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# Stakeholder Assessment of the Implementation of E-Waste (Management) Rules, 2022 In India: A Case Study of the State of Kerala

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***Abstract***
*Electronic waste (e-waste) has been expanding around the world. Since 2011, India has enacted Rules for e-waste management from time to time and recently, the E-waste (Management) Rules, 2022 were enacted. Factors like inadequacy of Rules, lack of formal recycling, and unawareness of consumers contribute to improper management of e-waste in India. It is in this scenario that a study on the effectiveness of the Rules in India needs to be considered. The objective of the paper is to analyse the implementation of Rules in the state of Kerala to understand its effectiveness and to suggest effective mechanisms to overcome the hindrances in implementation. The authors have identified issues with implementation, such as non-filing of annual reports and inaction on the part of several stakeholders. The paper recommends an improvement in the provisions by the enactment of an all-inclusive regulation addressing effective and innovative methods for e-waste management in India.*
***Keywords:*** *E-waste in India, E-waste (Management) Rules, 2022, Kerala, Model Bill on e-waste management*

## INTRODUCTION

Electronic waste has immensely grown over the years owing to technological advancements, digitalisation etc. The work and study from home during the pandemic has contributed to a severe increase in the use of electronic products (Bawkar et al., 2024). India's e-waste is accelerated by the growing digital transformation (Kumar, 2025). The e-waste generation is estimated based on the amount of sales data given to the Central Pollution Control Board (CPCB) by the producers and the average life of an electronic product. The Ministry of Housing and Urban Affairs released the following data on the quantity of e-waste generated at the National level in the last five years (Rajya Sabha, 2024).

| Financial Year | E-Waste Generation(Metric Ton) |
|---|---|
| 2019-20 | 10,14,961 |
| 2020-21 | 13,46,496 |
| 2021-22 | 16,01,155 |
| 2022-23 | 16,09,117 |
| 2023-24 | 17,51,236 |

Figure 1: Quantity of E-Waste generation during the last five years.

As per the data analysed from the average life of electronic products in India, e-waste has increased by more than seven hundred thousand in the last five years. In 2024, nearly 57% of e-waste, i.e., equivalent to 990,000 MT, still remains unprocessed in the country (Pandey, 2024).

"In addition to domestic e-waste, the country is also a magnet for e-waste from countries such as Yemen, the United States, and the Dominican Republic, making India the third-largest importer of it in the world, from both legal and illegal sources" (Sharma, 2025).

The fast-paced growth of e-waste in India warranted a more effective mechanism to manage electronic waste properly. In 2011, a set of guidelines was initially introduced by the 'Central Pollution Control Board (CPCB)' for proper administration of electronic waste which was subsequently followed by the E-waste (Management and Handling) Rules, 2011. The central government implemented the revised E-waste (Management) Rules, 2016 (2016 Rules) to address the limitations of the 2011 Rules. On 2nd

November 2022, the Ministry of Environment, Forest & Climate Change ('MOEFCC') replaced the E-waste (Management) Rules, 2016 and notified the E-waste (Management) Rules, 2022 (2022 Rules). It is in this scenario that the effectiveness of e-waste management Rules in India needs to be analysed.

Kerala has established systems in other waste management. In 2022 Kerala introduced a QR code system for solid waste management which can be scanned in the 'Harithamitram' mobile application to obtain information regarding the type of waste, amount of waste, date of delivery, user fee paid etc. (Times of India, 2025). The existence of an established system for other waste management can act as a catalyst for establishing a system for e-waste management. Kerala was selected for the empirical study to avoid the language barrier as 95% of e-waste in India is handled by the informal sector (Times of India, 2025). Kerala State Pollution Control Board was one among the few who had submitted the e-waste annual report.

The present paper is aimed at analysing the effectiveness of the existing e-waste management Rules and to look at the implementation of the E-waste (Management) Rules, 2022 in the State of Kerala. The authors intend to suggest an all-inclusive approach for effective electronic waste management in India focussing on the provisions of the legal framework.

## METHODOLOGY

This paper adopts a mix method approach. The doctrinal component is based on the literature survey by using various legal and academic databases focussing on articles, reviews and studies on growth of electronic waste in India and the enforcement of E-waste (Management) Rules, 2022. The doctrinal study facilitates in evaluating the legal framework for e-waste management in India to identify the inconsistencies and ambiguity and provide the ground for the empirical research.

The qualitative method has been used to identify the stakeholders to obtain comprehensive knowledge from the stakeholders who are directly involved in the process of e-waste management. This approach will help in analysing compliance with regulations, challenges in e-waste handling and management, and awareness levels.

The empirical research methods are employed to analyse the implementation of E-Waste (Management) Rules, 2022 by the stakeholders in the state of Kerala (India). Kerala is featured for its high literacy rate and environmental consciousness among other states in India (Census, 2025). The IT industry in Kerala has been ever-growing in the past decade, 181 new companies opened IT parks in Kerala amidst the pandemic (Schneide, 2024). The growth of the IT industry has contributed to the increase in e-waste in Kerala. The high literacy rate, environmental awareness, and establishment of separate projects by the state for the management of other waste signify the importance given to the environment in Kerala, leading to the possibility of establishing proper e-waste management. Kerala was selected for the empirical study based on the availability of published data, 'Annual Report on E-Waste Management' by the Kerala State Pollution Control Board, which provides the list of authorised stakeholders, which is a manageable number of respondents for the study.

