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A Study on Solid Waste Management under UNEP and its Implications in Tamil Nadu

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Abstract: *Across India, existing systems for the collection, transportation and disposal of solid waste are mired in chaos. The problem is more acute in the urban areas, where rapidly growing populations generate increasingly larger quantities of solid waste that urban local bodies (ULBs) are unable to manage effectively. Solid waste management (SWM) has emerged as one of the most massive development challenges in urban India. Numerous studies indicate that the unsafe disposal of waste generates dangerous gases and leachates, due to microbial decomposition, climate conditions, refuse characteristics and land-filling operations. According to the 12th Schedule of the 74th Constitution Amendment Act of 1992, urban local bodies (ULBs) are responsible for keeping cities and towns clean. Many Indian ULBs do receive government assistance, almost all of them continue to be financially fragile. India has already exhausted all available landfill sites, and the concerned ULBs do not have resources to acquire new land. The data was collected within Chennai by adopting the convenient sampling method and the sample size is 200. The used for the study is the structured questionnaire. The independent variable included in the study is age, gender, educational qualification, and occupation .Among the total of respondents 18% were male and 49 % were female . The objectives of the study are to study about the various solid waste management techniques , to know about the public opinion on various solid waste management missions enforced by the Government , to educate people on the concept of solid waste management and segregation of waste , to study the various reasons behind the hardships faced to enforce the idea of waste segregation . The main aim of the research is to analyze the efficiency of various solid waste management schemes and how it is implemented and to see how many individuals are aware of the concept of solid waste management.*

Keywords: solid waste management, disposal , plastic , segregation

I. INTRODUCTION

The natural reserves of the Planet are not enough now so suppon human demands and economic activities Global warming has demonstrated the risk of overstepping the ability of the Planet to consume our wide goods. However, the implications of increasing the sufficient availability of vital materials and the degree to which we have already advanced in this chain are not well known, and are instead viewed with an economic and manufacturing perspective. The ability of the Planet to consume our waste is a significant factor that drives the development of waste management technologies .Land-filling is perhaps the oldest method in coordinated waste management. Until the 19, land filling was practiced as an unceremonious waste disposal in any convenient location without taking into account health. welfare, environmental conservation or cost efficiency. Yet now the situation has shifted not because of the understanding and value of the handling of waste, but also other manners .Availability of landfill capacity in urban environments is becoming frightening and a very bad problem. The problem causes political incentive to redirect waste to any other methods for structure.Solid waste management is a term that refers to the storage and disposal process for solid wastes. This also provides recycled options for things that don't belong to trash or waste. As long as humans have lived in villages and rural areas, the problem has been trash or solid waste. The solid waste management used in solid, liquid, and gaseous waste disposal .It is known as a realistic method of disposal of certain toxic waste products (such as

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medical organic waste), cineration is a controversial waste disposal process, owing to concerns including gaseous pollutant pollution. The most significant justification for recycling waste is to protect the environment and public health. Garbage and waste can pollute the air and water. It is also known that decaying garbage releases poisonous gasses that interact with the atmospheric air and can cause respiratory issues in people. Categorization and comparison of solid industrial waste based on the thermo-chemical properties. Municipal solid waste (MSW) has usually been divided into six categories: food residues, wood waste, palp, sextiles plastics, and rubber. Products may be further divided into subgroups within each grouping .Improper management of solid waste poses risks to the environment and public health. This paper dissects the state of solid waste management in Tamil Nadu , and offers recommendations to solve the myriad challenges. Various legislations have been passed for regulating the manner of waste disposal. The Ministry of Environment, Forest and Climate Change (MoEFCC) and the Ministry of Housing and Urban Affairs (MoHUA) have together rolled out policies and programmes to address these issues. However, most of these have failed to achieve their objectives due to a lack of clarity and awareness amongst the stakeholders, and poor enforcement by the regulators.A "green culture" needs to be developed, in which each individual contributes to waste minimization by reducing, reusing and segregating waste. The Clean India Campaign has been launched in the city by the Municipal Corporation, involving resident welfare associations, market associations, hotel and restaurant associations, traders' associations, industry associations in the sanitation campaign, and campaigns in schools, in colleges and with the public at large. But the corporation should ensure that this participation is not limited to the duration of the Clean India Campaign.

OBJECTIVES

- To study about the various solid waste management techniques
- To know about the public opinion on various solid waste management missions enforced by the Government
- To educate people on the concept of solid waste management and segregation of waste
- To study the various reasons behind the hardships faced to enforce the idea of waste segregation

