. Correlation and regression techniques were applied and CB-SEM using Amos to analyse the relationships between service performance attributes and household satisfaction. The results provide actionable insights for municipal authorities, highlighting the importance of enhancing operational efficiency, improving service responsiveness, and adopting more citizen-oriented management approaches. Strengthening these aspects can improve household satisfaction and promote the long-term sustainability of solid waste management systems.*

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**KEYWORDS:** Waste Management, Municipal Solid Waste, Service Quality, Sustainable Waste, Household Satisfaction.

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## 1. INTRODUCTION

The management of municipal solid waste (MSW) has turned out to be one of the most topical issues in the urban governance of the twenty-first century. Solid waste management (SWM) is a big problem for the environment all over the globe, but it's particularly bad in emerging nations where cities are growing quickly. The tremendous rise in garbage generation and the lack of safe ways to get rid of it, such as open dumping and uncontrolled burning, are major threats to public health, the environment, and the expansion of cities. Statistics show that the amount of municipal solid waste is growing faster than urbanization. Cities produce 1.3 billion tons of solid waste each year, or 1.2 kg per day, making solid waste management a major issue for both developed and developing countries (Damigos, 2016). The unparalleled rate of urbanization, industrialization and population explosion have dramatically escalated the amount of urban waste in developing countries and more specifically, in India. The Central Pollution Control Board (CPCB, 2023) writes that almost ten percent of the emissions produced by India are solid waste: almost 160,000 tonnes per day are produced, and only approximately 75-80% of the material is collected, and less than 25% are scientifically processed. This widening disparity between generational and managerial efficiency is the symptom of structural flaws in the systems of municipal service delivery and mechanism of public participation.

Sustainable urban development is not just a matter of operation, but a key aspect it involves proper waste management. Sustainable Cities and Communities are the focus of the United Nations sustainable development goal 11, in which effective waste management, participation of citizens, and environmental responsibility are fundamental pillars (UN-Habitat, 2022). In this regard, the sustainability of urban areas depends on the quality of the municipal waste management services to be a determinant. Once local services are seen as trustful, attentive, and accountable, the local people are inclined to display satisfaction and collaboration, which also promotes sustainable activities like source segregation and community recycling (Gupta and Sharma, 2023).

The quality of the service, which is traditionally viewed as the SERVPERF framework (Cronin and Taylor, 1992), gives a solid ground to determine the extent to which residents rate municipal waste management. The five dimensions of the model, such as tangibility, reliability, responsiveness, assurance, and empathy, represent a functional and relational

dimension of service delivery. In the municipal setting, tangibility means the physical appearance of waste bins, trucks, and uniforms; reliability entails regularities in the waste collections; responsiveness is how timely the municipal staff is when it comes to complaints; assurance describes how the citizens trust the municipal personnel; and empathy involves the personal attention paid to a resident (Ali and Singh, 2021). All dimensions have their individual contribution in service quality perception which also impacts satisfaction and the behavioural reaction.

User satisfaction is a crucial consequence of perceived service quality and a primary precursor of sustainable waste behaviour. Research has shown that households who are content with city services are more eager to undertake environmentally friendly activities like waste separation, composting, and payment of user fees (Yadav and Gupta, 2021). In contrast, the dissatisfaction can lead to non-cooperation, illegal dumping, and opposition to municipal reforms (Rahman and Bhatnagar, 2022). User satisfaction, therefore, serves as a behavioural intermediary between the technical performance of the municipalities and the ecological objectives of sustainability.

In spite of policy efforts such as the Swachh Bharat Mission and Smart Cities Mission, there is still a noticeable disparity in the quality of services in Indian municipalities. Poor waste collection, the absence of a waste separation system, the insufficient knowledge of citizens, and poor feedback systems are problems that many urban local bodies (ULBs) experience (Chaudhary and Joshi, 2021). Over the course of the last several decades, some locations in India, such as Goa, have seen a significant rise in the amount of trash that has been generated. This rise may be attributed to the rapid urbanization, economic expansion, and changing tastes of consumers. The Indian state of Goa is well-known for its breathtaking landscapes, highly developed civilisation, and flourishing tourist industry. Goa is conveniently located in India. In spite of this, the state is facing an increasing number of difficulties in effectively monitoring and controlling the use of its waste management resources. There is a strong correlation between the amount of satisfaction that households have with municipal solid waste management (MSWM) services and the subsequent adherence to waste legislation, as well as the lifetime of MSWM systems. The primary reason for this is that residential properties are the ones that are largely responsible for producing the great bulk of solid waste. It is possible that household satisfaction surveys might provide a wealth of information on the

efficiency, scope, and accountability of waste management services with regard to trash management. The dissemination of this knowledge is essential for influencing the perceptions of the general public and resolving other problems linked with trash management.

