# Environmental Impacts on Solid Waste Management in Tamil Nadu

**D. Jeevan Vignesh**
*Research Scholar, PG & Research Department of Economics*
*Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, India*
*https://orcid.org/0009-0006-0324-5523*

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**Abstract**
*Overpopulation, urbanization and the growing technology are among the few reasons for solid waste pollution. The rising population has led to the production of more waste, with every passing year people have several kinds of stuff to use and discard. Technology has a very vast impact on the growing population. Improper handling of waste may lead to contamination of surface water, ground water, land, and the air. For instance, when waste is illegally dumped along roadsides, in the woods, in illegal dumps, in wetlands, in lakes and streams, or by being improperly burned, these are all examples of improper handling. Improperly managed solid waste can have serious environmental consequences. It can contaminate soil, air, and water and harm wildlife and ecosystems. Effective solid waste management helps reduce the amount of waste. The solid waste thus ends up in landfills and ensures that hazardous waste is disposed of safely. Poor waste management - ranging from non-existing collection systems to ineffective disposal -causes air pollution, water and soil contamination. Open and unsanitary landfills contribute to contamination of drinking water and can cause infection and transmit diseases. solid waste management in India include prevention of environmental degradation, reduction in greenhouse gas emissions, provision of employment, improvement in public health, and stimulation of economic growth. The study analyzed the household solid waste management in Tirupattur municipality of Tamil Nadu. Further it suggests, reusing materials can reduce the need for new resources, which helps protect the environment from the impacts of resource extraction.*

**Keywords: Solid Waste Generation, Environmental Impact, Waste Generation, Pollution, Waste-to-Energy, Sustainable Practices, Community Engagement**

## Introduction

Solid waste management is a major concern for India's environmental sustainability and public health (Rajendiran et al.). With increased urbanization, industry, and population expansion, the country's solid waste output has skyrocketed. This spike not only stresses current waste disposal infrastructure, but it also worsens environmental deterioration and jeopardizes public health. The environmental effect of solid waste management in India goes beyond simple disposal difficulties to include pollution, resource depletion, and habitat damage (Goswami et al.). As a result, understanding and minimizing these effects is critical for India's goal for sustainable development. This article investigates the environmental consequences of solid waste management techniques in India, examining important concerns, emerging trends, and viable solutions to protect both the environment and the well-being of its people. Understanding the environmental effect of solid waste management in India is critical for maintaining ecosystems, promoting public health, achieving sustainable development goals, unlocking economic advantages, guiding policy design, and empowering local people. By thoroughly researching the implications of waste management practices, stakeholders can devise strategies to reduce environmental degradation, health risks, promote economic growth, implement evidence-based policies, and empower communities to actively participate in sustainable waste management initiatives.

This comprehensive strategy tackles not just current environmental challenges, but also promotes long-term resilience and prosperity for the environment and society.

**Review of the Literature**

Geographical variables and economic issues both have an impact on how soil waste is managed. The impacts of socioeconomic and seasonal fluctuations on municipal solid trash in Lahore were studied by (Kamran et al.). Food waste accounted for 84% of the total municipal solid trash generated in the research area and there is a favorable association between economic position and garbage generation, according to a study that evaluated the solid waste generated among three income categories in all seasons. Additionally, because they use more diapers and eat less during the winter than during other seasons, the Low-income group produces less income during this time. The report advises doing household level surveys throughout the year in order to develop field-based management policies.

The management of solid waste in various nations is the subject in particular studies. The relationship between municipal solid waste management, household choices, and local government engagement was explored by (Banerjee and Prasenjit). This study made an effort to pinpoint the economic elements affecting household and private waste management participation in emerging nations. Data collected at the city level were utilized to analyze the variations in garbage management. It was discovered that social, economic, and demographic aspects had an impact on waste management partnerships. As a result, the study recommended using an effective system in the transfer of garbage from the primary disposal level to the landfill.

(Vij) looked at trends in solid waste management and urbanization in one Indian study. The report identifies the lack of an adequate supply of sanitary landfills as a serious problem. Other issues include the non-segregation of trash, rising population and garbage production, and a lack of waste management strategy, resources, and technology. The report recommends implementing rules like the polluter pay principle, enhancing financial management, and adopting efficient waste planning and management. Strict rules need to be implemented for efficient trash management and disposal.

(Premkumar and Susairaj) studied on household solid waste management in Tirupattur. The study focused on factors resulting environmental degradation and detailly investigated to scrutinize the management of solid waste and willingness to pay for the improved solid waste management.

(Afroz Mukthi) study also looked at the variables influencing garbage generation in Dhaka, Bangladesh. The factors impacting garbage generation among 402 respondents in the research area were identified using ordinary least square regression in this study. Only 25.6 percentage of respondents, according to the study routinely recycled households' waste. The three biggest factors influencing garbage generation are household size, income, and environmental concerns. Therefore, the study advised that government efforts be made to educate the public and raise awareness of the recycling process and trash reduction techniques.