II. REVIEW OF LITERATURE

Prof. Sudha Goel (2018) There is a large volume of literature on the different aspects of SWM in India. For example, in her paper, "Municipal Solid Waste Management in India: A Critical Review," Pm Suggests that regular monitoring and data collection are essential for designing an efficient SWM system. **Anand (2019)** To improve SWM practices in the country, Goel recommends establishing a centralized database on ULB experiences in SWM, and using modern tools and technology such as remote sensing, GIS and mathematics optimization.**Rajkumar Joshi and Sirajuddin Ahmediv (2016)** argue that lack of awareness and technical knowledge, inadequate funding, and ineffective implementation of laws and policies are the reasons for the failure of Municipal Solid Waste Management (MSWM).**Som Dutta Banerjee (2017)** for his part, highlights the challenge of infrastructure. Banerjee argues that private participation in SWM must be encouraged to ease the burden on the public coffers.**Chavan and Zambarevi (2017)** have also observed that the essential inadequacies of SWM in India are in treatment methods and techniques. In his paper, "Sustainable Solid Waste Management in India," **Annepuvi (2012)** explores ways to reduce the quantity of solid waste. In Mumbai alone, the open burning of solid wastes and landfill fires emit nearly 20,000 tonnes per year of air pollutants on land. Amongst other ways to repurpose waste, such as by creating fly-ash bricks, Annepu recommends the integration of informal recycling into the formal system by training and employing waste-pickers for the door-to-door collection of waste, and allowing them to sell the recyclables they collect.**Gopal Krishna (2020)** in his paper, "Why Urban Waste Continues to Follow the Path of Least Resistance," argues that SWM cannot improve unless institutional and financial issues are addressed. Krishna criticizes the 2016 SWM Rules, framed by the MoEFCC, Government of India, stating that they fail to make any provision against the NIMBY syndrome or provide a mechanism for the implementation of Extended Producer Responsibility . The paper suggests that the rules should incentivise systems where producers minimize waste and take responsibility for the reuse and/or recycling of used products. **Shyamala Mani and Satpal Singh (2018)** in their paper "Sustainable Municipal Solid Waste Management in India: A Policy Agenda suggest that the policy agenda for sustainable SWM needs to drive behavioral change amongst

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citizens, elected representatives and decision-makers to minimize waste and maximize reuse and recycling.**Karthikeyan et al (2014)** There is also the study of the SWM system in urban India by Karthykeyan et al.x It finds the failure of ULBs in providing proper SWM service and the general lack of awareness to be the main reasons for poor waste management in India. Thus, the rationale for encouraging private-sector participation (PSP) is to gain efficiency, expertise and technology, not finance. If the private sector provides higher standards of waste management service at the same cost, or equivalent service at a lower cost, compared to ULBs, then PSP should be leveraged for private-sector efficiency and to ameliorate the methods of waste management by ULBs.**Mazumdarxi (2009)** "Transforming Urban Waste Management in India," Mazumdarxi outlines the various tools to overcome the problems of urban waste management. The study recommends that urban waste management be streamlined using technology, and that the system of SWM be made techno-economically viable and sustainable.**Miriam (2019)** The author of this paper, in a previous one, "Decentralised Solid Waste Management in India: A Perspective on Technological Options proposed a decentralized approach to SWM, along with appropriate technologies to solve the problems of processing and treating waste.**Anderson et al (2016)** Current studies have demonstrated that the presence of micro-plastic causes disturbances in the aqua life (primarily the food chain) and ultimately leading to global warming. Consequently, reported as the primary reason for the extinction of various indigenous species on the planet Earth .**United Nations (1992)** As per the report published in UNDP, the world produces around 300 million tonnes of plastic waste, only 9% of the generated plastic waste is recycled, ~14% collected for recycling while the rest reaches the ocean annually **Ngwabie et al (2019)** The citizens are not much aware of waste management related issues, and their careless attitude towards their waste creates challenges for the municipalities. The potential threat about MSW at landfill sites which emit harmful greenhouse gasses eventually leading towards environmental pollution subsequently contaminates the groundwater with the formation of leachates .**Annepu (2012)** Nevertheless, a few cities in India such as Surat, Alleppey, Bobbili, Panji, and Pune have showcased the positive intent towards SWM strategies selection which have been discussed in the present study. It has also been observed that the municipalities are focusing mainly on the collection part, but advance treatment is missing. However, this also needs further up-gradation to eliminate the MSWM issue . **Singh (2020)** Eventually, there are prior issues of MSWM in India that have not been addressed efficiently so far for the treatment of waste. Hence this paper also discusses the missing interlinks and loopholes. The situation has become severe for most of the municipal authorities as a proper assessment of the SWM is not done before suggesting and implementing the strategies **S. Kumar et al (2017)** In India, approximately 143,449 MT of MSW is being generated daily, out of which around 111,000 Metric tonnes are collected, and about 35,602 Metric tonnes are processed . City wise generation of waste shows significant variation in the waste per capita/day generation at an exponential rate strictly (0.24 to 0.85) from the year 2001 to 2018 presented by CPCB in their annual report 2018. Which is likely to increase shortly at a rapid rate **Aayog (2018)** The young towering mountains, magnificent landscapes, expedition areas, and religious spots all across the IHR allures visitors and pilgrims throughout the world, receiving a million tourists yearly . Over the last few decades, footfall of about 100 tourism in IHR has become one of India's fastest-growing economic sectors. Undoubtedly, it is expected to grow at an average annual rate of 7.9% from 2013 million by 2025 to 2023 and is projected to witness a rise in tourists to 240 Kuniyal **(2005)** But the downside to this economic turnaround for the IHR is the unmonitored activities resulting in unchecked solid waste generation. Already, tourism-related activities like million tonnes per year trekking, expeditions, etc., generate about 8.395 (MT/Y) of solid waste, causing a concern toward the ecologically sensitive areas **Puri et al (2020)** The waste generated is inconsistent throughout the year as tourist inflow varies in summers and winters, which burdens the otherwise afflicted waste collection, transportation, treatment, and disposal facilities. The waste generated by trekkers and campers is left behind in such delicate locations due to a lack of waste management education and awareness program and the absence of any formal management system for the appropriate collection of solid waste.