The study was designed to be conducted among the stakeholders i.e., manufacturer, producer, collection centre, refurbisher, dismantler and recycler. These stakeholders have been identified under the e-waste Rules, who are responsible for ensuring proper collection and the effectiveness of e-waste at the ground level. As per the Annual Report 2022-23 on e-waste by the Kerala State Pollution Control Board, there are no authorised manufacturers in Kerala. There is only one authorised refurbisher, one authorised recycler and one authorised dismantler working in Kerala. Hence, the questionnaire was circulated only among the producers and collection centres all over Kerala. 40 stakeholders i.e. producer and collection centres were identified based on the Annual Report 2022-23 of the Kerala State Pollution Control Board and a survey using questionnaire was conducted.

### Limitations of the Study

As there are no manufacturers and there is only one authorised refurbisher, one authorised recycler and one authorised dismantler working in Kerala it was not possible to reach out to all the stakeholders. As the primary data was collected through the questionnaire method, some answers may be subject to response bias.

## BACKGROUND

### E-waste in India

In 2020, India was reported as the third-largest producer of electronic waste. 38% of the 53.6 million tonnes (Mt) of electronic waste across the world is from India, China and the United States (C.P. Baldé,

2022). From the data released by the Lok Sabha in 2022, it can be understood that not even 25% of the electronic waste generated in India is collected (Jadhav, 2022).

The adoption of e-waste management Rules in 2011 was a major step for India; even then, there are many challenges in the implementation and management of e-waste. 95% of e-waste in India is handled by the informal sector, which leads to unsafe methods of handling e-waste, which affects the health and environment adversely (MAIT-GTZ, 2007). However, the informal sector has not been identified in any of the policies or regulations. There has been no authorisation for the informal e-waste recycling business. They continue to run without observing any Rules or safety, employing low-wage workers, including children, who handle the e-waste, ignoring their health and the environment (Bagwan, 2024). The informal workers have established a highly efficient network; however, the sorting and recovery of valuable materials exposes the workers to hazardous chemicals, affecting the environment and their health (Bhat, 2023). Informal workers depend on crude processes such as open burning or acid baths, which contaminate the surroundings (Puri et al., 2025).

The E-waste (Management and Handling) Rules, 2011 had identified the lack of inventory on e-waste generated. In order to mitigate the lack of data, the State Pollution Control Boards (SPCBs) were authorised to integrate the state-wise inventory of e-waste. Unfortunately, it has been nearly impossible for most SPCBs to collect the sales data of electronic products, let alone the e-waste generated. The aggregate sales of electronic products at the national level have made it difficult to assess the e-waste generated state-wise. Moreover, the illegal import of e-waste is contributing to the already existing amount of e-waste in India, which is negatively affecting the effective implementation of collection and recycling of e-waste (Turaga et al., 2019). Many times, the imported goods are sent as second-hand products, which are donated to organisations for use. The State of India's Environment Report in 2022 reported that most SPCBs did not provide any data on e-waste (Roy, 2021).

In the present day, electronic products are manufactured on the linear strategy of "take-make-dispose" (Bagwan, 2024). Adding to the problem of e-waste is the designed-to-dump strategy of the companies, where products are becoming obsolete in two to three years. "For instance, the use of glues that make opening up the case non-viable or the use of special screws that cannot be opened with the help of a universal screwdriver. In terms of software, products are designed to lose functionality by excluding them from the software or operating system upgrades" (Gandhiok, 2022). It is indirectly forcing consumers to buy new products with the latest technology, which is making the older devices useless, thereby leading to more e-waste. Planned obsolescence is the new marketing strategy of many companies as more products can be manufactured and sold.

The viability of extended producer responsibility in India needs to be evaluated, as it is challenging to keep track of electronic products as they are resold several times before they reach the end of life (Rajya Sabha Secretariat, 2011). The rise of e-commerce leads to the infiltration of foreign companies that sell online without any physical presence in India, and accountability from such companies is another issue that needs to be considered. As they are not registered under the EPR, it creates a loophole for avoiding responsibilities as a producer and cost (Mahesh & Dixit, 2019).

In 2016, there were only 178 authorised recyclers, but this has increased to 569 authorised dismantlers/recyclers as per the authorisation issued by SPCBs/PCCs in June 2023 (CPCB, 2023). Unfortunately reports suggest that not even 50% of the capacity of the formal recyclers has been utilised (Mohan, 2022).

Another detrimental factor in effective e-waste management is the unawareness of consumers. Consumers are unaware of the constituents of e-waste and the effects of improper handling of e-waste on the environment and the health of the community. It has been ingrained in the Indian society to receive payment for selling e-waste to the scrap dealers who come from door to door (Turaga et al., 2019). Many products that are functional are stored as backup devices in many homes (Shevchenko, 2019). There is a need for effective awareness programmes for all stakeholders. India needs to introduce innovative technology for recycling with the support of the e-waste regulations to effectively handle the emerging e-waste production (GRPL, 2024).

**E-waste Management Rules**

In 2011, the E-waste (Management and Handling) Rules, 2011(2011 Rules) were enacted as the first legal framework in India for e-waste management. The 2011 Rules established the principle of Extended Producer Responsibility (EPR) in India. However, the existing practices of e-waste management continued without any change or improvements from the 2011 Rules. In order to mitigate the issues of the 2011 Rules, the E-Waste Management Rules, 2016(2016 Rules) were brough into force. The 2016 Rules

broadened the scope of e-waste by expanding to components, consumables, spares, and parts of EEE in addition to equipment as listed in Schedule I, which were only two categories of electrical and electronic equipment. The responsibilities of manufacturers, dealers, refurbishers, consumers, and dismantlers were broadened, and collection targets were introduced. Even then, it has not been possible to fulfil the collection targets by the producers, and there was no proper data on e-waste collected and processed.

