

A Study on Knowledge and Attitude of Individual Consumers towards E-Waste Management in Tamilnadu

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Abstract: E-waste (electronic waste) is a growing environmental concern worldwide, with Tamil Nadu emerging as a significant contributor due to its rapid technological advancements and increasing consumer electronics usage. This study examines the knowledge and attitude of individual consumers towards e-waste management in Tamil Nadu, highlighting awareness levels, disposal practices, and key barriers to effective recycling. The research finds that while awareness about e-waste exists, many consumers lack knowledge of proper disposal methods and the environmental hazards associated with improper handling. Urban consumers show higher awareness but limited participation in formal recycling programs, whereas rural areas struggle with low knowledge and infrastructure gaps. Most individuals store, sell to informal scrap dealers, or dispose of e-waste with general household waste, leading to environmental risks. Key barriers include lack of collection centers, financial incentives, convenience, and concerns over data security. This study highlights the urgent need for comprehensive awareness programs, expanded e-waste collection networks, and policy-driven incentives to encourage responsible e-waste disposal among Tamil Nadu's consumers. Addressing these gaps will lead to more sustainable e-waste management practices and contribute to environmental conservation.

Keywords: E-Waste Management, Sustainable Waste Management, Electronic Waste Disposal, Informal Recycling Sector, Extended Producer Responsibility (EPR).

Introduction

E-waste (electronic waste) is a rapidly growing environmental concern worldwide, especially in developing regions like India. Tamil Nadu, being a hub for IT, electronics, and industrial growth, generates a significant amount of e-waste. The way consumers perceive and manage e-waste plays a crucial role in effective waste disposal and environmental sustainability. This study explores the knowledge and attitudes of individual consumers in Tamil Nadu regarding e-waste management.

Objectives of the Study

To assess the level of awareness among consumers about e-waste and its environmental impact.

- To understand consumer behavior towards e-waste disposal.
- To examine attitudes towards recycling, refurbishing, and proper disposal of e-waste.
- To identify barriers to proper e-waste management in Tamil Nadu.

Literature Review

- Kumar et al. (2017) conducted a study in India and found that while urban consumers were somewhat aware of e-waste, their knowledge of proper disposal methods remained low.
- Raghupathy et al. (2019) focused on Tamil Nadu and reported that nearly 60% of consumers had heard about e-waste, but only 25% knew about formal disposal options.

- Mishra & Akhtar (2021) highlighted that rural populations in India, including Tamil Nadu, have significantly lower awareness about e-waste hazards compared to urban residents.
- Singh & Gautam (2020) explored consumer hesitancy in India and identified trust issues related to data security as a major barrier to e-waste recycling.
- E-Waste (Management) Rules, 2016 by the Government of India introduced the Extended Producer Responsibility (EPR) policy, requiring manufacturers to collect and recycle e-waste. However, studies suggest poor implementation at the consumer level.
- Chaudhary et al. (2018) found that despite existing regulations, only a small fraction of consumers were aware of government-led e-waste disposal initiatives in Tamil Nadu.
- Jain et al. (2021) studied corporate participation and found that brands like Apple and Samsung offer take-back programs, but consumer participation is low due to a lack of incentives and poor promotion.
- TNPCB (Tamil Nadu Pollution Control Board, 2022) reported that while Tamil Nadu has multiple authorized e-waste collection centers, many consumers do not utilize them due to lack of awareness and inconvenience.

Case Studies and Real-World Examples

To further illustrate the challenges and opportunities in e-waste management in Tamil Nadu, here are some relevant case studies and real-world examples:

Case Study 1: Chennai's Struggle with E-Waste Collection

Chennai, the capital city of Tamil Nadu, generates over 20,000 tons of e-waste annually. Despite being a major IT hub, the city faces significant issues in managing its e-waste. Chennai has several formal e-waste recycling centers, but most people still sell old electronics to informal scrap dealers who use unsafe recycling methods.