## 2. CONCEPT OF SERVICE QUALITY

It is essential to first define the words "service" and "quality" before gaining a grasp of the notion of "service quality." A service is defined as the act of one party carrying out an activity for another party in return for a valued thing; nevertheless, the original owner continues to maintain ownership of the useful object. According to Mahmood (2021), the basic objective of any service is to satisfactorily satisfy the requirements of its customers in order to guarantee their contentment. When it comes to selecting a provider, the most important aspect that customers should take into consideration is the quality of the service that a business provides. As stated by Kunszabó (2022), it is of utmost importance to define and assess services from the point of view of the consumer. Consumers are considered to be the key benefactors and the most discriminating judges of service quality; hence, the organization places a strong emphasis on ensuring that they are satisfied with the services that are supplied to them, as stated by Ismail (2021). Efficiency, effectiveness, and equality are the three "Es" that have an impact on the perceptions, feelings, and general well-being of persons when it comes to the quality of services that are provided by the private sector. As a direct result of this, the operational efficiency of the organization is negatively impacted. There is a direct correlation between the degree to which the process of collecting and disposing of solid waste satisfies the technical requirements that have been set and the efficacy of the process. The word "efficiency" is the one that is most often used when talking about the value that garbage disposal services provide to entities such as enterprises, government organizations, and contractors. According to Hemidat (2022), equity in social efficiency is defined by the cost and accessibility of solid waste disposal services across all demographic groups. This is the case regardless of the kind of demographic group.

## 3. APPLICATION OF THE SERVPERF MODEL

The SERVPERF model, introduced by Cronin and Taylor in 1992, provides a focused framework for assessing service quality based exclusively on customer perceptions of performance, eliminating the need for separate expectation measurements

found in earlier models like SERVQUAL. The conceptual framework of this study is grounded in the SERVPERF model, which conceptualizes service quality as a function of perceived service performance. The framework proposes that service quality is a multidimensional construct reflected through five key dimensions, namely, Reliability, Responsiveness, Assurance, Empathy, and Tangibles. Each dimension represents a distinct aspect of service delivery that collectively shapes users' overall evaluation of service performance.

Within the framework, the service quality dimensions are conceptualized as latent constructs measured through multiple observed indicators. Reliability refers to the ability of service providers to perform promised services dependably and accurately, while Responsiveness reflects the willingness and promptness of service personnel in addressing user needs and service-related requests (Parasuraman, Zeithaml, & Berry, 1988). Assurance represents the knowledge, competence, and credibility of service providers, as well as their ability to inspire trust and confidence among service users. Empathy captures the extent to which service providers offer individualized attention and demonstrate concern for users' specific needs. Tangibles pertain to the physical facilities, equipment, and other visible resources associated with service delivery (Cronin & Taylor, 1992; Parasuraman et al., 1988).

Empirical studies applying SERVPERF in MSW contexts have demonstrated that these dimensions significantly influence household satisfaction and perceptions of service quality. For instance, research conducted in urban municipal areas has shown that operational reliability and responsiveness are among the strongest predictors of resident satisfaction with waste collection services, underscoring the importance of performance-based evaluation in public service delivery (Afon, 2012; Gupta & Gupta, 2015). Similarly, studies in developing country contexts have utilised SERVPERF-based models to generate gaps in municipal waste services and to identify priority areas for policy intervention and providing improvement in the services (Yadav & Karmakar, 2020).

Overall, the application of SERVPERF in MSW studies enables municipalities to move beyond technical efficiency metrics and incorporate people-centric performance evaluation. By linking service performance dimensions directly to household perception and satisfaction, SERVPERF provides a robust framework for assessing and improving the quality and sustainability of municipal solid waste

management services

#### 4. REVIEW OF LITERATURE

Municipal solid waste management (MSWM) has now become a part of sustainable urban development, especially in developing economies where fast urbanization puts a lot of strain on the already existing infrastructure. As the World Bank (2022) notes, municipal waste will keep on growing at an annual rate of 3.4 billion tonnes by 2050, and South Asia is expected to contribute many of them because of the population density and the low recycling rates. In India, the poor segregations, absence of door-to-door collection, and poor treatment facilities have served as a setback to attaining sustainable cities (Mohan & Agarwal, 2022). Sustainable waste management thus necessitates both technical solutions as well as a multi-dimensional approach that entails the effective service provision and citizen involvement (Khatri and Ramesh, 2023).

The most significant actors in the process of keeping the environment and hygiene are the municipal bodies. They directly affect the perception of urban governance by citizens because of their level of consistency and citizen-focused waste services. The interdependence of the municipal service efficiency and sustainability outcomes is illustrated by studies by Dutta and Bose (2021) that show that the level of satisfaction, compliance, and recycling behaviour are higher in cities with participatory waste management programs.

Service quality has historically been studied in the context of the private sector, including banking, healthcare, and hospitality, although it has become common in the last 20 years as it is applied to the public sector. Service quality in public service delivery refers to how well citizens feel the service delivery has met their expectations as compared to the actual experience of the service (Lewis & Mitchell, 1990). Waste management, as one of the essentials of the city, must be subject to constant quality evaluation in order to maintain responsibility and credibility.