The continued growth of e-waste, low recycling rates, and lack of accountability warranted an improvement to the existing Rules for streamlining e-waste management. This led to the enactment of E-Waste (Management) Rules, 2022 (2022 Rules).

**E-Waste (Management) Rules, 2022**

The E-Waste (Management) Rules, 2022 (2022 Rules) have broadened the scope for e-waste management with mandatory registration requirements and modified the EPR approach. The definition of e-waste has been broadened to include solar photovoltaic modules, panels, or cells which are discarded as waste (Rule 3 of 2022 Rules). Seven categories of electrical and electronic equipment, including their components, consumables, parts, and spares, have been inserted to be covered under the Rules. The definition of Extended Producer Responsibility has been made more specific, such that the producer has the responsibility to meet recycling targets according to Schedule III and IV through registered recyclers for environmentally sound management of electronic waste. Under Rule 3 (t) the definition of producer has been widened to include any person or entity who imports used electrical and electronic products.

Rule 4 of the 2022 Rules has mandated compulsory registration for the entities, and they should not deal with an unregistered manufacturer, producer, refurbisher or recycler. In case false information or inadequate information is not provided, the Central Pollution Control Board (CPCB) can revoke the registration and levy compensation. Registration fee and annual maintenance charges are fixed by the CPCB based on the capacity of e-waste generated, recycled or handled with the approval of the Steering Committee.

Rule 14(1) specifies the concept of the extended producer responsibility certificate. From the Central Pollution Control Board (CPCB) portal, a registered recycler can obtain an extended producer responsibility certificate. The validity of the extended producer responsibility certificate shall be for a period of two years. The certificate will have a unique number containing the year of generation, the code of the end product, the recycler code and a unique code. For a registered refurbisher, a refurbishing certificate can be obtained from the portal.

The principle of deferred liability, i.e., the producer can obtain the refurbishing certificate from the refurbisher, whereby the extended producer responsibility can be deferred according to the duration given by the Central Pollution Control Board (CPCB). This will be added to the extended producer responsibility of the producer when the refurbished product reaches its expiry, and an incentive of 75% of the deferred quantity is added to the extended producer responsibility for recycling when it reaches expiry. The duty of the producer is extended till the end-of-life disposal of the refurbished product through a registered recycler.

The 2022 Rules also have enacted the principle of Environmental Compensation and Prosecution. For the imposition and collection of environmental compensation from entities that violate the provisions of the Rules and guidelines issued the Central Pollution Control Board shall establish guidelines with the approval of the Ministry of Environment, Forest and Climate Change.

The growth of IT industry has aided in the vast generation of e-waste in Kerala and how it is handled in the state is a question that needs to be addressed. Kerala have established a separate project under the leadership of local self-government bodies known as 'Haritha Keralam Mission focused on Water Conservation, Sanitation, Waste Management and Agriculture (Haritha Keralam Mission, 2016). 'Harithakarma Sena', which embeds environmental stewardship at the local level, has been instrumental in waste management in Kerala. Yet there have been significant gaps in handling waste from segregation to unsafe disposal methods and even interstate disposal of waste (Aishwaryaa, 2024). All these factors make Kerala which has an already established proactive system for other waste management an ideal place to evaluate e-waste management.

**Findings and Analysis**

The stakeholders were very suspicious of the purpose of the study. Many of them were very reluctant to respond as they were registered because of the compulsion in the Rules and were not willing to participate. Some of the respondents had registered as they were importers of electrical and electronic equipment, and without registering in the portal, they cannot operate as per the Rules. Some of the respondents had

recently registered and had not established a plan for the collection and filing of annual returns. Several of the stakeholders in the list were closed down or on the verge of shutting down their operations.

The empirical study aided in analysing the compliance and awareness of the producers and collection centres in the implementation of the 2022 Rules. The questionnaire assisted in gaining an understanding of the working and application of the 2022 Rules at the ground level. The findings of the empirical research are discussed.

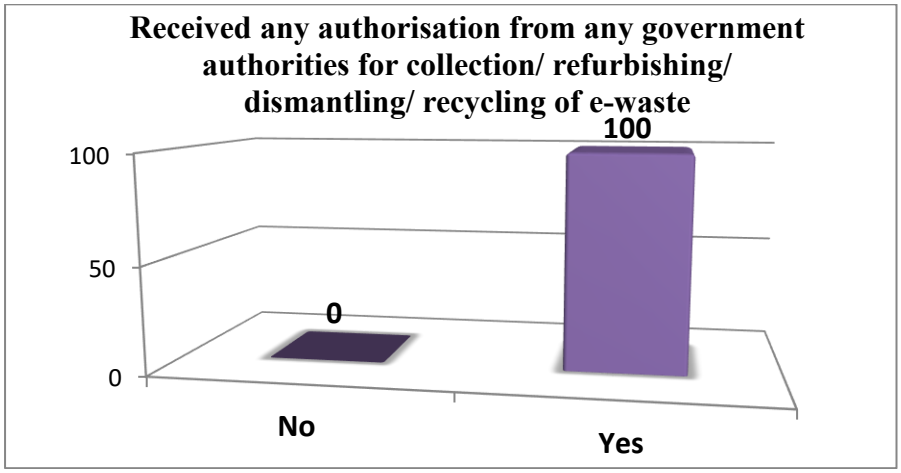


Figure 1: Diagrammatic representation of percentage distribution of respondents based on "Received any authorisation from any government authorities for collection/ refurbishing/ dismantling/ recycling of e-waste?"

