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Techniques For Disposing of Household Waste: Centralized and Decentralized Sites in Salem

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Abstract

The impact of biomacromolecule-based household waste and its disposal strategies in the central and decentralized areas of Salem is complicated by environmental, economic and community factors. The main objective of the study was to evaluate the existing municipal solid waste disposal strategy in the study area. A comprehensive analysis was carried out in each selected city to determine the amount of municipal waste disposed of, its physical composition and its MSW. The data collection was carried out using a structured questionnaire. A sample survey of 300 houses and businesses, of which 298 are sample homes, was used to conduct the survey. The survey covers all the types of waste generated, the amount of waste generated by households each day, the disposal options, and the existence of compost pits. Information on population characteristics, area and area, population growth, density, literacy, number of households and household size, and other related topics is collected from the survey, Salem Municipality, village, school, city directory and city directory. To obtain more information about waste production and disposal processes, a questionnaire survey was conducted in 15 different areas of Salem, each representing a different area. Through a field survey, the objective views of the various sections and stakeholders were taken into account. The composting method (ECO-CENTRIC & ECONO-CENTRIC) has had a strong positive impact and is considered to be an environmentally friendly technology.

Keywords: Manual survey, structured questionnaire, waste disposal strategy, comparison of centralized vs. decentralized areas, impact of biomacromolecules based household waste

INTRODUCTION

Salem's municipal waste management and community waste management plan are often in line with the state requirements for municipal waste reduction. Reusing non-recyclable solid waste may be a more appealing option than reusing municipal solid waste in accordance with environmental regulations, depending on the level of enforcement and financial resources. It aims to evaluate the existing disposal strategies for municipal solid waste (MSWs) in various areas of Salem. The amount and composition of MSW vary from place to place, but usually correspond to the average living standards. In each selected city, comprehensive analysis is carried out to determine the amount of municipal waste disposed of, examine its physical composition and describe its MSW. This chapter also includes the evaluation of the status of management of MSW (defined in the 2016 MSW Regulation) and the development of an action plan for better management. The data collected were collected using organized questionnaires, including questions

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on the type of waste produced, how much waste a family produces each day, disposal options, and the existence of a compost [1].

The Principal Data Source Utilized to Investigate Earlier Methods of Solid Waste Management in The Research Region

Principal data are obtained directly from the source and are from recent or original research studies. It is data that has been collected firsthand through tests, surveys, or in-person observations. The foundation of solid waste management is to begin as soon as waste is generated. To get additional data regarding the waste generation and disposal strategy, we conducted manual surveys at various locations in Salem with a questionnaire [11].

Questionnaire-Based Manual Survey (QBMS)

Fifteen different Salem district locations, each representing a separate taluk, participated in the QBMS to collect data on the primary method of disposing of household garbage. In every one of the fifteen zones, ten houses at different locations throughout the sample were surveyed. After a thorough analysis of the collected data, it was found that all 15 places had advanced current practices. The collected data related to population characteristics, ward wise population, zone wise population, population growth, density, literacy, number of households, size of household and the like was collected from village, educational institution and town directory of Salem, Census of India and Municipal Corporation Salem. Pannangkattur, R. E. Quarters, Neethipuram, K. Pudur, Sauripalayam, Avarangapalayam, Kannangkurichi, Mullaivadi, Allikuttai, Suramangalam, Udayapatti, Alagapuram, Shevapet, Jagairammapalayam, and Narayanapuram are the fifteen regions of Salem that are included in this survey.

Quantity Generation Rate of Municipal Solid Waste (MSW) is one of the data concerning current solid waste management in the research area that was gathered from QBMS.

- The quantity of equipment used for the transportation, collection, and disposal of municipal solid waste (MSW). overall quantity and variety of garbage receptacles [8].
- The total quantity of disposal sites, transfer stations, and collection points.
- The total number of employees involved in solid waste management and their shift schedule.
- The research area's current municipal solid waste (MSW) disposal strategies [15].