A survey conducted by the Tamil Nadu Pollution Control Board (TNPCB) found that only 30% of residents were aware of proper e-waste disposal methods. Many consumers admitted to hoarding old phones and laptops, fearing data breaches or lacking knowledge of where to dispose of them. Large IT companies follow e-waste disposal regulations, but households and small businesses contribute to improper disposal. Sharma, D., & Kulkarni, S. (2025)

Solution & Impact:

The Greater Chennai Corporation launched an e-waste collection drive in 2022, installing bins for small electronics across the city.

Some private companies started buyback schemes, encouraging consumers to exchange old gadgets for discounts.

Increased awareness campaigns led to a 15% rise in formal e-waste disposal within a year.

Setting up designated e-waste collection points in schools, colleges, and shopping malls made disposal easier.

Continuous awareness campaigns led to a 40% increase in proper e-waste disposal compared to the previous year.

Key Lesson:

Accessibility and incentives improve participation—when disposal becomes convenient, consumers are more likely to follow proper methods.

Local electronic retailers collaborated with recyclers, offering customers small discounts for returning old devices.

Educating the younger generation is crucial—they influence household decisions and adopt sustainable practices more easily.

Case Study 2: Rural Tamil Nadu - Lack of Awareness and Infrastructure

In contrast to urban areas, rural Tamil Nadu struggles with low awareness and lack of formal disposal infrastructure. A study in Tirunelveli district revealed shocking practices. Most residents dumped electronic waste with regular garbage or burned broken appliances. E-waste collection centers were non-existent, forcing consumers to rely on local scrap dealers. Many farmers and small business owners were unaware of the environmental hazards posed by improper disposal.

Solution & Impact:

A local NGO, in collaboration with the Tamil Nadu government, organized workshops in villages to educate residents.

The state introduced mobile collection vans to visit rural areas monthly, collecting e-waste.

After six months, e-waste dumping in landfills decreased by 25% in participating villages.

Key Lesson:

Rural outreach programs and mobile collection units can be effective in improving e-waste management.

The case studies highlight that Tamil Nadu's urban areas are making progress, but rural regions still require better infrastructure, awareness, and accessibility. Government and corporate participation, along with consumer incentives, play a crucial role in improving e-waste management.

Global Comparison: What Tamil Nadu Can Learn

- Sweden's Model: Sweden recycles over 95% of its e-waste due to strict regulations and incentive-based collection programs.
- Japan's Extended Producer Responsibility (EPR) System: Electronics manufacturers are required by law to take back and recycle old products.
- India's Best Practices (Bangalore's Initiative): Bangalore has implemented door-to-door e-waste collection services, making it easier for residents to dispose of their electronics properly.

Methodology

A mixed-method approach is used in this article. It is an explanatory technique with both quantitative and qualitative methods. Quantitative data were collected from 350 respondents and selected through simple random sampling using questionnaire. Qualitative data were obtained from few consumers, recyclers, Producers Responsible Organisations and importers of electronics through interview method. Socio demographic details and disposal practices were summarized as frequencies and percentages.

- Study Area: Tamil Nadu (urban and rural regions).
- Data Collection: Surveys and interviews with individual consumers and organisations.
- Sample Size: A diverse group of 350 respondents covering different age groups, occupations, and education levels.

➤ Data Analysis: Statistical tools as SPSS, frequency distribution and percentage analysis to evaluate knowledge levels, attitudes, and disposal practices.

Analysis and Interpretation

On assessing consumer awareness of e-waste, the following results shown in Table 1 were observed. More than half of them (59.4%) were unaware of the term “e-waste or e-waste handling” and the majority (79.4%) were unaware of e-waste legislation in our country.

Table 1. Level of awareness among consumers about e-waste

Knowledge on e-waste handling	Good knowledge	Poor knowledge
Aware of the term “e-waste or e-waste handling”	139 (40.5)	204 (59.4)
Aware of ill effects of e-waste on health and environment	280 (81.7)	63 (18.3)
Aware of e-waste handling before disposal (reuse or donate)	297 (86.6)	46 (13.4)
Aware of available options for disposal of e-wastes	220 (64)	123 (36.1)
Aware of e-waste segregation at house hold level	327 (95.4)	16 (4.6)
Aware of e-waste legislation available in our country	71 (20.6)	272 (79.4)

The majority of consumers (84%) strongly believed that “E-waste handling and disposal should be improved in India.” The level of attitude toward e-waste handling and management of consumers is shown in Table 2.