From Figure 1, it is clear that all (100%) respondents had received authorisation from government authorities for the collection/ refurbishing/ dismantling/ recycling of e-waste. The Rules mandate that entities have to register to conduct business, so all the respondents have received authorisation to operate. The stakeholders have been identified from the Annual Report of the Kerala State Pollution Control Board, which makes them authorised producers and collection centres.

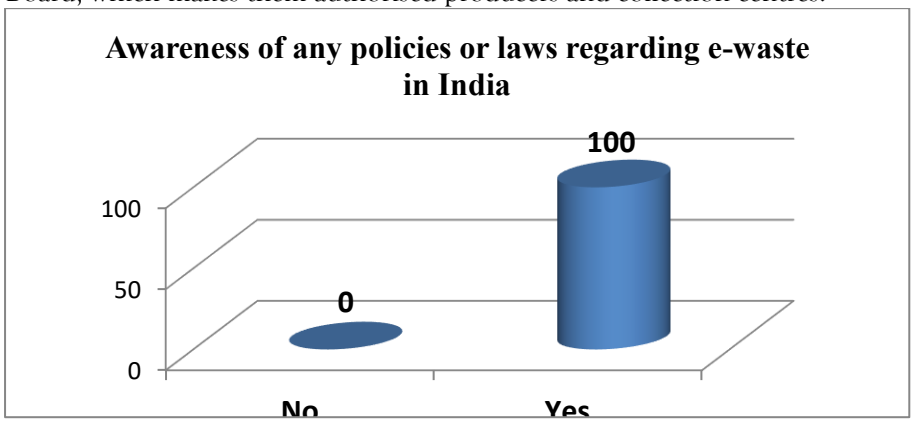


Figure 2: Diagrammatic representation of the percentage distribution of respondents based on awareness of any policies or laws regarding e-waste in India.

As all the respondents are authorised by the Kerala State Pollution Control Board, there is awareness about the Rules in existence for e-waste management. The authorisation by the Kerala State Pollution Control Board denotes that they have knowledge about the Rules as they are mandated under the Rules.

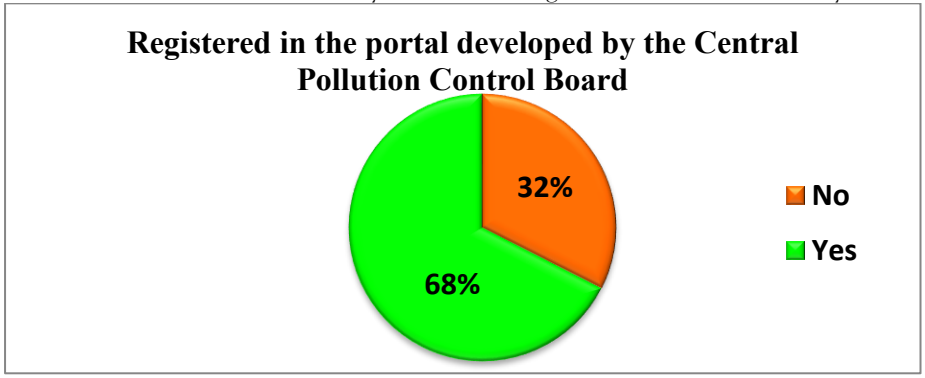


Figure 3: Diagrammatic representation of the percentage distribution of respondents registered in the portal developed by the Central Pollution Control Board.

According to section 4 of the 2022 Rules, producers are mandated to be registered under the portal. 67.5% of the respondents, i.e., all the producers, have registered in the portal developed by the Central Pollution Control Board, while 13 respondents have not registered as they are collection centres. The portal and the e-waste Rules have not mandated the collection centres to be registered.

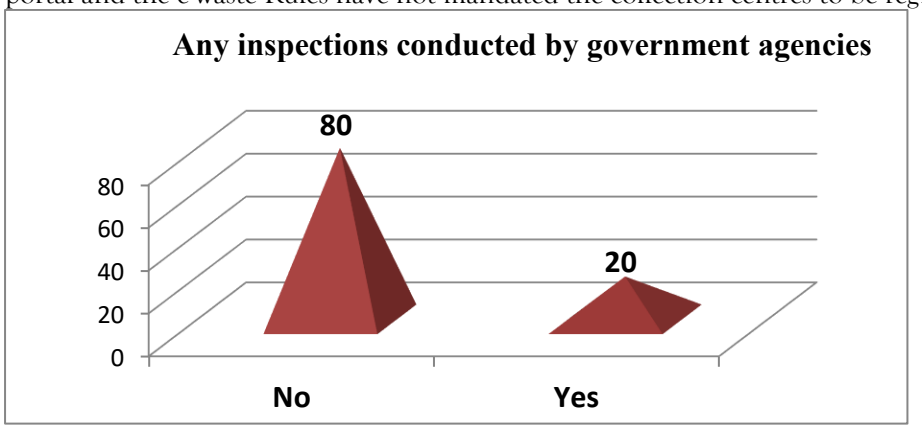


Figure 4: Diagrammatic representation of percentage distribution of respondents based on any inspections conducted by government agencies.