As opposed to the case with private services, researchers have highlighted that the quality of public services is characterized by involuntary consumption as citizens cannot easily change their providers and this increases the relevance of responsiveness, assurance, and empathy (Sureshchandar et al., 2002). The perceived quality of municipal operations in the waste management context entails promptness of the waste collection schedule, sufficiency of the infrastructure,

responsiveness to complaints, and ethical conduct of the sanitation employees (Tahir and Mahmood, 2021). Excellence in service delivery creates an institutional legitimacy and encourages the integration of the citizens, which are both important in ensuring sustainable municipal results (Nayak and Sethi, 2020).

Hassan and Karim (2021) discovered that regular collection of garbage and polite treatment of sanitation workers have a profound positive effect on the satisfaction level, which, in its turn, enhances the desire to become involved in the recycling process and cleaning up activities in the community. Equally, Rathi and Chatterjee (2023) found that satisfaction was key in determining environmental citizenship - citizens tend to be more sustainable in their actions when they have confidence in the capabilities of local waste authorities. Therefore, satisfaction is not simply a psychological concept but rather an effective performance indicator that connects the quality of service with the sustainability of the behaviour.

A significant amount of research has occurred in the waste management sector in Goa over the course of the years. This change has been mostly brought about by the increasing number of people, both short-term and long-term, who are visiting the state. These tasks include the collection of solid waste items, transportation of those materials, and disposal of those materials. Municipalities and local panchayats have been empowered to take on the burden of carrying out these responsibilities. The quality of service, on the other hand, differs from one site to another (Chowdhury, 2022). There are a variety of factors that have led to environmental difficulties, such as the poisoning of water and the loss of coastal habitats. These factors include poor trash collection, inadequate source segregation, bad transportation infrastructure, and an inadequate number of sanitary landfills. These issues have surfaced as a consequence of a particular set of events coming together. Panaji, Margao, and Vasco are examples of locations that are especially prone to experiencing these difficulties due to their high population density. The reason for this is that the existing waste treatment facilities are under increased demand as a direct result of the growing population at the moment. How satisfied households are with the services they get is a crucial measure of how effectively urban and rural local administrations are responding to the growing needs of waste management in the state. This is because the level of satisfaction among households is a vital indicator of how well they are responding.

In addition, it is vital for people to collaborate with one another in order for waste management systems to work in an efficient manner. Understanding on the part of the general population, desire to engage, and confidence in the local system are all essential aspects that considerably impact the effectiveness of government activities that encourage segregation, recycling, and correct disposal (Wang, 2020). Individuals will be unable to apply the suitable procedures for trash disposal if they have the perception that refuse collection services are unreliable, too difficult, or inadequate. There is a possibility that this will lead to a number of unfavourable outcomes, including unlawful disposal, pollution, and other environmental concerns of substantial importance. If lawmakers and local administrations had a more thorough understanding of the perspectives that inhabitants have on their communities, there is the possibility that they might be able to enhance the delivery of services. This might become a reality if there is a mix of improved planning, more engagement from the community, and technical developments.

It has been determined via a number of studies that taking into account the willingness to pay (WTP) is an essential component in the process of improving solid waste management. It is difficult to achieve effective management of solid waste for two primary reasons: first, people are hesitant to pay fees, and second, they do not appreciate the necessity of appropriate solid waste management. Both of these problems contribute to the difficulty of achieving effective management of solid waste. In light of the fact that insufficient management of solid waste may have significantly negative effects on public health (Almasi, 2019), it is of the utmost importance to have an understanding of the variables that motivate people to make investments in efficient management of solid waste. Metropolitan areas that are experiencing rapid population growth have an obligation to make the efficient management of their municipal solid waste a top priority. For this reason, they play a significant part in preserving the environment and ensuring the health and safety of all humans. Additionally, they play an important part in protecting the environment. During the course of their investigation of the elements that encourage people to spend finances on improved solid waste management, researchers have focused their attention on a variety of socioeconomic categories. In point of fact, these constituents are present.

Based on the overall discussion stated above, the following hypotheses were set for the study.

H1: The Reliability of municipal solid waste

management services has a significant impact on household satisfaction.

H2: The Responsiveness of the municipality significantly influences household satisfaction with solid waste management services.

H3: Assurance provided by municipal workers and authorities has a significant effect on household satisfaction.

H4: Empathy shown by municipal authorities significantly affects household satisfaction with solid waste management services.

H5: Tangible infrastructure and service facilities have a significant impact on household satisfaction with municipal solid waste management services.

## 5. PROBLEM STATEMENT

Management of the volume of waste created in relation to the quantity of garbage produced is becoming an increasingly difficult task for local governments to do in an efficient and environmentally responsible manner. This mismatch is the source of the problem, which is also the moment at which everything starts coming together. The fast rise of urban regions and their inhabitants have resulted in an increase in municipal solid trash that surpasses our existing capacity for management. This is due to the fact that our technical capabilities, financial resources, and physical infrastructure are all at their current levels. In this particular instance, this is the case since our present capabilities to handle such garbage are more than our existing capacity. In spite of the fact that Goa is widely recognized as one of the most forward-thinking and environmentally sensitive states in India, the state is now confronted with increasing difficulties in eradicating pollution. (Fadhullah, 2022).