The field inquiry carried out through a schedule, targeted group discussions, and field research (FGD) forms the foundation of QBMS [18]. During the field visit different types of solid waste garbage samples were taken of the selected locations of the city. GPS survey was done to mark the location of dust bins, collection points, dumping sites, transfer stations and compost plant. Primary survey also includes the samples taken from different collection points and field observation of dumping sites / landfill sites and transfer stations to get a fair idea about solid waste management in the city. An interview-schedule with open-ended questions is used to know life style, attitude and perception of society towards waste, its management, their role in it, impact of solid waste on health of the public as well as workers of municipal and other private firms who are involved in the process of solid waste collection and disposal mechanism.

Transfer stations, disposal sites, and collection points were also surveyed as part of the primary study. To gain a general understanding of the city's solid waste management practices, samples were also collected from the landfill sites [14].

Selection of Sampling Sites

Every location chosen was evenly distributed throughout Salem City's nine taluks. MSW generated from these sites amounts to about 600 metric tons per day. The activities around the garbage collection location and the surrounding population's style of living determine the characteristics of municipal solid

waste. To evaluate the solid waste properties, a total of fifteen sampling sites were chosen, evenly distributed around the city. The following list of sampling locations was chosen to represent various demographic activities:

- Domestic
- Commercial
- Dairy activities
- Vegetable market
- Food grain market
- Meat market

Table1. Surveyed Places in Different areas of Salem (2)

S .no	Taluk	Area
1	Omalur	Pannangkattur
2	Mettur	R.E. Quarters Neethi puram
3	Edappadi	K. Pudur Sauripalayam
4	Sankari	Avarangapalayam
5	Yercaud	Kannangkurichi
7	Salem	AllikuttaiSuramangalamUdayapattiAlagapuramShevapetJagairammapalayam
8	Gangavalli	Narayanapuram
9	Attur	Mullaivadi

Apart from 15 sampling sites above selected site from residential area (High, Middle, Low-income group) situated at Salem, 2 sampling sites were selected from commercial (Educational Institution) area situated at Salem. In order to evaluate the characteristics of the wastes generated from agricultural activities, vegetable market, food grain market and meat market, one site each was also selected from these locations.

Selection of Sample

A sample survey of 300 residences and businesses, of which 298 are samples of households and 2 are samples of commercial activity, forms the basis of the study [3]. These samples were selected proportionately from the neighborhoods of different economic level groupings, taking into account the size of the residences, companies, and industries. i.e. very low, low, medium and high-income group (Table 2). Data from the employees involved in the solid waste collection and disposal mechanism process was gathered using an interview schedule. [19]

Table 2. Zone-Wise Sample Selection from Residential, Commercial, and Industrial Units (6)

S. no	Taluk	Area	Total number of samples
1	Omalur	Pannangkattur	15
2	Mettur	R.E.QuartersNeethipuram	15
3	Edappadi	K.PudurSauripalayam	15
4	Sankari	Avarangapalayam	15
5	Yercaud	Kannangkurichi	15
7	Salem	AllikuttaiSuramangalamUdayapattiAlagapuramShevapetJagairammapalayam	88
8	Gangavalli	Narayanapuram	15
9	Attur	Mullaivadi	15

Analyze The Implications of Solid Waste Quantity Generation Rate

In order to evaluate the impact of solid waste and determine the degree of vulnerability to solid waste in a spatial context, the objective opinions of various sections and stakeholders were considered through a field survey. This was done using the indices of the chosen parameters listed below. [6]

1. Average Vegetables Consumption in Kg per Day (Direct reply from the residents)
   Vegetables Consumed in kg Per day = (VEGETABLES Purchased Per Week) / 7
   Through manual survey we found that the people living in Village purchasing the vegetables per week for cooking purpose. From above formula we calculated the daily vegetable consumption in kg per day.
2. Consumption of Vegetables per Person in Kg per Day (16).
   Consumption of Vegetables Per Person in kg Per Day = (Vegetables Purchased Per Day) / (Number of People)
   From the above formula daily consumption of vegetables in kg per day per house is calculated.
3. Average waste generated by each person per day(4)
   5 % of the vegetables consumed are accounted as waste per person in kg
4. Vegetable waste generated by per person is 5% of vegetable consumed in kg per day[5].
   Total Solid Waste in kg per day per house = Vegetable waste + Paper (or) Plastic waste
   Among the surveyed houses, only 2-3% houses is using diary milk remaining people using
5. Average Waste Generation in an area: (Direct reply from the residents) (2)
   The amount of solid waste produced daily in their residence was recorded in kilograms (Kg) / the total number of homes examined
6. Average per capita demand in an area (2)
   Sum of per capita solid waste generation / Number of houses surveyed