From the above figure 80% of the respondents answer that no inspections have been carried out by the Government Agencies, only 20% have answered that there has been an inspection. The lack of inspection provides a leeway to the stakeholders in not strictly implementing the obligations as per the Rules. There is no scope for checks and balance as there are no inspections conducted by the authorities.

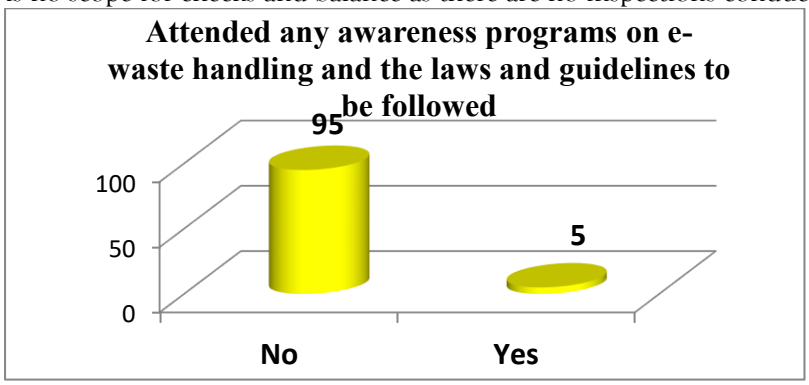


Figure 5: Diagrammatic representation of percentage distribution of respondents based on attended any awareness programs on e-waste handling and the laws and guidelines to be followed.

From the above diagram, 95% of the respondents answered that they had not attended awareness programs on e-waste handling and the laws and guidelines to be followed whereas only 2 had attended. The stakeholders engaged in handling e-waste is not receiving any awareness or training on e-waste. The 2022 Rules does not provide any provisions for creating awareness to the stakeholders.

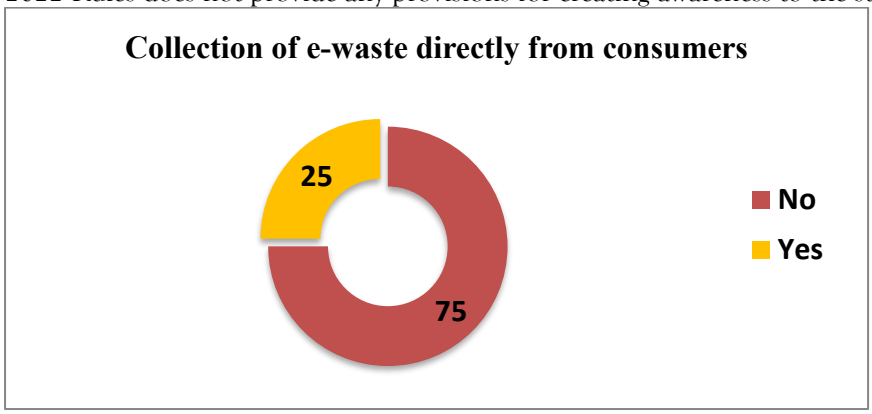


Figure 6: Diagrammatic representation of percentage distribution of respondents based on collection of e-waste directly from consumers.

From the diagram it can be seen that only a quarter (25%) of the respondents collect e-waste directly from the consumers. This raises the question of accessibility of consumers in disposing their e-waste as only 10 respondents are collecting e-waste directly from consumers. The 2022 Rules specify extended producer

targets to be attained each year but with only 10 stakeholders collecting e-waste what methods are used by consumers to dispose e-waste is a pertinent issue that needs to be addressed.

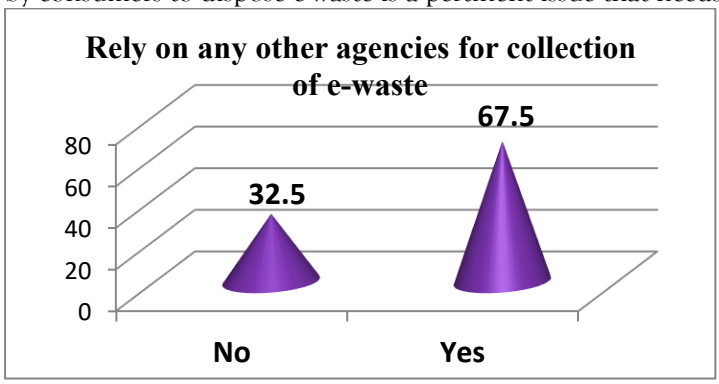


Figure 7: Diagrammatic representation of percentage distribution of respondents based on rely on any other agencies for collection of e-waste.

Around 67.5% of the respondents conveyed that they rely on other agencies for collection of e-waste. But the other 32.5% do not. Most of the stakeholders are relying on other agencies for collecting e-waste. This leads to unaccountability and non-compliance with the provisions of the Rules. There is no mechanism for monitoring and ensuring compliance to the regulatory framework by the third-party collectors of e-waste.