Despite the fact that it is the responsibility of local and municipal authorities to provide these services, the citizens of Goa have voiced their dissatisfaction with the variable quality of solid waste management services that are provided across the state. This is putting extra strain on urban regions that are already under severe pressure, such as Panaji, Margao, and Vasco, which are witnessing population booms and an inflow of tourists (Donkor, 2018). The daily creation of garbage is increasing, which is putting more strain on these municipalities. Families, who are the major suppliers of garbage in urban contexts, are voicing displeasure at the same time. This dissatisfaction stems from issues over the efficiency of operations, public awareness, and the implementation of rules governing waste management. In accordance with Deus (2019), the use of domestic feedback is an essential method for

determining the effectiveness of the system. This is due to the fact that levels of satisfaction suggest that the services are dependable, conveniently available, and prompt in their replies.

The lack of understanding among persons about the ways in which socioeconomic variables influence the inclination of families to cooperate, their readiness to separate and recycle trash, and their level of satisfaction with the waste management services provided by the city is one of the most essential challenges. It is possible that policy measures will not be successful in accomplishing their goals if there is not a comprehensive understanding of public opinion and support for ecologically friendly waste management techniques (Abas 20, 2021). Individuals who do not have a feeling of connection to persons in their immediate area are less likely to make contributions, which leads to an increase in the amount of garbage that is accumulated and other environmental problems, such as the contamination of water, the spread of illnesses that are transmitted by insects, and the deterioration of ecosystems. In light of this, it is of the utmost importance to determine whether or not households are satisfied with the services that are being offered in order to identify areas of service deficiency and to direct modifications in the design and execution of MSWM.

As presented by Chatterjee (2019), the primary purpose of this investigation is to investigate the insufficient assessment of home satisfaction with relation to the municipal solid waste management services that are provided by Goa. This has now become realistically achievable as a result of the continually increasing amount of garbage that is being generated, as well as the issues that are already present within the service sector. Through the examination of persons from a variety of viewpoints, including their socioeconomic position and the variables that impact their involvement in waste management programs, the purpose of this research is to fill the information gap that currently exists. The possession of a complete awareness of these concerns is very necessary in order to establish policies that are supported by the community and that improve the overall efficacy of Goa's municipal solid waste management. These policies should boost operational efficiency, promote environmental sustainability, and improve overall effectiveness.

## 6. RESEARCH METHODOLOGY

The research takes a quantitative, descriptive, and explanatory research design. The descriptive part will record the current situation of the municipal

waste management services and customer satisfaction, whereas the explanatory part will test the causal relationships as hypothesized between the quality of the services and customer satisfaction. Primary information was obtained mainly through a well-structured questionnaire designed for household respondents.

To evaluate citizens' perceptions, awareness levels, and satisfaction with municipal solid waste services, the SERVPERF model was adopted as the guiding assessment tool. This research employs the SERVPERF framework by focusing exclusively on performance-based indicators, namely Reliability, Responsiveness, Assurance, Empathy, and Tangibles. Questionnaire items were constructed based on the identified explanatory variables, ensuring that each statement reflected a specific service attribute. These attributes included operational efficiency in waste collection and transport, access to recycling facilities, convenience of waste disposal systems, and the degree of community involvement in waste management programmes.

The study population was selected using a stratified random sampling technique to ensure representation from the households from 14 municipalities across the state of Goa. This method allowed for the inclusion of households from diverse socio-residential contexts, thereby improving the robustness of the dataset. Data was collected from a total of 216 households across the state of Goa. Responses obtained from the survey were coded and transformed into quantitative values to support empirical analysis. Statistical techniques such as correlation and regression analysis were applied to determine the influence of service performance dimensions on overall household satisfaction.

Secondary data sources comprised official government documents, municipal records, peer-reviewed academic literature, environmental assessment reports, and publications from organizations working in the field of waste management and sustainability. These sources were incorporated to contextualize the primary findings, assess policy alignment, and examine consistency with municipal objectives and national solid waste management regulations.

## 7. OBJECTIVES OF THE STUDY

To address the research problem and achieve the intended scope of analysis, this study defines a set of specific objectives focused on evaluating service quality and household satisfaction in municipal solid waste management.

1. To study the dimensions of service quality towards municipal solid waste management services in Goa.
2. To study the impact of service quality on household satisfaction with municipal solid waste management services in Goa.

## 8. DATA ANALYSIS

This section presents the procedures and techniques used to analyse the data collected for the study. The analysis was carried out to examine household perceptions of municipal solid waste management services and to test the proposed relationships among service quality dimensions and household satisfaction.