III. MATERIALS AND METHODS

The study was based on an empirical method of research. The data was collected within Chennai by adopting the convenient sampling method and the sample size is 200. The used for the study is the structured questionnaire. The independent variable included in the study is age, gender, educational qualification, occupation, marital status . The

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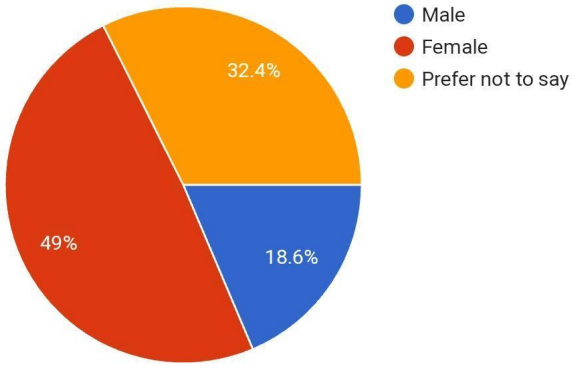
dependent variables were the public opinion on various solid waste management missions enforced by the Government studying and the various reasons behind the hardships faced to enforce the idea of waste segregation . The tools used for analysis were pie charts and bar charts.

IV. ANALYSIS

Figure 1



Legend :
Figure 1 represents The sample population
of the percentage of respondents to the questionnaire based on gender

Figure 2

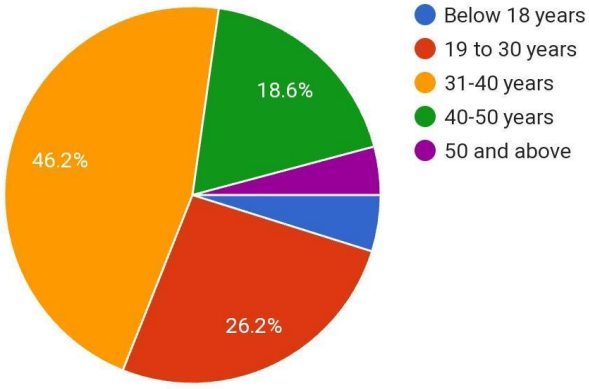


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Figure 2 represents The sample population
of the percentage of respondents to the questionnaire based on age

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Figure 3

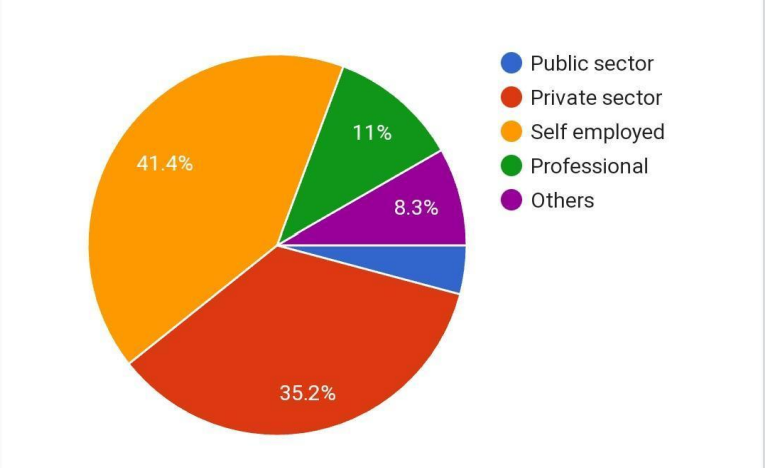

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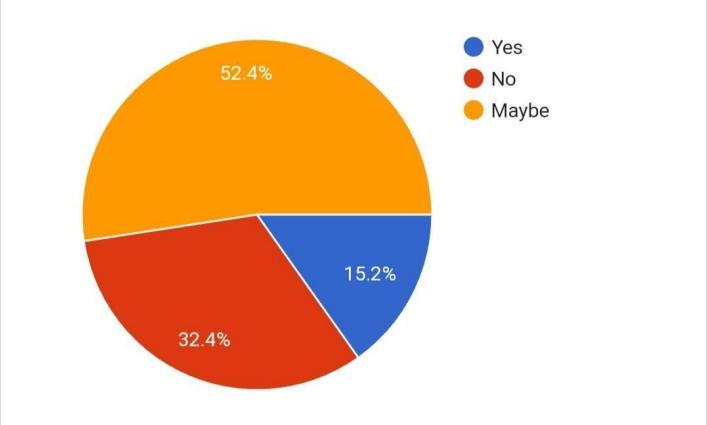
Figure 3 represents The sample population
of the percentage of respondents to the questionnaire based on their employment

Figure 4



Legend :
Figure 4 represents The sample population
of the percentage of respondents to the question on whether they segregate the waste based on their degrading efficiency in their household ?