There are two methods for managing wastes: the linear approach and the circular approach. In a linear strategy, also known as an economically linear framework, all trash is produced and dumped at land field sites. Waste is brought back into use rather than being disposed of in the circular economy framework, also known as the circular approach. As a result, recycling garbage and researching its many dimensions, notably the circular economy approach, have become crucial elements in the subject of environmental economics. In order to understand how local governments are managing the circular economy. In order to understand how local governments are managing the circular economy with regard to urban solid waste, (Carmen and Tinoco-Castrejón) researched the management of urban solid waste in the direction of that economy. Focus groups, semi-structured interviews, and interviews with municipal employees are examples of qualitative data collection techniques that were used to examine the current methods for collecting waste, the nature and state of waste management, the impact of the circular economy on business and industry toward recycling, and the creation of jobs. Recycling and waste management are cited as major municipal challenges. In order to improve

the circular economy and create more employment possibilities, it is advised that local governments establish the metrics needed to access it. They must also show more willingness to do so.

According to (Fadhullah et al.), 74.3 percent of households disposed of food scraps as garbage and 18.3 percent of households disposed of plastic products as waste. The study also confirmed that while 49.7% of households did not segregate their waste, 15.3% did. About 95.9% of respondents agreed that poor waste management contributes to diseases like malaria and diarrhoea. Waste segregation behavior was correlated with locality and agent housing type among respondents (chi square test, P = 0.05). Additionally, associations between location and the idea that poor waste management causes sickness were discovered. According to principle component analysis, age, marital status, and kind of house all have positive relationships with 77.94% of the variance (high positive loading).

According to (Kumar and Agrawal), there is an urgent need for appropriate treatment and recycling solutions that must be modified in accordance with the nature of Indian solid waste. Through a variety of accessible scientific treatment methods, it is important to underline the potential property consequences of centralized and decentralized municipal solid waste management options. Municipalities must therefore concentrate on developing potential prospects and achieving the long-term aim of municipal solid waste management sustainability for Indian towns, along with the environmental and informal sectors commercial agencies.

(Karousakis and Birol) investigated London homeowners' preferences for recycling services. The choice experiment method was used in the study to determine household valuation for recycling services. To evaluate households' willingness to pay for solid waste generated in London, a random parameter logic model and a conditional logic model were utilized. I discovered that homeowners are willing to pay more for dry and composite garbage. As a result, the study recommends developing late adequate policies with record to motivate recycling management for the good of London.

The researchers paid close attention to household behavior toward solid waste management, as well as the methods and means by which families deal with solid waste. (Mukui), for example, stated that factors impacting home solid waste management in Kenya. I discovered that only 24.6% of households employ the wave separation method, and the others do not use the right method of ways dispersible owing to negligence and a lengthy distance to waste bins. As a result, the study suggests that common methods such as self-storage bins, street garbage bins, and composite pits be used for waste disposal at the household level, and the government take effective actions to address the issue of waste management.

**Objectives of the Study**

- To quantify the per capita generation of solid waste in different regions of India.
- To analysis the issues and challenges faced by the municipality in waste management in Tirupattur municipality.

**Hypothesis**

The study hypothesizes a strong Correlation between population density and per capita solid waste output in India's metropolitan districts. Furthermore, it is expected that places with higher levels of industrialization and urbanization will have higher rates of solid waste creation and lower rates of waste treatment, resulting in a greater reliance on landfilling as the major disposal strategy. Furthermore, the study argues that socioeconomic characteristics such as income and education would impact waste management practices, with higher-income populations being more likely to participate in recycling and waste reduction activities.

**Methodology of the Study**

The study is based on both primary data and secondary data. To gather data, a well-structured interview schedule was established, and simple random sampling was used to collect the data and variables were systematically arranged and the data collected from 108 households from Tirupattur municipality of Tamil Nadu. The collected data were organised and enter into SPSS and it was analysed and presented in the form of tables and discussed the research outcomes. For secondary data information collected from published reports, journals, articles and websites.