Table 2. Description of the consumer behaviour towards e-waste disposal

Consumer behavior towards e-waste disposal	Good (%)	Poor (%)
E-waste handling and disposal should be improved in India	288 (84.0)	55 (16.0)
Storing e-wastes in homes is harmful	269 (78.3)	74 (21.7)
E-wastes have a harmful effect on environment and human health	340 (99.1)	3 (0.86)
Increasing global demand on electronic devices is a serious problem	269 (78.3)	74 (21.7)
Important to recycle e-waste before disposal	221 (64.6)	122 (35.4)
Electronic devices not working are considered waste	43 (12.6)	300 (87.4)

The distribution of disposal methods used by e-waste handlers is shown in Table 3. The scoring of the questions based on awareness revealed that 76% respondents had high awareness. The scores of the perception subscale showed that 70% respondents had good perception.

Table 3. Distribution of disposal methods used by e-waste handlers

Disposal methods	No. of respondents	Percentage
Sold to second hand dealer	34	10%
Donation	13	4%
Scrap dealer	122	35%
Storage	58	16%
Disposed with house hold waste	72	21%
Exchanged with new purchase	51	14%

The association of independent variables with knowledge and perception scores is tabulated in Table 4. Education sub grouped as less or more than 10th grade and occupation had significant associations with good knowledge and attitude scores. Education ≥ 10 th grade was an independent predictor for both good knowledge and attitude. Further, the predictors of good knowledge and attitude on e-waste were male gender and skilled workers. The determinants of poor knowledge and attitude on e-waste management were drawn using linear regression which is shown in Table 5

Table 4. Association of independent variables with knowledge and attitude of consumers

Independent variable	Subcategory	Awareness		Attitude	
		Mean $\pm$ SD	t	Mean $\pm$ SD	t
Age(years)	<35	4.01 $\pm$ 0.94	1.256	4.89 $\pm$ 1.22	-0.667
	>35	3.88 $\pm$ 0.89		4.98 $\pm$ 1.09	
Gender	Males	3.86 $\pm$ 0.84	-2.679*	4.92 $\pm$ 1.18	-0.151
	Females	4.13 $\pm$ 1.01		4.91 $\pm$ 1.18	
Education	<10 th grade	3.83 $\pm$ 0.97	-2.668*	4.47 $\pm$ 1.40	-6.877*
	≥ 10 th grade	4.09 $\pm$ 0.86		5.29 $\pm$ 0.78	
Occupation	Unskilled, students and homemakers	3.95 $\pm$ 0.91	-2.830*	4.84 $\pm$ 1.18	-2.321*
	Skilled and professional	4.56 $\pm$ 1.91		5.18 $\pm$ 1.12	
Average income	Annual income<2.5 lakhs	3.94 $\pm$ 0.92	-0.963	4.82 $\pm$ 1.19	-2.644*
	Annual income>2.5 lakhs	4.06 $\pm$ 0.94		5.21 $\pm$ 1.11	

* $P < 0.05$ is statistically significant by independent t -test. SD=Standard deviation

Table 5. Multiple regression analysis results: Factors related to awareness and attitude of consumers

Independent variable	Awareness		Attitude	
	β co-efficient	F	β co-efficient	F
Age>35years	-0.171	2.336	-0.111	0.649
Male : Gender	-0.246	5.411*	-0.023	0.031
Education: $\geq 10^{\text{th}}$ grade	0.276	6.373*	0.852	40.04*
Occupation: Skilled and professional	-0.201	0.320	-0.758	4.337*
Average income: >2.5 annual lakhs	0.220	0.172	0.702	1.155

*P<0.05 is statistically significant

Findings and Discussion

The study on the knowledge and attitude of individual consumers towards e-waste management in Tamil Nadu reveals several critical insights. These findings highlight gaps in awareness, behavioural patterns, and challenges faced by consumers in managing e-waste effectively.