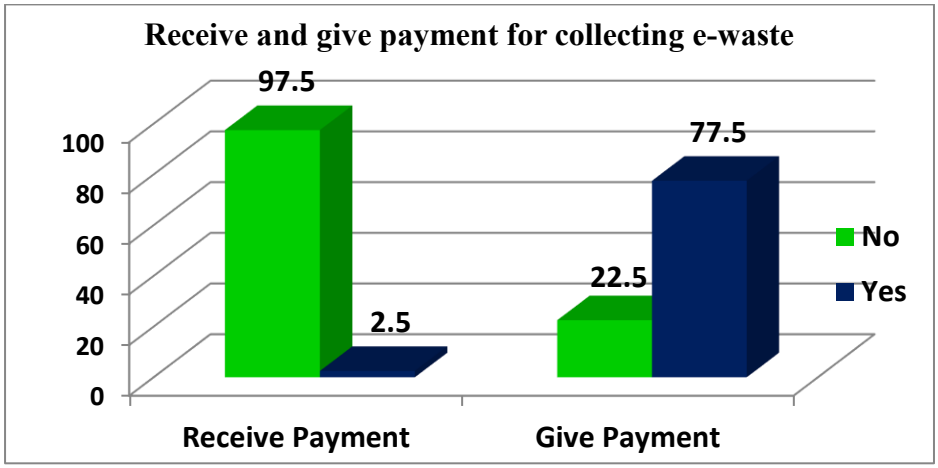


Figure 8: Diagrammatic representation of the percentage distribution of respondents based on receiving and giving fee payment for collecting e-waste.

The financial aspect of e-waste management points out that 77.5% of respondents have to pay for the collection of e-waste. Only 2.5% receive payment for collecting e-waste. The majority of the stakeholders have to bear the financial burden from collection to recycling, which acts as a reason why many stakeholders do not directly collect e-waste from consumers. This depicts the consumer mindset that they have to receive payment for giving the e-waste for recycling. This consumer expectation leads to handing e-waste to informal workers who willingly pay for the e-waste.

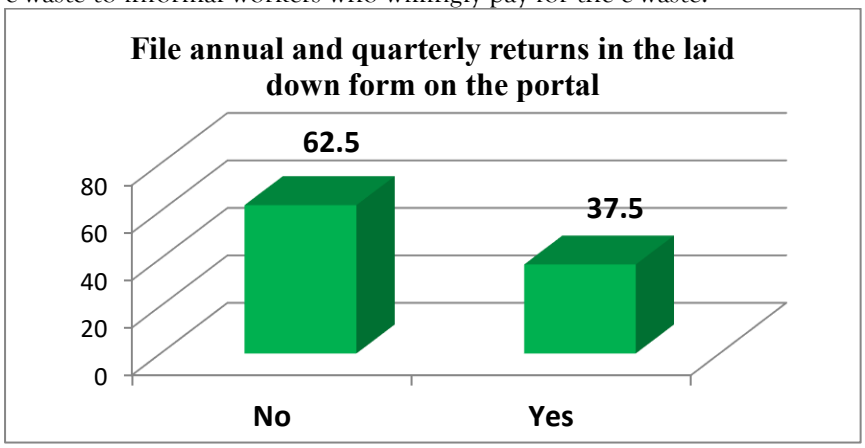


Figure 9: Diagrammatic representation of the percentage distribution of respondents based on filing annual and quarterly returns in the laid-down form on the portal.

From the data, 62.5 % (25) of the respondents are not filing the annual and quarterly returns in the laid-down form on the portal, and only 37.5% (15) of the respondents are filing the returns. The majority of the stakeholders have not filed annual and quarterly returns in the portal. This depicts the gap in compliance with the mandate provided under the 2022 Rules. This also leads to the problem of effective monitoring and a lack of data on the e-waste generated. There is an unawareness as to the significance of filing data in the portal. As per section 3(t) of the 2022 Rules, "producer means any person or entity that offers to sell electrical and electronic equipment and their components, consumables, parts, or spares". An importer of electronic parts or components are not filing annual return as they have already sold the product and it has been used for manufacturing other products.

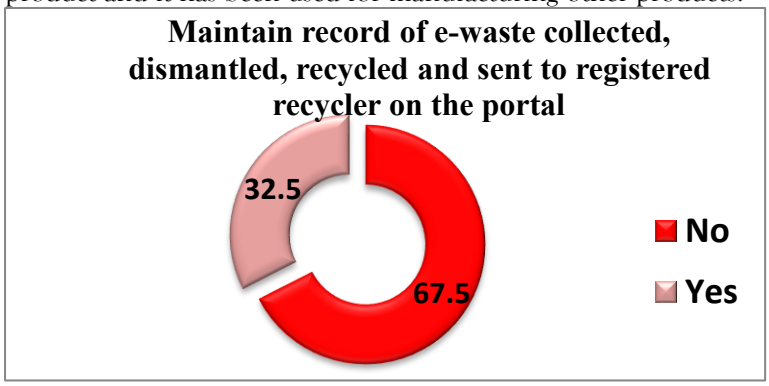


Figure 10: Diagrammatic representation of percentage distribution of respondents based on maintaining record of e-waste collected, dismantled, recycled and sent to registered recycler on the portal.

67.5% of the respondents do not maintain record of e-waste collected, dismantled, recycled and sent to registered recycler on the portal only 32.5% maintains records. This indicates the non-compliance in maintenance of records. There is reluctance on the part of stakeholders as they are importers of components or consumables or spares.