## Results and Discussion

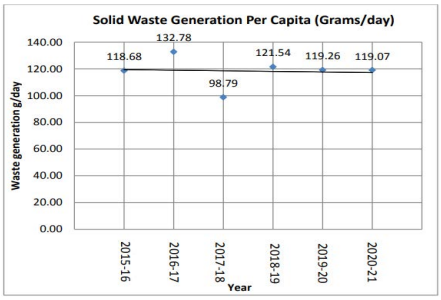
**Table 1 Solid Waste Generation Per Capita**

| Year | Solid Waste Generation Per Capita (gm/day) |
|---|---|
| 2015-16 | 118.68 |
| 2016-17 | 132.78 |
| 2017-18 | 98.79 |
| 2018-19 | 121.54 |
| 2019-20 | 119.26 |
| 2020-21 | 119.07 |

**Source:** *Annual Report on Solid Waste Management (2020-21)*

Table 1 shows the per capita solid waste generated at the source. The largest percentage, amounting for 132.78% of total per capita trash, was recorded in 2016-2017. Similarly, the next year, 2018-2019, had a matching rise, with 121.54% of per capita garbage being created. This increased trend in per capita solid waste can be linked to the steady increase in population. The growing population contributes considerably to the society's rising environmental imprint, resulting in great environmental consequences (Arun and Premkumar).

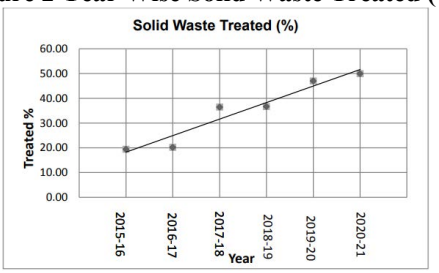
**Figure 1 Solid Waste Generation Per Capita (gm/day)**




**Source:** *Annual Report on Solid Waste Management (2020-21)*

Figure 1 summarizes per capita solid waste generation during the last six years. Figure 1 shows the trend in per capita waste production. Notably, per capita solid garbage creation has decreased little throughout this time period. This chart highlights the gradual decline in per capita solid waste output in recent years. Despite this little decrease, the general trend is one of rising per capita solid waste. This growing trend is attributed to an expanding population, which leads to an increase in solid waste creation. As a result, the growing population has a greater influence on the environment, owing mostly to society's deficient waste management procedures.

**Figure 2 Year Wise Solid Waste Treated (%)**




**Source:** *Annual Report on Solid Waste Management (2020-21)*

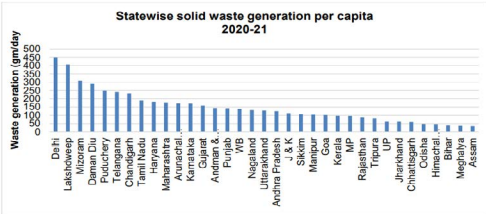
Figure 2 detailly describes the trend of solid waste processing percentages from 2015-21. Over the previous five years, the percentage of solid waste treated has climbed from 19% in 2015-16 to 49.96% in 2020-21. This indicates large waste generated and treated in the form of Landfilling and other waste processing techniques take place for the management of waste in the study area.

**Figure 3 Year Wise Solid Waste Landfilled**


**Source:** *Annual Report on Solid Waste Management (2020-21)*

Figure 3 shows the percentage of solid waste that was landfilled from 2015 to 21. Decreasing trend in solid waste landfilled has been seen throughout the previous six years whereby solid waste landfilled has declined from 54% in 2015-16 to 18.4% in 2020-21. This clearly describes the quantity of waste that disposed in the form of landfilling and its impacts. The trend highly describes the amount of waste that landfilled in these Six years. The trend decreasing year by year implementing new waste processing techniques to treat the waste in the eco-friendly manner.

**Figure 4 State Wise Per Capita Solid Waste Generation**




**Source:** *Annual Report on Solid Waste Management (2020-21)*

Figure 4 shows the per capita generation of solid waste in various states and union territories. Delhi has the highest solid trash per capita, followed by Lakshadweep and Mizoram. The figure shows the quantity of garbage generated by states, the average percentage of waste processed, and the different societal implications. This information is critical for policymakers to develop successful waste management programs that are suited to the unique demands of each location. Disparities in trash creation among states reflect differences in economic growth, infrastructure, and population density. Policymakers can utilize this data to highlight areas that require immediate attention, such as upgrading waste treatment facilities in areas with lower rates of processed trash. Finally, it offers thorough insights on the solid waste landscape across different states and union territories in India.

**Table 2 Collection and Separation of Waste**

| Particulars | Frequency | Percentage |
|---|---|---|
| Yes | 65 | 60.2 |
| No | 43 | 39.8 |
| Total | 108 | 100.0 |

**Source:** Primary Data

Table 2 reveals the municipality separating a waste while collection itself. Majority 60.2 % of the respondents are saying that municipality workers collecting the waste while collection itself and remaining 39.8 % of the respondents says that the municipality workers don't separate the waste while collection in the study area. The study reveals the waste separation by the municipality workers while collecting the waste in the study area.