1. Knowledge of E-Waste Among Consumers

A significant portion of consumers recognize what e-waste is but have limited understanding of its environmental and health hazards.

Many believe that e-waste simply refers to non-functional electronics, without considering end-of-life devices like old mobile phones, batteries, chargers, and accessories.

Awareness about toxic materials in e-waste (e.g., lead, mercury, cadmium) is low, especially in rural areas.

2. Current E-Waste Disposal Practices

- **Selling to Scrap Dealers:** Many consumers sell old electronics to local scrap dealers (kabadiwalas) without ensuring proper recycling.
- **Storage at Home:** A large number of people keep non-functional devices at home, either due to sentimental attachment or uncertainty about disposal options.
- **Dumping with General Waste:** Some individuals discard small electronic items in household garbage, leading to improper landfill disposal.
- **Returning to Retailers:** Only a small percentage of consumers return devices through official take-back programs offered by manufacturers.

3. Attitudes Towards Recycling and Proper Disposal

- **Support for Recycling:** While most consumers agree that recycling is beneficial, few actively participate due to inconvenience.

- **Lack of Motivation:** Many people do not prioritize e-waste management because it does not provide immediate personal benefits.
- **Trust Issues:** Some consumers fear data security risks when recycling electronic devices, making them hesitant to hand over old gadgets.
- **Limited Awareness of Recycling Centers:** Even in urban areas, consumers are unaware of nearby e-waste collection points.

4. Barriers to Effective E-Waste Management

Limited Access to Collection Centers: In many towns and villages, there are no dedicated e-waste drop-off points.

- **Inadequate Awareness Campaigns:** Government and corporate initiatives exist, but they do not effectively reach the public.
- **Informal E-Waste Sector Dominance:** Local scrap dealers handle most e-waste, often using unsafe recycling methods that harm the environment.
- **Lack of Incentives:** Unlike plastic or paper recycling, consumers do not see financial benefits in e-waste recycling.

5. Role of Government and Corporate Initiatives

Government Policies Exist but Need Strengthening: Tamil Nadu follows the E-Waste Management Rules, 2016, but enforcement is weak at the consumer level.

- **Manufacturers' Take-Back Programs Underutilized:** Major electronics brands offer collection and buyback schemes, but public participation remains low due to lack of awareness.
- **Corporate Social Responsibility (CSR):** Some companies and NGOs run e-waste awareness programs, but their outreach needs to expand.

6. Differences Between Urban and Rural Consumers

- **Urban Consumers:** More aware of e-waste hazards but still lack proper disposal habits.
- **Rural Consumers:** Limited knowledge and fewer recycling facilities, leading to improper disposal in landfills or burning.
- **Tech-Savvy Youth vs. Older Generations:** Younger individuals are more open to recycling initiatives, while older consumers often store or discard e-waste improperly.

Recommendations

- **Awareness Campaigns:** Educational programs in schools, colleges, and workplaces to spread knowledge about e-waste hazards.
- **Accessible Collection Centers:** More drop-off points for easy disposal.
- **Incentives for Recycling:** Financial benefits, discounts, or exchange programs for responsible disposal.
- **Stronger Regulations:** Enforcing proper disposal practices through policies and penalties.
- **Corporate Responsibility:** Encouraging manufacturers to adopt take-back schemes and sustainable production.

Conclusion

E-waste management in Tamil Nadu requires a combination of consumer awareness, government policies, and industry participation. By improving knowledge and changing attitudes, individuals can contribute to a cleaner and more sustainable environment. Strengthening infrastructure and incentives can drive positive behavioural changes toward responsible e-waste disposal. The study indicates that while Tamilnadu's consumers have some awareness of e-waste, their attitude towards proper disposal is passive due to various challenges. Bridging this gap requires stronger awareness campaigns, improved recycling infrastructure, and incentive-driven programs to encourage responsible e-waste management.

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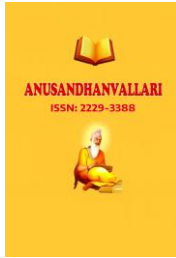
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