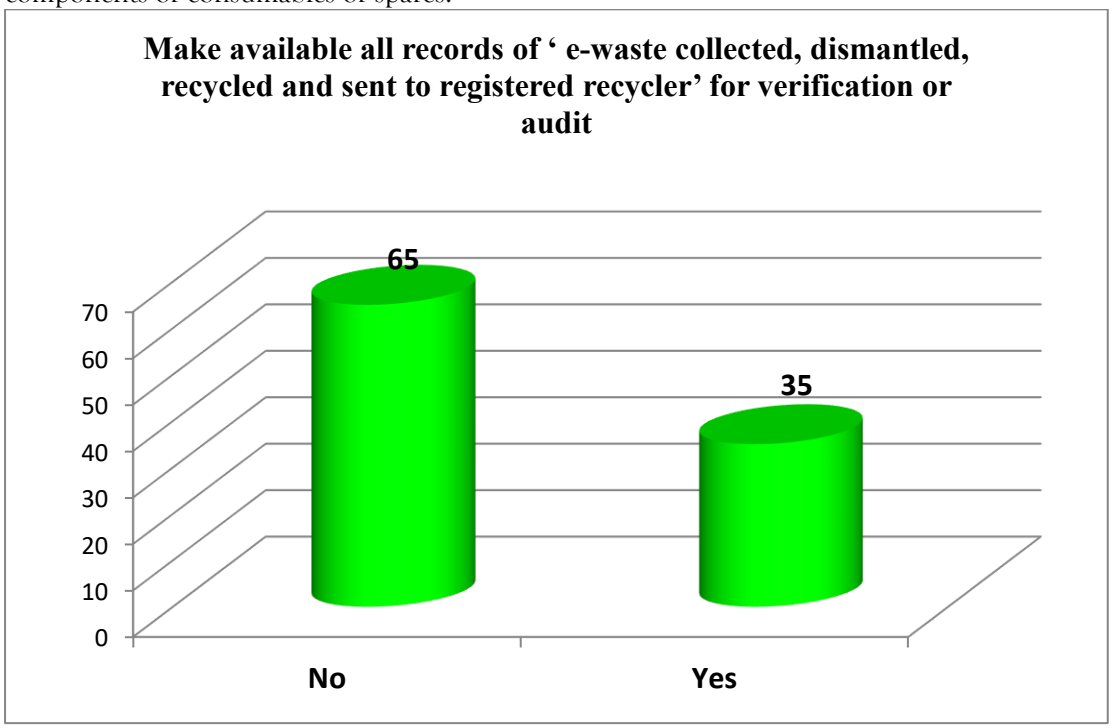


Figure 11: Diagrammatic representation of percentage distribution of respondents based on making available all records of 'e-waste collected, dismantled, recycled and sent to registered recycler' for verification or audit

From the above data it can be understood that 65% of the respondents are not divulging the records of e-waste collected, dismantled, recycled and sent to registered recycler for verification or audit. Only 35% of the respondents have the data for verification. This shows that many stakeholders are not maintaining data of e-waste collected, dismantled, recycled and sent to registered recycler. Section 24 of the 2022 Rules enables the CPCB the power to verify compliance by conducting inspections and audit. This lack of data and non-compliance leads to mismanagement of e-waste.

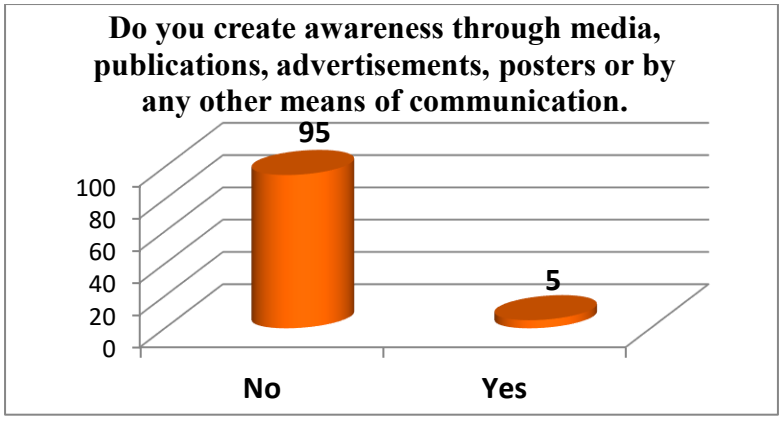


Figure 12: Diagrammatic representation of percentage distribution of respondents based on "Do you create awareness through media, publications, advertisements, posters or by any other means of communication".

Only 5% of the respondents create awareness through media, publications, advertisements, posters or by other means of communication, while other 95% do not. The gap in responsibility given under chapter 3 of the 2022 Rules is clearly visible from this response. Awareness is an essential part in establishing proper e-waste management. Unfortunately, only 2 stakeholders have created awareness through any form of communication. The lack of creating awareness is negatively affecting the e-waste management from the grassroot level.

From the study it can be observed that the stakeholders are aware about the e-waste management Rules. Despite the awareness regarding the Rules, the compliance to the provisions of Rules is only by very few stakeholders. Majority of the stakeholders have not received any awareness on handling or management of e-waste. More than 30% have not registered in the portal as an option for registration of collection centres is not provided in the portal. Only 10 stakeholders collect e-waste directly from consumers. The lack of direct collection and reliance on third party for collection of e-waste is clearly visible from the study as 68% of stakeholders rely on other agencies for collection to recycling. More than 60% of the stakeholders do not file annual and quarterly returns in the form and the majority do not have data on collection and send for recycling. This again leads to lack of data on e-waste generated. The non-filing of returns, lack of maintenance of record and non-availability of data for audit highlights the prevailing non-compliance with respect to the responsibilities provided under the Rules. There is also need for technical support and ease of access to upload data in portal. The consumer mindset is set in receiving payment for handing e-waste for recycling. Majority of the stakeholders have not done anything to create awareness among the consumers in any form. This depicts the responsibility of stakeholders in creating awareness programs for consumers regarding proper e-waste management. In another study also it was found that abstract norms and conveniences and incentives highly influence consumer participation in e-waste recycling (Nguyen, 2025).