**Table 3 Solid Waste Recycling Facilities Must be Provided**

| Particulars | Frequency | Percentage |
|---|---|---|
| Strongly disagree | 19 | 17.6 |
| Disagree | 22 | 20.4 |
| Neutral | 25 | 23.1 |
| Agree | 16 | 14.8 |
| Strongly agree | 26 | 24.1 |
| Total | 108 | 100.0 |

**Source:** Primary Data

Table 3 emphasizes the solid waste recycling facilities provided by the Tirupattur municipality for the study area majority 17.6 % and 20.4% of the respondents says that they are Dissatisfied and Highly Dissatisfied in the solid waste recycling facilities provided by the municipality.

Correspondingly 23.1% of the respondents says that there is average level in the recycling. And remaining 14.8% and 24.1% of the respondents says that they are Satisfied and highly satisfied in the recycling facilities of solid waste management in the study area. It could be stated that 24.1% of the respondent are majorly agreed in the recycling facilities in the study area.

**Table 4 Processing System of Waste is mostly used in Tirupattur**

| Particulars | Frequency | Percentage |
|---|---|---|
| Landfilling | 38 | 35.2 |
| Incineration | 16 | 14.8 |
| Recycling | 15 | 13.9 |
| Composting | 17 | 15.7 |
| Waste to energy | 7 | 6.5 |
| Source reduction | 7 | 6.5 |
| Others | 8 | 7.4 |
| Total | 108 | 100.0 |

**Source:** Primary Data

Table 4, the most commonly used processing systems for solid waste in the study area have been listed. Landfilling is the primary method, accounting for 35.2% of solid waste processing and disposal. Incineration and composting contribute to the next major portion, with 14.8% and 15.7%, respectively. The study area efficiently utilizes the landfilling method for processing and disposal of solid waste.

**Table 5 Schedule Municipality Collect the Waste Everyday**

| Particulars | Frequency | Percentage |
|---|---|---|
| Once a day | 27 | 25.0 |
| Twice a day | 47 | 43.5 |
| Thrice a day | 11 | 10.2 |
| Alternative days | 13 | 12.0 |
| Weekly once | 10 | 9.3 |
| Total | 108 | 100.0 |

**Source:** Primary Data

The above Table 5 emphasis the collection of wastes from home every day in the study area. Majority 43.5% of the households said that the waste collection from home being done twice every day. And remaining respondents says that there is no proper collection of wastes from home every day in the study area. Majority of households responded that there is no proper collection and management of waste from every day in the study area. The study reveals the collection timings of Tirupattur municipalities from the study area. The municipalities are collecting waste twice in a day from households.

## Findings

- The study discovered that Improper disposal of solid waste often leads to the contamination of water bodies such as rivers, lakes, and groundwater. The leachate from landfills containing hazardous chemicals seeps into the soil and pollutes water sources, posing serious health risks to communities relying on them for drinking water.
- Open burning of garbage, particularly plastic and organic waste, emits dangerous pollutants into the air, including dioxins, furans, and particulate matter. These contaminants cause respiratory ailments and damage air quality, affecting both human health and ecosystems.
- Improper landfill management causes land deterioration and the loss of fertile soil. Landfills can take up enormous tracts of land, destroying habitats and reducing biodiversity. Furthermore, the accumulation of non-biodegradable trash exacerbates issue of soil degradation, rendering the ground unfit for cultivation or other uses.
- Inadequate solid waste management procedures expose communities to a variety of health risks. The presence of microorganisms in uncollected garbage raises the danger of illnesses including cholera, typhoid, and hepatitis. Furthermore, scavenging rubbish for recyclable items exposes persons to harm and infections, exacerbating health inequalities.
- Improper waste management increases greenhouse gas emissions, particularly methane and carbon dioxide, which are major drivers of climate change. Landfills produce methane when organic garbage decomposes anaerobically, whereas open burning emits carbon dioxide and other greenhouse gases into the atmosphere, aggravating global warming and its consequences.

## Suggestion

To successfully address the environmental effects of solid waste management in India, coordinated actions at all levels are essential. To begin, rigorous rules and enforcement measures must be put in place to prevent unlawful garbage dumping and open burning. Second, increasing waste segregation at the source and investing in strong waste management infrastructure, such as recycling centres and sanitary landfills, may considerably minimize pollution. Furthermore, public awareness programs highlighting the significance of responsible waste management methods and the implementation of circular economy concepts are critical. Finally, increasing collaboration among government agencies, communities, and companies to create long-term waste management solutions will be critical in reducing environmental degradation and protecting public health.

## Conclusion

Addressing the environmental effect of solid waste management in India is critical for long-term growth and the well-being of its people. The findings highlight the critical need for comprehensive programs that address waste segregation, infrastructure development, public awareness, and regulatory enforcement. By efficiently implementing these policies and encouraging stakeholder engagement, India can reduce pollution, safeguard

natural resources, and build a healthier, more sustainable environment for current and future generations.

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**Author Details**

**D. Jeevan Vignesh,** *Research Scholar, PG & Research Department of Economics, Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, India,* ***Email ID****: jeevanvignesh11@gmail.com*