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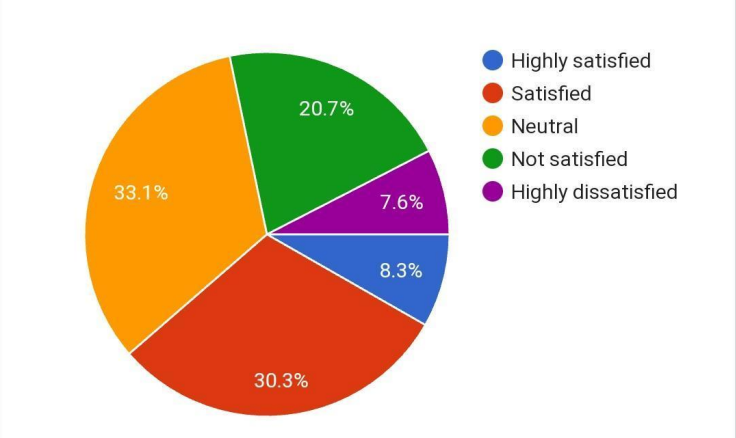
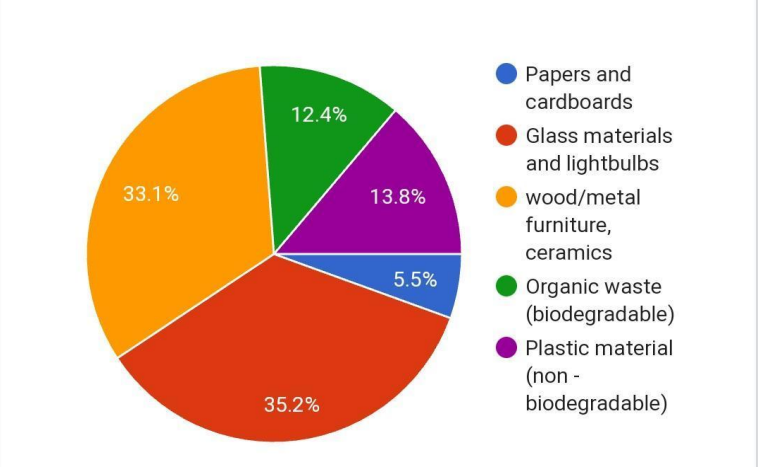
Figure 5



Legend :
Figure 5 represents The sample population
of the percentage of respondents to the question on whether they are satisfied with the disposal facilities and arrangements provided by the solid waste management department ?

Figure 6



Legend :
Figure 6 represents The sample population
of the percentage of respondents to the question "Among the various listed waste select the one you find hard to dispose"

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Figure 7

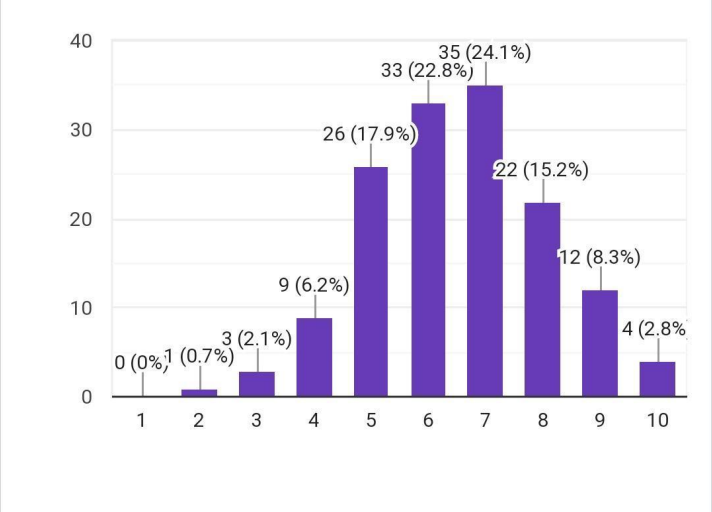

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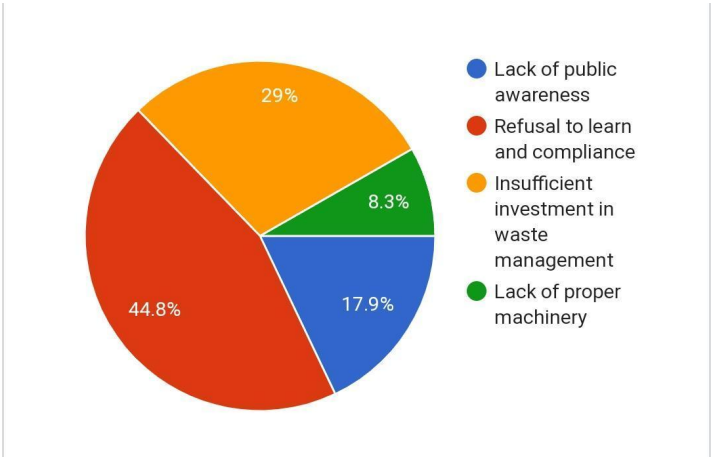
Figure 7 represents The sample population of the percentage of respondents to the satisfactory level of public on a scale of 1 to 10 on the implications and developments brought by the Swachh Bharat Mission in solid waste management.