WASTE QUANTITY ASSESSMENT

Per Capita Waste Generation in Different Areas: Assessing waste quantity typically involves several steps depending on the context, such as for households, businesses, or industrial settings.
Here's a general approach you might consider.

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Table.3. Information about the people living in Kandarkulamanickam (7)

Code no. of each house	Number of people per house	Vegetables purchased per week in kg	Vegetables purchased in kg per day in kg	Consumption of vegetables per person in kg per day	solid waste details in kg per day		Capacity of tank per house in litres	Total solid waste in kg		Capacity of tank per house in litres
					Vegetable Waste	*paper waste*		*Accurate*	*Approximate (From questionnaire)*	
1	1	3	0.428	0.428	0.0214	Nil	0.0214	0.0214	0.05	-
2	4	5	0.714	0.178	0.1428	Nil	0.1428	0.1428	0.6	30
3	2	3.5	0.5	0.25	0.025	Nil	0.025	0.025	0.1	100
4	1	0.326	0.046	0.046	0.023	Nil	0.023	0.023	less than 0.75	-
5	3	2	0.285	0.666	0.1	Nil	0.1	0.1	0.2	-
6	3	4	0.571	0.19	0.02855	Nil	0.02855	0.02855	2	-
7	1	2	0.285	0.285	0.01425	Nil	0.01425	0.01425	0.5	-
8	6	5	0.714	0.119	0.0357	1 Milk Cover	0.0457	0.0457	1	1000
9	3	3	0.428	0.1428	0.0214	Nil	0.0214	0.0214	2	-
10	4	5	0.714	0.1785	0.03448	Nil	0.3448	0.3448	-	2000
11	4	5	0.714	0.1785	0.03448	Nil	0.3448	0.3448	-	200

12	4	4	0.571	0.142	0.028	1 Milk Cover	0.038	0.038	-	-
13	4	3	0.428	0.107	0.021	Nil	0.021	0.021	-	-
14	9	5	0.714	0.178	0.3213	0.33 Kg	0.654	0.654	2	1000
15	4	3.5	0.5	0.25	0.05	Nil	0.05	0.05	-	-
16	3	5	0.714	0.178	0.107	Nil	0.107	0.107	-	-
17	4	4	0.571	0.142	0.285	Nil	0.285	0.285	-	-
18	7	6	0.857	0.122	0.04	Nil	0.04	0.04	-	-
19	5	4	0.571	0.142	0.357	Nil	0.357	0.357	2	-
20	6	5.25	0.75	0.125	0.0375	1 Milk Cover	0.0475	0.0475	3	-
21	4	5	0.714	0.178	0.1428	Nil	0.1428	0.1428	0.5	750
22	3	4	0.571	0.142	0.214	Nil	0.214	0.214	0.5	-
23	1	3.5	0.5	0.25	0.0125	Nil	0.0125	0.0125	0.1	-
24	4	5	0.714	0.178	0.1428	Nil	0.1428	0.1428	0.5	-
25	2	2.33	0.33	0.016	0.004125	Nil	0.004125	0.004125	0.5	-
26	4	5	0.714	0.7148	0.0357	1 Milk Cover	0.0357	0.0357	1	-
27	4	0.326	0.046	0.184	0.0368	Nil	0.0368	0.0368	0.5	750
28	7	6	0.857	0.122	0.0428	Nil	0.0428	0.0428	-	-
29	3	4	0.571	0.19	0.028	Nil	0.028	0.028	0.5	600
30	9	4	0.571	0.063	0.028	Nil	0.028	0.028	-	750
31	5	5	0.714	0.142	0.035	Nil	0.035	0.035	-	-
32	6	3	0.428	0.0714	0.0214	Nil	0.0214	0.0214	-	-
33	4	4	0.571	0.142	0.028	1 Milk Cover	0.028	0.028	-	-
34	6	5	0.714	0.119	0.0357	1 Milk Cover	0.0357	0.0357	-	1000
35	5	3	0.571	0.142	0.357	Nil	0.357	0.357	2	-
36	2	4	0.571	0.142	0.357	Nil	0.357	0.357	2	-
37	4	2.5	0.357	0.089	0.01785	Nil	0.01785	0.01785	-	-
38	5	5	0.714	0.142	0.035	Nil	0.035	0.035	-	-
39	6	6	0.857	0.142	0.0428	Nil	0.0428	0.0428	-	-
40	4	5	0.714	0.142	0.035	Nil	0.035	0.035	-	-