*Table 1: Demographic Analysis.*

Age	Frequency	Percent
18 - 25 years	21	9.70
26 - 35 years	50	23.10
36 - 45 years	45	20.80
46 - 55 years	57	26.40
56 - 65 years	30	13.90
Above 65 years	13	6.00
Gender	Frequency	Percent
Male	136	63.00
Female	80	37.00
Marital Status	Frequency	Percent
Single	77	35.60
Married	139	64.40
Education	Frequency	Percent
Uneducated	26	12.00
Below SSC	47	21.80
SSC	72	33.30
HSSC	55	25.50
Graduate	16	7.40
Annual Income	Frequency	Percent
Below 3,00,000	52	24.10
Rs. 3,00,00 - Rs. 5,00,000	77	35.60
Rs. 5,00,001 - Rs. 7,00,000	67	31.00
Rs. 7,00,001 - Rs. 10,00,000	20	9.30
Usage of services (in yrs)	Frequency	Percent
0 - 10 years	13	6.00
11 - 20 years	45	20.80
21 - 30 years	66	30.60
More than 30 years	92	42.60
<b>Total</b>	<b>216</b>	<b>100.00</b>

According to the demographic make-up of the respondents, the group seems to be highly developed and economically engaged. The bulk of respondents are between the ages of 46 to 55, followed by those between the ages of 26 to 35 and 36 to 45 respectively. After performing the analysis, it was shown that families of middle age were the most common respondents.

Marital status data reveal that the majority of people who participated in the poll are found to be married. As far as gender distribution is concerned, there are more women participants in the survey than men the reason can be women manage household as compared to men. The stability of the families is what decides whether or not they are able to utilize municipal services. As a result of the fact

that the majority of people create their educational experiences throughout their time in high school and college, students who participated in the poll do not have a comprehensive grasp of the problem, and graduation rates are low. It seems that the majority of households falls under the income range of 300,000 to 700,000 rupees who are basically considered to be middle-income families.

A great number of individuals are financially secure and depend on the employment provided by the government. The survey also indicates that the majority of respondents had used municipal services for more than thirty years. They may provide valuable feedback on the efficiency of municipal solid waste management services.

**Table 2: Correlation Analysis.**

Correlations	Reliability	Responsiveness	Assurance	Empathy	Tangibles	Satisfaction with the Municipal Solid Waste Management Services
Reliability	1	.867**	.846**	.922**	.793**	.839**
Responsiveness	.867**	1	.830**	.841**	.818**	.837**
Assurance	.846**	.830**	1	.825**	.813**	.817**
Empathy	.922**	.841**	.825**	1	.805**	.804**
Tangibles	.793**	.818**	.813**	.805**	1	.751**
Satisfaction with the Municipal Solid Waste Management Services	.839**	.837**	.817**	.804**	.751**	1

According to the findings of a statistical study, there is a positive connection between all service quality metrics and the level of household satisfaction with the solid waste management services provided by the urban local bodies. On a statistical level of 1%, every relationship is important. There is a connection between reliability and enjoyment, as we are aware. This demonstrates that having a dependable garbage collection service would make living at home better. Certainty and reaction are inextricably tied to the experience of pleasure. The speed with which services are provided, complaints are addressed, and the degree

to which the community trusts municipal workers all have a significant influence on the image of the city. As a result of the close connection between pleasure and empathy, it is essential that services and feedback systems be centred on the households. On the other hand, tangibles demonstrate a very small but significant beneficial connection, highlighting the importance of infrastructure and recreational facilities. When the municipal solid waste management services in Goa are strengthened in every way, the level of satisfaction experienced by each household using the services increases.

**Table 3: Regression Analysis.**

Model	Sum of Squares	df	Mean Square	F	p value
Regression	346.13	5	69.226	139.984	0.00
Residual	103.851	210	0.495		
Total	449.981	215			
Coefficients	B	Std. Error	Beta	t	p value
(Constant)	0.211	0.137		1.535	0.13
Reliability	0.302	0.097	0.307	3.123	0.00
Responsiveness	0.345	0.079	0.329	4.352	0.00
Assurance	0.275	0.077	0.253	3.561	0.00
Empathy	0.023	0.09	0.024	0.259	0.80
Tangibles	0.015	0.069	0.014	0.214	0.83
a Dependent Variable: Satisfaction with the Municipal Solid Waste Management Services					

Shown by the high F value of 139.984 and the p value of 0.00 at the same time as per the analysis. It is clear from the high value of F, in a good way, the independent variables describe the level of satisfaction that Goan households have with MSWM services. A significant proportion of the difference in household satisfaction can be attributed to the selected service quality assessments, as shown by the regression model, which demonstrates that these measurements are adequate. It's possible that life enjoyment might be inferred from dependability, responsiveness, and assurance. For every component, it was noted that the regression coefficients were positive, and the p-values were less than 0.01. The most influential factors on individuals

are responsiveness, reliability, and certainty. According to Eshete (2023), the homeowners are most impacted by the reliability of rubbish collection, the faith that they have in municipal officials, and the quality of the service. On the other hand, the fact that the beta coefficients are low and the p-values are climbing over the significance threshold demonstrates that the physical and empathy-based characteristics do not have a significant influence on the level of pleasure experienced by households. According to Guo (2021), this demonstrates that human interaction, feedback mechanisms, service charges, and physical infrastructure do not have an independent impact on customer satisfaction, despite the fact that they are all quite important. As a result

of the fact that the constant does not have a statistically significant value, it is probable that the observed satisfaction is due to the characteristics that were included rather than the baseline factors that were absent. According to the results of the regression study that validated the structural model and the correlation analysis, functional efficiency and service assurance have a significant impact on the level of satisfaction that households have with Goa's municipal solid waste management services.