Figure 8



Legend :

Figure 8 represents The sample population of the percentage of respondents to the question that among the various listed reasons, what do you think is the reason behind people not following solid waste management guidelines for disposing waste.

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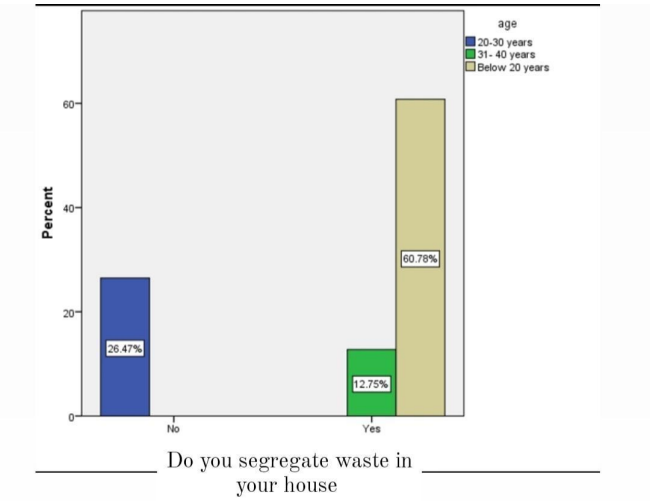
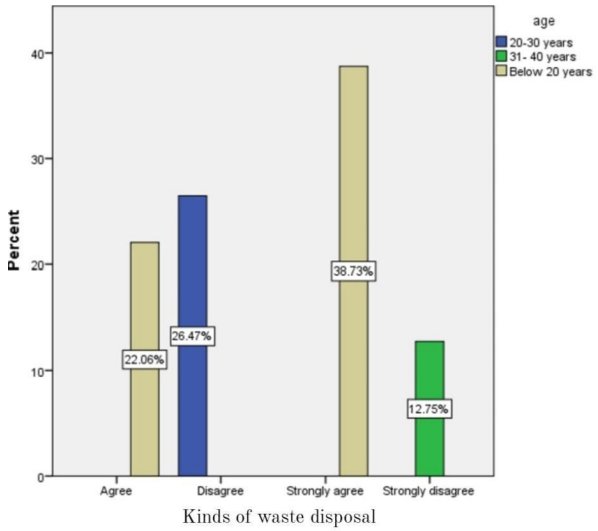
Figure 9



Legend :

Figure 9 represents The sample population of the percentage of respondents to the question based on their age that whether they segregate waste in their house ?

Figure 10



Legend :

Figure 10 represents The sample population of the percentage of respondents to the question in correlation with their age that the waste disposal techniques are not very easy to implement in everyday life

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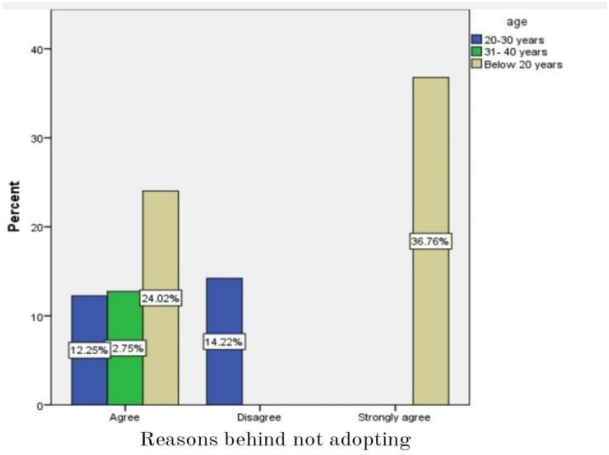
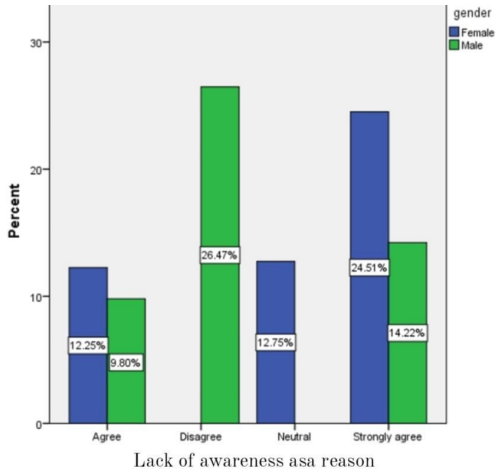
Figure 11



Legend :

Figure 11 represents The sample population of the percentage of respondents to the various reasons behind as to why they are not able to segregate waste and dispose in correlation with their age

Figure 12



Legend :

Figure 12 represents The sample population of the percentage of respondents to the option that lack of awareness among the public as a reason for the failure to adopt the disposing mechanism .