Impact of Biomacromolecules based household waste and its Disposal strategy: Centralized vs. Decentralized Areas of Salem

The term "biomacromolecules waste" in the context of household waste typically refers to the byproducts or remnants of large biological molecules that are commonly found in everyday items[3]. These biomacromolecules may include materials derived from living organisms such as proteins, nucleic acids, carbohydrates, and lipids. While these biomacromolecules are not typically considered waste in their natural biological context, certain household items or products may contain or be composed of biomacromolecular materials [9]. The impact of biomacromolecules-based household waste and its disposal strategy in centralized and decentralized areas of Salem involves various environmental, economic, and community considerations. Here's an overview of the potential impact associated with each disposal strategy [19]:

Centralized Waste Disposal

a. Environmental Impact
   - *Efficient resource management:* Centralized disposal facilities may optimize the processing of biomacromolecules waste efficiently, potentially reducing environmental impact.
   - *Controlled waste treatment*: Centralized facilities can implement advanced technologies for the controlled treatment of biomacromolecular waste, minimizing environmental hazards.

b. Economic Considerations
   - *Economies of scale*: Centralized facilities might benefit from economies of scale, potentially reducing overall waste management costs.
   - *Employment creation:* Larger, more centralized facilities could boost the local economy and provide more jobs.

c. Challenges
   - *Transportation costs*: Transporting waste to centralized facilities can result in higher transportation costs and associated environmental impacts.
   - *Community opposition*: Centralized facilities may face resistance from local communities due to concerns about pollution, odor, and noise.

Decentralized Waste Disposal (12)

a. Environmental impact
   - *Localized processing:* Decentralized disposal removes the need for long-distance transportation and the associated environmental impacts, allowing for localized processing costs.
   - *Community-based* Solutions: Tailored decentralized solutions may address specific environmental concerns of local communities.

b. Economic Considerations
   - *Local Job Opportunities*: Decentralized waste management solutions may create jobs at the local level, fostering economic development.
   - *Community Investment*: Supporting decentralized waste disposal may encourage community investment in sustainable practices.

c. Challenges
   - *Resource Limitations*: Smaller decentralized facilities may lack the resources for advanced biomacromolecular waste processing.
   - *Consistency Challenges*: Ensuring consistent waste management practices across decentralized locations may be challenging.

Community Engagement and Awareness (21)

Centralized Approach
- Public awareness programs can inform communities about the benefits and safety measures associated with centralized waste disposal.
- Addressing concerns and building confidence require community involvement in decision-making processes. Decentralized Approach:
- Localized garbage disposal promotes community involvement and a sense of ownership over waste management practices.
- Tailored education programs can address specific biomacromolecular waste challenges at the community level.

Regulatory Compliance

Centralized Approach [4]
- Centralized facilities may be subject to stricter regulations, ensuring a higher level of environmental compliance.
- Regulatory oversight may be more centralized and easier to implement.

Decentralized Approach

- Ensuring regulatory compliance across various decentralized facilities may require more coordination and monitoring efforts.
- Local regulations and enforcement may vary, posing challenges for consistent compliance.