**Table 4: Reliability Analysis.**

Variables	No. of Items	Cronbach Alpha
Reliability	6	0.823
Responsiveness	6	0.766
Assurance	6	0.809
Empathy	7	0.811
Tangibles	7	0.782
Satisfaction with the Municipal Solid Waste Management Services	5	0.864

Based on the findings of the reliability study, every single research construct has an internal consistency that ranges from very excellent to remarkable. As a result, the scales may be relied upon to accurately quantify the level of household satisfaction with the municipal solid waste management services provided by the municipalities in Goa. The alphas of independent variables range from 0.766 to 0.823 according to Cronbach's index. According to Hou (2020), this demonstrates a very high level of consistency across a variety of variables, including responsiveness, certainty, empathy, and tangibles. The dependent variable that measures the level of satisfaction with the services provided by municipal solid waste management has the highest Cronbach's alpha value, which is 0.864. All of the signals provide evidence of the dependability and consistency of the dependent variable. Based on the data, it can be concluded that the questions on the questionnaire are reasonable and most likely reflect the viewpoints of the respondents. Both statistical analysis and interpretation may benefit greatly from their use.

**Table 5: Chi-square 1.**

Chi-Square Tests	Value	df	p value
Pearson Chi-Square	259.459a	16	0.00
Likelihood Ratio	289.235	16	0.00

The results of the chi-square test may be used to assess whether or not there is a significant relationship between the variables. Sixteen degrees of freedom and a value of 259.459 are associated with the Pearson Chi-square statistic. This link demonstrates that the correlation is not a coincidence

and shows a genuine relationship between the category variables that are being investigated. This conclusion is supported by the chi-square value of 289.235, even when the significance level is set at 1%. The results indicate that there is a direct connection between people's views and their reactions to the services provided by municipal solid waste management. As a result of this, we may draw the conclusion that the qualities that have been mentioned are significant in determining the level of pleasure that Goans have with these services.

**Table 6: Chi-square 2.**

Chi-Square Tests	Value	df	p value
Pearson Chi-Square	256.769a	16	0.00
Likelihood Ratio	294.491	16	0.00

The results of the chi-square test indicate that there is a significant connection between the variables. This is proved by the fact that there are 16 degrees of freedom, a p-value of 0.00, and a Pearson Chi-square value of 256.769. The data demonstrates that there is a significant difference in the responses to the categories, which suggests that the link is not a coincidence.

The result of 294.491 for the chi-square statistic is significant at 1%, which indicates that there is a substantial correlation. Critical service-related features have a significant impact on the level of satisfaction that Goa households have with their municipal solid waste management (MSWM) service, according to the statistics, both individually and collectively.

**Table 7: Chi-square 3.**

Chi-Square Tests	Value	df	p value
Pearson Chi-Square	237.047a	16	0.00
Likelihood Ratio	259.986	16	0.00

The third chi-square test revealed that there was a statistically significant connection between the variables. There is a p-value of 0.00, and the Pearson Chi-square value is 237.047. Apart from that, there are sixteen other degrees of freedom. This demonstrates that the association between the category variables is a reliable one. The chi-square value of 259.986 is significant at the one percent level, indicating that there is concordance across a number of statistical criteria.

This conclusion is corroborated by this value. The data reveal that the public's satisfaction with the management of municipal solid waste in Goa is strongly associated with the criteria for service excellence.

**Table 8: Chi-square 4.**

Chi-Square Tests	Value	df	p value
Pearson Chi-Square	244.826a	16	0.00
Likelihood Ratio	291.921	16	0.00

As can be seen in Table 8, the fourth chi-square analysis demonstrates that there is a significant statistical connection between the variables. The Pearson Chi-square test yields a p-value of 0.00, which stands for 244.826. 15 degrees of freedom are available. Not a coincidence, this demonstrates that there is a strong connection between the category variables. At a significance level of 1%, the chi-square value of 291.921 provides evidence that a robust and persistent correlation exists. According to the findings, there is a significant connection between the level of pleasure that Goan homeowners have with MSWM services and the quality of life in the state.