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Figure 13

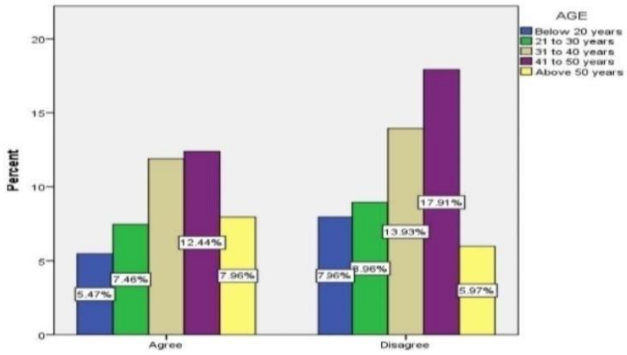

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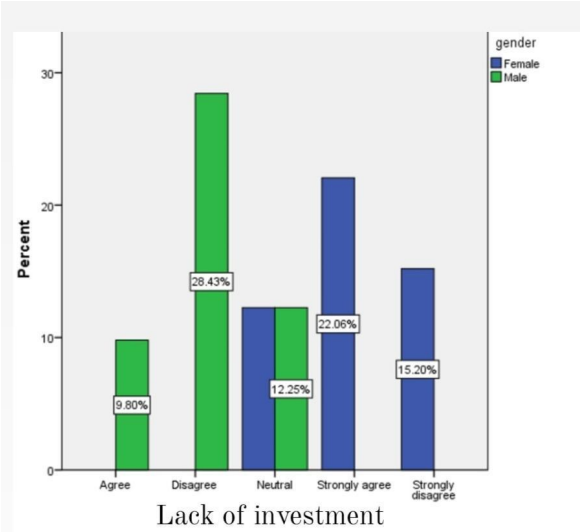
Figure 13 represents The sample population of the percentage of respondents to the option that lack of proper machinery as a reason for the failure to adopt the disposing mechanism .

Figure 14



Legend :

Figure 14 represents The sample population of the percentage of respondents to the option that lack of investment as a reason for the failure to adopt the disposing mechanism .

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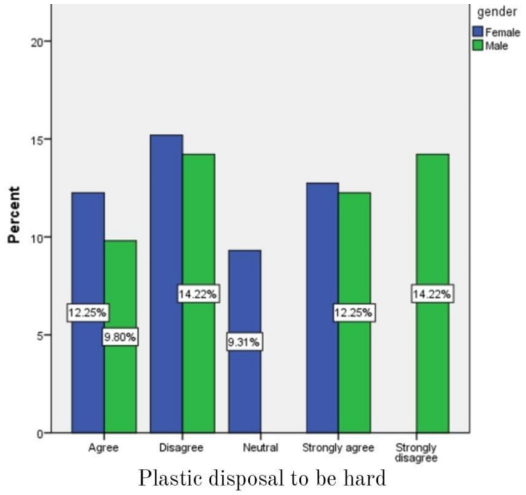
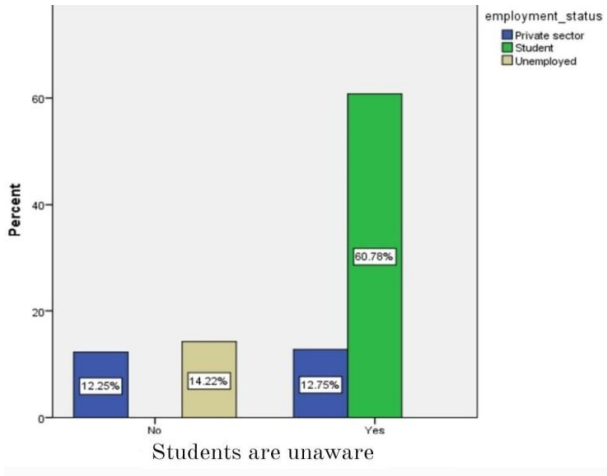
Figure 15



Legend :

Figure 15 represents The sample population of the percentage of respondents to the option that plastic disposal facilities are not present and that it's hard as a reason for the failure to adopt the disposing mechanism .

Figure 16



Legend

Figure 16 represents The sample population of the percentage of respondents to the option that students are unaware as a reason for the failure to implement the disposing mechanism .