Innovation and Technological Solutions [13]

Centralized Approach

- Centralized facilities may have the capacity to implement and invest in advanced biomacromolecular waste treatment technologies.
- Innovation and research can work together to promote the adoption of cutting-edge, environmentally friendly methods.

Decentralized Approach

- Smaller, decentralized facilities may adopt more agile and community-specific innovations in bio macro molecular waste management.
- Local research and solutions may be driven by the unique needs of each community.

RESULTS AND DISCUSSION

Waste Disposal Strategies in different areas of Salem: When discussing waste disposal strategies in different areas of Salem, Massachusetts, or any other locality, it's crucial to consider several factors that influence waste management practices and outcomes. Here's a structured approach for results and discussion**.**

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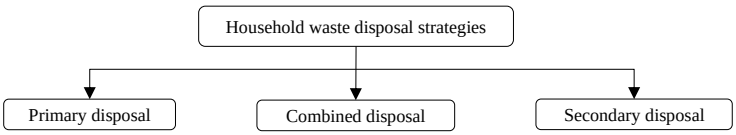
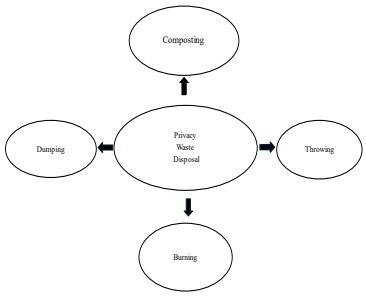
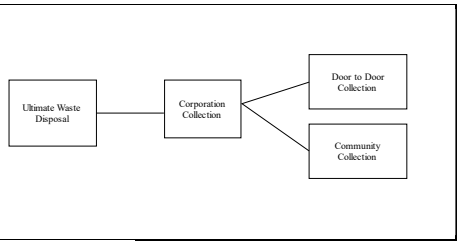


Figure 3. Waste disposal strategies in different areas of salem

Table 1. Waste disposal strategies in different areas of salem

Current Waste Disposal	Definition
Primary Waste Disposal: The main procedure for getting rid of household waste close to each individual home in and around their Premises (17).	

Composting: Organic waste can be disposed of by composting, which allows it to organically break down in an environment high in oxygen. While all waste will eventually break down, only specific waste materials should be deposited to compost bins since they are deemed biodegradable. Eggshells, coffee grinds, and banana peels are examples of food waste that works well in a compost. (25)	
Throwing The act of disposing of rubbish by merely dumping it outside the home or next to the compound wall. This could also result in the proliferation of rats and mosquitoes, which can infect humans (20).	
Burning: Burning of waste materials converts the waste into ash, flue gas and heat. The ash is mostly formed by the inorganic constituents of the waste, and may take the form of solid lumps or particulates carried by the flue gas (21). *Community Burning:* Process of Collecting the waste from each house at the end of the street and converting it into ash, flue gas and heat. *Backyard Burning:* Backyard burning is a waste treatment process that involves the combustion of organic substances contained in waste materials in their own house. Backyard burning and other high temperature waste treatment systems are described as "thermal treatment".	
Dumping: Dumping is one of the most poorly rendered services by Municipal authorities in developing countries as the system applied are unscientific, outdated and in-efficient(22).	
Community Dumping: The domestic wastes from all the individual houses of an area are dumped in a common place of a street.	
Premises Dumping: The domestic wastes from the individual houses are dumped nearby their premises. (29)	
Ultimate Waste Disposal: The domestic waste is collected from each house by the corporation for further treatment and disposal of waste which is away from the town (23).	
Door to Door Collection: The domestic waste is collected from each house by the person from door	

to door with the help of vehicle in a regular cycle.	
Community Collection: A common bin is kept for a single street at the edge of the street. If there is delay in removing waste the wastes are thrown outside the bin. Hence this disposal causes impact to people due to foul odors, mosquitoes, flies, etc (24).	