**Table 9: Chi-square 5**

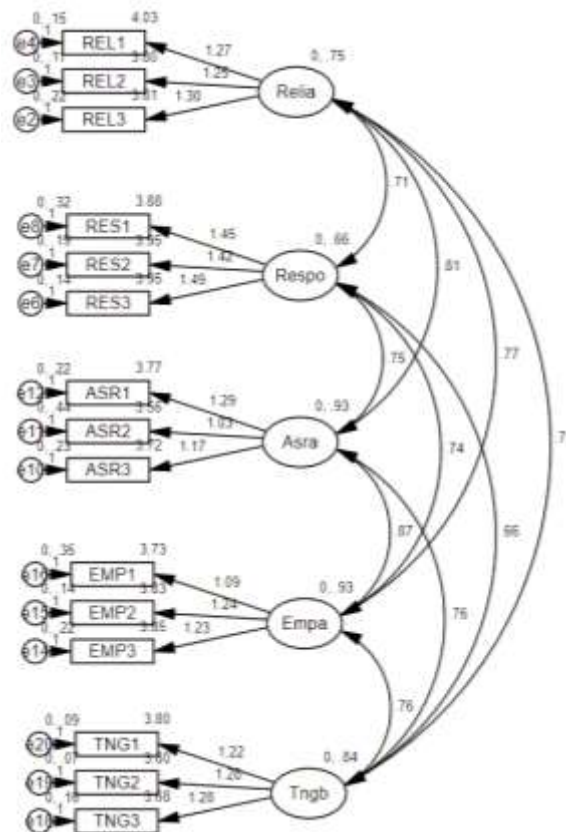
Chi-Square Tests	Value	df	p value
Pearson Chi-Square	283.610a	16	0.00
Likelihood Ratio	294.644	16	0.00

Lastly, the fifth chi-square analysis, which is shown in Table 9, demonstrates that there is a statistically significant correlation between the

variables. This hypothesis is supported by the fact that there are 16 degrees of freedom, a p-value of 0.00, and a Pearson Chi-square value of 283.610. In addition to demonstrating that the relationship is genuine, this argument demonstrates that the responses are not scattered among categories in a random fashion. It is clear that there is a substantial correlation since the chi-square score is 294.644, which is statistically significant at 1%. The findings of the research indicate that parameters related to service quality have a significant impact on the level of satisfaction that households in Goa have with SWM services.

**9. STRUCTURAL EQUATION MODEL**

Structural Equation Modelling (SEM) is a comprehensive multivariate analytical technique that enables the simultaneous examination of complex relationships among observed variables and latent constructs. SEM integrates features of factor analysis and multiple regression, allowing researchers to test both measurement models, which specify the relationships between latent constructs and their indicators, and structural models, which represent hypothesised causal relationships among latent variables (Bollen, 1989).



**Figure 1: Visual Representation of the Construct Relationship.**

SEM has been widely applied in service quality and customer satisfaction research, particularly in studies employing models such as SERVPERF, where latent dimensions are measured through multiple indicators (Kline, 2016). Software packages such as AMOS facilitate SEM analysis by providing user-

friendly graphical interfaces and maximum likelihood estimation procedures, enabling researchers to test theoretical models with both observed and latent variables. The following is the model obtained from the study.

**Table 10: Path Estimates of the Measurement Model.**

	Path		Estimate	S.E.	C.R.	P	Results
REL3	<---	Reliability	1.298	0.078	16.64	0.00	Supported
REL2	<---	Reliability	1.247	0.075	16.63	0.00	Supported
REL1	<---	Reliability	1.27	0.08	15.88	0.00	Supported
RES3	<---	Responsiveness	1.493	0.085	17.56	0.00	Supported
RES2	<---	Responsiveness	1.417	0.082	17.28	0.00	Supported
RES1	<---	Responsiveness	1.45	0.088	16.48	0.00	Supported
ASR3	<---	Assurance	1.169	0.072	16.24	0.00	Supported
ASR2	<---	Assurance	1.03	0.068	15.15	0.00	Supported
ASR1	<---	Assurance	1.293	0.079	16.37	0.00	Supported
EMP3	<---	Empathy	1.23	0.076	16.18	0.00	Supported
EMP2	<---	Empathy	1.237	0.077	16.06	0.00	Supported
EMP1	<---	Empathy	1.09	0.07	15.57	0.00	Supported
TNG3	<---	Tangibles	1.28	0.081	15.8	0.00	Supported
TNG2	<---	Tangibles	1.275	0.08	15.94	0.00	Supported
TNG1	<---	Tangibles	1.222	0.074	16.51	0.00	Supported

The structural equation model enumerates how five service quality dimensions, reliability, responsiveness, assurance, empathy, and tangibles, affect overall satisfaction with municipal solid waste management services (Li, 2021). The model shows how people in various homes think about different parts of service delivery and how much each part affects their overall happiness. According to the findings of the structural equation modelling (CB-SEM) investigation, a SERVPERF-based measurement paradigm is recommended. A high level of construct validity was achieved since all of the observable indicators loaded positively on their respective latent variables. Concepts such as responsiveness, certainty, empathy, and tangibles are examples of dormant principles. The MSWM service quality may be determined by the indicator item standardised factor loadings that are high. There is a considerable connection between the hidden variables of trustworthiness, confidence, and compassionate behaviour. This suggests that the evaluations of service quality made by families are connected. According to the correlation values, increasing the quality of one service standard would almost certainly result in a rise in other standards. According to the findings of the SEM analysis, SERVPERF variables correctly represent the perspectives of households. When taken together, the statistics provide a thorough analysis of the services that Goa provides for the management of solid waste.