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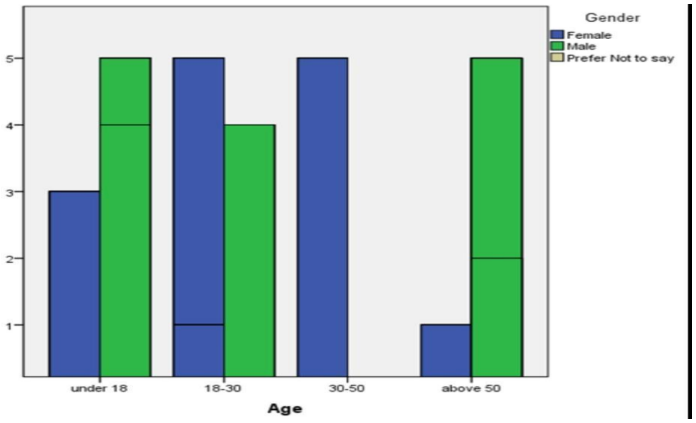
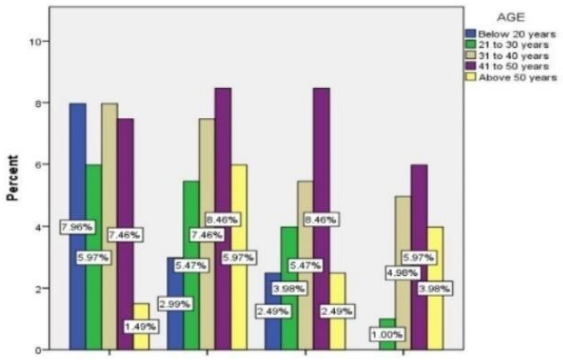
Figure 17



Legend

Figure 17 represents the response to the question among the various listed waste select the one you find hard to dispose (plastic material) non bio degradable with relation to gender

Figure 18



Legend

Figure 18 represents the response for the question among the various listed reasons what do you think is the reason behind people not following solid waste management guidelines for disposing waste - (refusal to learn and conply)

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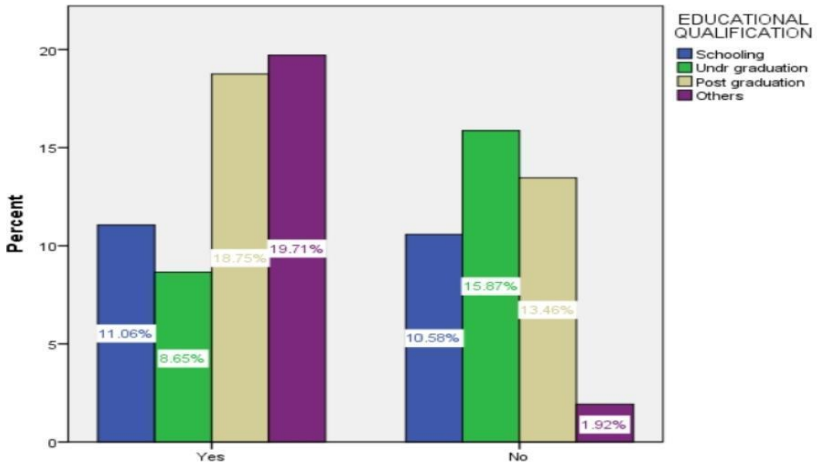
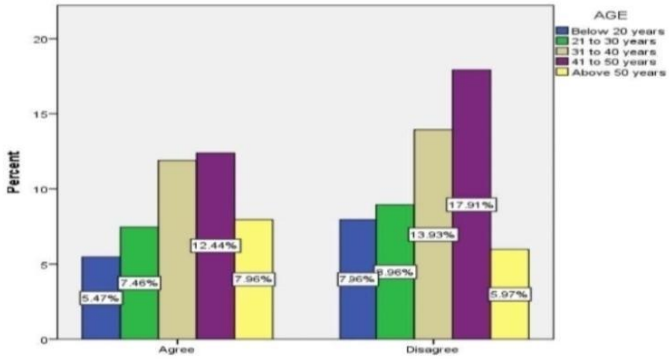
Figure 19



Legend :

Figure 19 shows the satisfaction of people with the disposal facilities and arrangements provided by the solid waste management department with respect to educational qualification

Figure 20



Legend :

Figire 20 shows the response of people for the question "what do you think is the reason behind people not following solid waste management guidelines for disposing waste " - ootion was lack of public awareness

V. RESULT

It represents overall sample population whether youth are prone to stress with respect to age, The respondent below 20 years of age by 60% and 31 to 40 years of age or else by 12% and 20 to 30 years of age 26% **(figure 1) is** the sample population and their percentage based on age **(figure 2)** The sample population is the sample population and their percentage based on their gender **(figure 3)** The sample population and their percentage based on their employment **(Figure 4)** In here 15% say yes 32 % say no where 52% say maybe for segregating waste based on their degrading efficiency the reason for the majority of answer is that most people at times try to segregate and dispose but it's not consistently followed **(figure 5)** represents the satisfaction of respondents on the disposal facilities and arrangements provided by the solid waste management department for which 8.3% highly satisfied , 30.3% satisfied , 33.1% neutral ,20.7% not satisfied and 7.6% are highly dissatisfied. The majority of people are better able to accept or deny the arrangements of Government to be effective while 30.3% are satisfied **(figure 6)** represents the various waste and as to which waste was hard to dispose" Papers and cardboards (5.5%) Glass materials and lightbulbs (35.2%) ,wood/metal