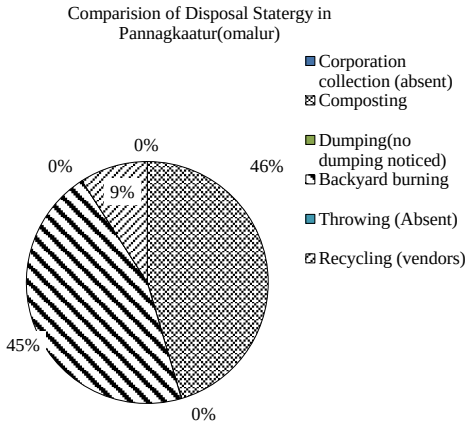


Figure1. Disposal strategy in omalur

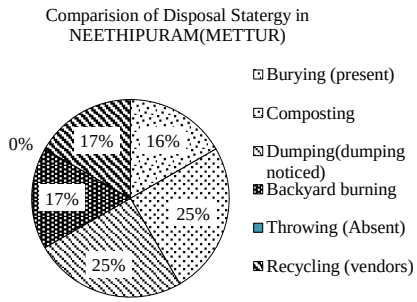


Figure 2. Disposal strategy in mettur

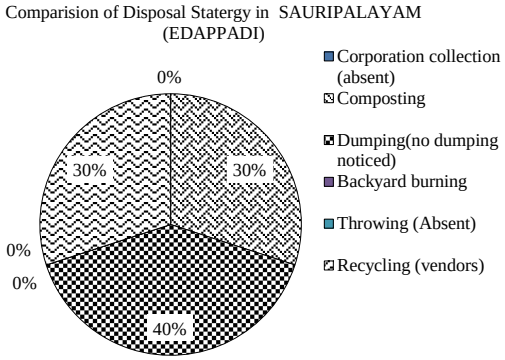


Figure 3. Disposal strategy in edappadi

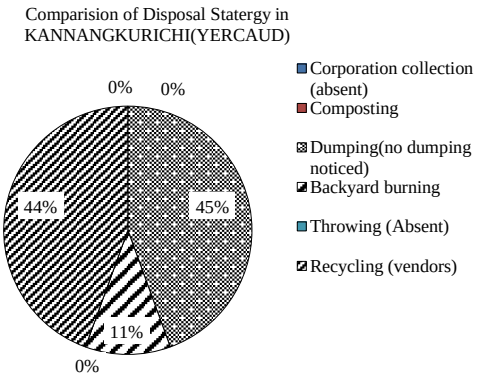


Figure 4. Disposal strategy in Yercaud

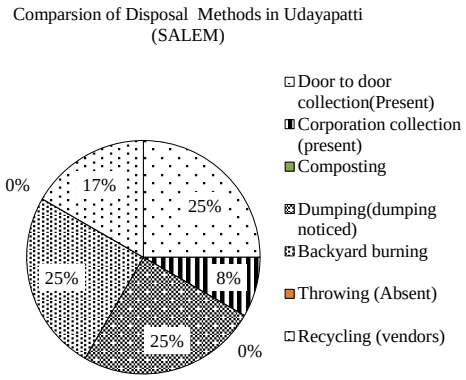


Figure 5. Disposal strategy in salem

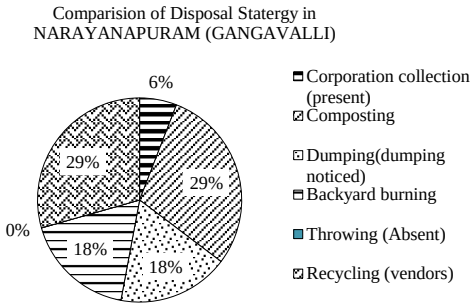


Figure 6. Disposal strategy in gangavalli

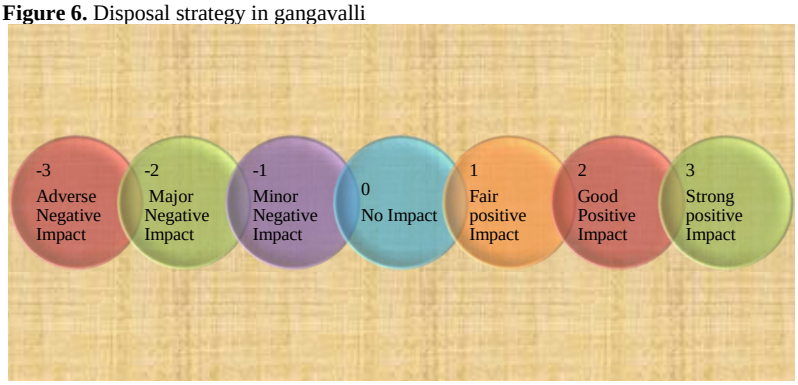


Figure 7. Impact Potential Scale (30)