The results of the measurement model indicate

that all observed indicators load significantly onto their respective latent constructs. The estimated regression weights for the items measuring Reliability, Responsiveness, Assurance, Empathy, and Tangibles are positive and statistically significant at the 1 per cent level ( $p < 0.001$ ), demonstrating strong relationships between the latent variables and their corresponding indicators. This is indicated by estimates that are too optimistic, key ratios that fall outside of the acceptable range, and p-values that are equal to zero. The positive and significant factor loadings provide empirical support for all proposed hypotheses, thereby confirming the adequacy of the SERVPERF dimensions in explaining perceived service quality in municipal solid waste management services.

All factor loadings exceed the recommended threshold, indicating satisfactory item reliability. The critical ratio (C.R.) values for all paths are substantially higher than the minimum acceptable value of 1.96, confirming the statistical significance of the parameter estimates. In particular, indicators associated with Responsiveness exhibit relatively higher regression estimates, suggesting that responsiveness-related attributes play a prominent role in shaping perceived service quality. In light of the higher estimations for responsiveness attributes, it is clear that families value promptness and service response. These characteristics are often displayed: tangibles, assurance, empathy, and reliability. The findings provide evidence that these criteria should

be used to assess the level of satisfaction that residential customers have with the services provided by municipal solid waste management and to illustrate the correctness of the model.

## 10. DISCUSSION

Based on demographic data, a structural model, reliability, correlation, regression, chi-square, and statistical tests, this study aims to determine the level of satisfaction that households in Goa have with municipal solid waste management services. Details on house happiness are revealed by this study. According to the results (Khairul Akter, 2022), the key functional and operational waste management components of the service have a substantial influence on the level of satisfaction experienced by the homeowner under the municipalities using the waste services. The demographic profile reveals that the majority of people who participated in the survey are employed, have access to education, and make optimum use of municipal services. When they provide their counsel, it seems more credible. Ismail (2023) asserts that families in Goa have reasonable expectations about accountability, transparency, and the quality of services provided, taking into consideration the socioeconomic situation in the state. The extent to which they are satisfied is indicative of the success of the municipality.

It was shown that the dependability of the study's evaluation instruments was demonstrated by the fact that Cronbach's alpha values for all constructs varied from acceptable to high. This internal consistency, according to Hassan (2018), will boost future research by guaranteeing that correlations accurately reflect the beliefs of households. Additionally, it guarantees that the links are representative of the sentiments of the family. The public's perception of the city's solid waste management is influenced by factors such as reliability, responsiveness, certainty, empathy, tangibles, and satisfaction, all of which include the factors that impact service quality. It is important to keep in mind that correlation does not necessarily imply causation; regression and structural equation modelling are essential for understanding the level of customer satisfaction (Abubakar 2022).

The regression analysis revealed that dependability, responsiveness, and certainty had the greatest impact on household satisfaction. It has been shown that tangible traits and empathy do not independently have a statistically significant impact when these characteristics have been controlled for. According to the findings of this poll, customers place a higher value on dependable service, prompt waste resolution, and the trust of municipal officials

than they do on customised care and physical infrastructure (Adefris, 2023). Additionally, valued is the capacity to have faith in the staff of the municipality. Although the amount of trash in Goa varies due to the presence of urban residents and visitors, it seems that service prices, feedback mechanisms, and infrastructure visibility are less important than the ability to collect rubbish in a timely and efficient manner (Khan, 2022). It has been shown using the structural equation model that the most important criteria for satisfaction are responsiveness, reliability, and assurance. Both trust and efficiency are essential components in the delivery of public services.

Chi-square studies consistently demonstrate that the quality of service has an effect on the level of satisfaction experienced by households. Different categories of respondents had quite different points of view on the services that are provided for rubbish management. In his study for the year 2020, Masud discovered that the utilization of urban services is highly tied to pleasure rather than being random. This demonstrates the reliability of the data via the significance of various chi-square tests. This demonstrates that measures of service quality may be used to assess the contentment of customers.

A significant influence is made on urban policy and development by the absence of characteristics that are both realistic and empathic. It has been shown by research that addressing issues with service delivery prior to investing in infrastructure and encouraging public contact may lead to an improvement in individual satisfaction (Puche-Regaliza, 2021). The family does not seem to be bothered by high-quality efforts and considerable infrastructure. Efficiency, safety, and speed in the handling of trash are all markers of municipal performance measurements. According to the service quality theory, relational and physical quality should come after functional excellence in order to increase the level of satisfaction for public service recipients.

## 11. CONCLUSION

This research makes a contribution to the existing body of literature by demonstrating that the effectiveness of Goa's municipal solid waste management services, rather than the characteristics of those services, is what determines public satisfaction. There is a possibility that towns may enhance the dependability of their services, respond more quickly to complaints from the general public, train their employees, and hold them accountable. When these core problems are addressed, it is possible that public confidence in the government,

community engagement, and the long-term viability of Goa's solid waste management systems would all strengthen.

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