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furniture, ceramics (33.1%),Organic waste (biodegradable) (12.4%) ,Plastic material (non- biodegradable) (13.8) . Highest number of people have chosen glass materials and lightbulbs to be the most hard to dispose of. It might be because of the danger that can occur through glass materials **(figure 7)** satisfactory level of public on a scale of 1 to 10 on the implications and developments brought by the Swachh Bharat Mission in solid waste management and the highest was 7 (22%) followed by 6(22%)and 5(17 %) . From this we can say that not everyone is satisfied with the various implications brought by the Government **(Figure 8)** among the various listed reasons what do you think is the reason behind people not following solid waste management guidelines for disposing waste -Lack of public awareness(17%) refusal to learn and compliance(44%) insufficient investment in waste management (29%) lack of proper machinery (8%) . The majority says that most people are refusing to adopt even after knowing and it can only be changed by giving awareness on its side effects. **(figure 9)** The sample population in most of the females agreed by 22% strongly disagreed by 15% and noted by 12% whereas male disagree by 20% and agreed by 9% are neutral by 12% **(figure 10)** sample population regarding psychological stress with respect to gender most of the females disagreed by 16% and agreed by 12% to neutral by 9% and translated by 13% whereas males wrong it is agreed by 14% strongly agreed by 12% it is agreed by 14% and and agreed by 9% **(figure 11)** Sample population regarding Stephen comes along the youth education and qualification graduate as depression percent both of anger by 12% and high schooler stores and writings on 7% eating by 14% bouts of anger by 9% and depression by 9% post graduates chose restlessness by 14% in **(figure 12)** sample population regarding social support and in minimise stress with respect to educational qualification by 36% neutral by 14% agreed by 9% under graduates it is agreed by 5% and agreed by 5% at it by 14% **(figure 13)** Sample population regarding practising yoga reduces the stress with respect to educational qualification, sources by 25% annum by 12% and high schooler soldiers by 50% and post graduates .

VI. DISCUSSION

(**Figure** 1) is the sample population and their percentage based on age and majority of them are 49% of them are above the age of 30 years (**figure 2**) The sample population is the sample population and their percentage based on their gender 46.2 % are from the age group 31-40 years (**figure 3**) The sample population and their percentage based on their employment in which 45.1% are self employed and 35.2% are working in private sector. (**Figure 4**) In here 15% say yes 32 % say no where 52% say maybe for segregating waste based on their degrading efficiency the reason for the majority of answer is that most people at times try to segregate and dispose but it's not consistently followed.(**Figure 5**) represents the satisfaction of respondents on the disposal facilities and arrangements provided by the solid waste management department for which 8.3% highly satisfied , 30.3% satisfied , 33.1% neutral ,20.7% not satisfied and 7.6% are highly dissatisfied. The majority of people are better able to accept or deny the arrangements of Government to be effective while 30.3% are satisfied (**Figure 6)** represents the various waste and as to which waste was hard to dispose" Papers and cardboards (5.5%) Glass materials and lightbulbs (35.2%) ,wood/metal furniture, ceramics (33.1%),Organic waste (biodegradable) (12.4%) ,Plastic material (non- biodegradable) (13.8) . Highest number of people have chosen glass materials and lightbulbs to be the most hard to dispose of. It might be because of the danger that can occur through glass materials (**Figure 7**) satisfactory level of public on a scale of 1 to 10 on the implications and developments brought by the Swachh Bharat Mission in solid waste management and the highest was 7 (22%) followed by 6(22%)and 5(17 %) . From this we can say that not everyone is satisfied with the various implications brought by the Government (**Figure 8**) among the various listed reasons what do you think is the reason behind people not following solid waste management guidelines for disposing waste -Lack of public awareness(17%) refusal to learn and compliance(44%) insufficient investment in waste management (29%) lack of proper machinery (8%) . The majority says that most people are refusing to adopt even after knowing and it can only be changed by giving awareness on its side effects. (**Figure 9)** The sample population in most of the females agreed by 22% strongly disagreed by 15% and noted by 12% whereas male disagree by 20% and agreed by 9% are neutral by 12% (**Figure 10**) sample population regarding psychological stress with respect to gender most of the females disagreed by 16% and agreed by 12% to neutral by 9% and translated by 13% whereas males wrong it is agreed by 14% strongly agreed by 12% it is agreed by 14% and and agreed by 9% (**figure 11**) Sample population regarding Stephen comes along the youth education and qualification graduate as depression percent both of anger by 12% and high schooler stores and writings on 7% eating

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LIMITATION

My study was unable to cover many more the real hardships faced by the ULBs amd workers in executing solid waste management efficiently as the responses were taken from students and common people .

VII. CONCLUSION

From the study made and the responses collected we can say that most people agree that the Government is taking all kinds of initiatives but it's level of implementation is the question here .

A “green culture” needs to be developed, in which each individual contributes to waste minimization by reducing, reusing and segregating waste. The limitation of the study is the number of people who have responded. We cannot rely upon the answers which are taken from a small population. The Clean India Campaign has been launched in the city by the Municipal Corporation, involving resident welfare associations, market associations, hotel and restaurant associations, traders’ associations, industry associations in the sanitation campaign, and campaigns in schools, in colleges and with the public at large. But the corporation should ensure that this participation is not limited to the duration of the Clean India Campaign. Through consistent awareness and regulations we can surely establish a green culture in Tamil Nadu .

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