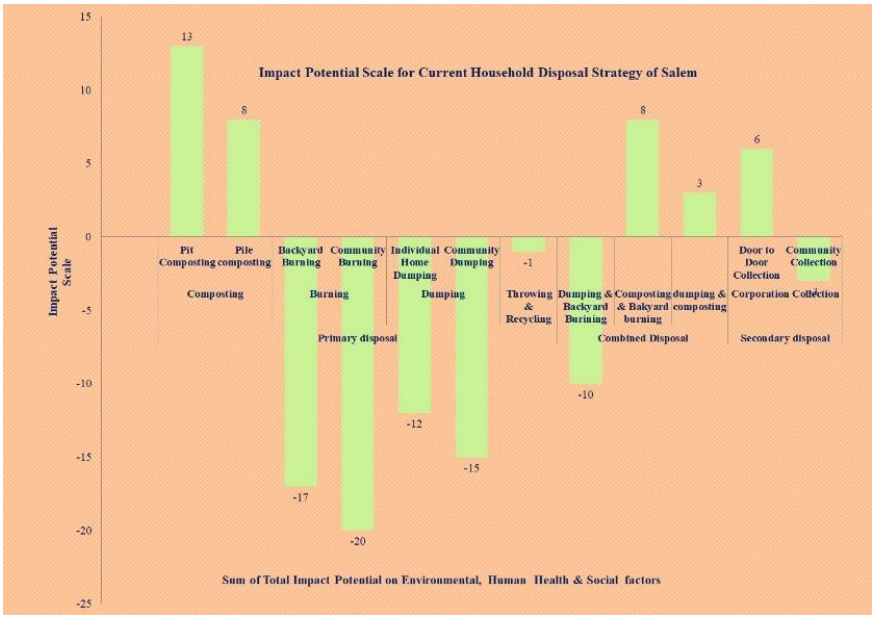


Figure 8. Environmental Impacts of Current Household Disposal Strategy of Salem

CONCLUSION

Household Waste Disposal Strategy performed was predicted from the direct reply from the household, the Solid Waste Management hierarchy of Salem, Household Waste Disposal Hierarchy Impact Potential Scale for Current Household Disposal Strategy of Salem has been designed. Among the locations under survey, those in Salem's centralized areas were using the Combined Disposal Strategy, while those in the city's decentralized parts were combining the use of main and Combined Disposal strategies [18]. Based on the Household Waste Disposal Strategy practiced the Impact Potential Scale has been designed and it shows that the Composting technique has strong positive impact (ECO- CENTRIC & ECONO- CENTRIC) and it is considered an Environmentally sound Technology. We have determined that Salem currently employs primary and final waste disposal as its two main disposal methods based on the previously described investigation. The majority of those surveyed in rural areas such as Pannangkattur (Omalur), Neethipuram (Mettur), Sauripalayam (Edappadi), and Narayanapuram (Gangavalli) said that composting is their main method of disposing of garbage [26]. These individuals were classified as Green House (pollution-free, environmentally beneficial, economy-generating). On the other hand, residents of Kannangkurichi (Yercaud) and Narayanapuram (Gangavalli) recycle their waste and are classified as Yellow House residents (Economy Generation, pollution free and eco-friendly). In conclusion, the impact of biomacromolecules-based household waste and its disposal strategy in centralized and decentralized areas of Salem involves a complex interplay of environmental, economic, and community factors [27]. The choice between centralized and decentralized approaches should consider the unique characteristics of the region, the preferences of local communities, and the overall goals of sustainable waste management [28]. Balancing these considerations can lead to effective biomacromolecular waste disposal strategies that align with environmental stewardship and community well-being [29].

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