The findings from the study in Kerala suggests that the 2022 Rules lacks compliance mechanism and does not address the growing challenge of e-waste in India. In order to bridge the gap in the present law and better equip India for e-waste management a robust, comprehensive, stakeholder centric legal framework is necessary.

**'Model Bill on E-Waste Management and Regulation in India - Towards a Comprehensive Legal Framework'**

In order to mitigate the drawbacks of the 2022 Rules an all-inclusive legal framework involving all the stakeholders is necessary for effective e-waste management. As a result of the study the authors have drafted a legal framework for India named as the Model Bill on E-Waste Management and Regulation in India (Bill). The Bill has been drafted so as to resolve the gaps between policy and practice and address the growing challenge of e-waste. The Bill intends for a stakeholder centric approach where each stakeholder has specific responsibilities and a system for compliance has also been included. The main provisions of the Bill are discussed below.

The Bill has included all the stakeholders i.e., every manufacturer, producer, consumer, bulk consumer, collection centres, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment including their components, consumables, parts and spares which make the product operational is

necessary. The Bill has identified informal workers and the responsibility for integration of these workers to mainstream have been entrusted with the collection centres.

The Bill specifies for registration of all entities in the portal run by the Central Pollution Control Board (CPCB) and prevents operation of businesses without registration in the portal. The responsibilities of manufacturer, producer, collection centre, dealers, Producer Responsibility Organisation, refurbisher, consumers or bulk consumers, dismantler, recycler and State Government or the Union territory are specified in the Bill, so that there is a system in place to ensure compliance. From registering on the portal, creating awareness to filing of annual returns is specified and compliance is ensured through the system.

The Bill also discusses the procedure in storing e-waste and a maximum time frame of 180 days is given within which the e-waste has to be processed.

The specific provisions for effective e-waste management reintroduces the process of advanced recycling fee which was previously introduced in the 2016 Rules and removed in 2022 Rules. By levying advanced recycling fee from the consumer at the time of purchase of the device for the purpose of bearing the expenses for recycling the product at the end of life the producers/ retailers can be made responsible for proper collection of e-waste.

The concept of reverse logistics is included in the Bill so that anyone who collects e-waste has a duty to ensure that products that can be reused are identified and repurposed, resold or recycled. The identified product has to be labelled and dispatched based on whether it is for reuse, repairing or recycling.

Provisions regarding circular economic practices are also specified which enables the stakeholders to ensure maximum utilisation of all products before it is send for recycling. From product design to end of life stakeholders are responsible for ensuring that the raw materials and other components are used to the fullest capacity.

Another system that is introduced in the Bill is for every electronic equipment to be allotted a distinct bar code which will enable easy identification and surveillance. By scanning the bar code at various stages of the products lifetime from collection to recycling the life of an electronic product and its maximum utilisation can be ensured.

In order to establish a stronger compliance mechanism environmental compensation has to be imposed and collected for violation of the provisions of the Bill and non-compliance by the stakeholders. In the provisions for compensation, a system where if the violation is rectified within a year a percentage of the environmental compensation will be returned back to the stakeholder, likewise a three-year period can be given for compliance with percentage of amount to be returned reduced each year. After three years if there is still no action on the part of the stakeholder a cancellation of registration can be executed. This method can act as a catalyst for compliance on the stakeholders. The Bill specifies revocation of registration and environmental compensation in cases where false information is provided regarding generation of extended producer responsibility certificate.

Provisions for prosecution is also included in which failure of compliance or contraventions to the provisions of the Bill by the stakeholders will lead to imprisonment for up to five years with fine which may extend to one lakh rupees or both. The continuance of the offence will lead to fine of Rs. 5000 per day and imprisonment which can extend to seven years.

The Bill also discusses constituting a committee under the Chairmanship of the Chairman, Central Pollution Control Board to oversee the overall implementation of the Act. The committee has to oversee the implementation, monitoring and supervision of the Act and it shall also decide upon the disputes arisen from time to time and on representations received.

The Central Government is given the authority to monitor and seek reports, returns and other information regarding the functions under the Bill.

The Bill intends to better equip and manage e-waste through the involvement of all stakeholders by specifying the responsibilities and ensure strict compliance through various mechanisms.

## CONCLUSION

The present e-waste management Rules are not adequate to meet the needs of the ever-growing e-waste in India. E-waste has grown immensely in India over the years due to various factors. India has enacted various Rules for e-waste management from 2011, which warrants an analysis of the effectiveness of the e-waste management Rules. Even though there have been various modifications to the Rules over the years, the informal sector was never recognized in any of the Rules or policies even though they are the major stakeholders in e-waste management in India. The import of second-hand goods, designed to dump

strategy and unawareness of consumers are all adversely affecting the e-waste management in India. The e-waste management Rules mandated various provisions for proper management of e-waste unfortunately, it lacks implementation measures.

The empirical study in Kerala highlighted the issues in lack of conformity to the e-waste Rules. Not all stakeholders are registered in the portal as there is no provision for registration of collection centres. There are no measures for checking the implementation of the e-waste Rules as no inspections are conducted. Even awareness programmes on e-waste handling and existing laws and policies are very few as only 2 respondents had attended the same.

More than 50% of the stakeholders rely on other agencies for collection of e-waste More than 75% stakeholders are giving payment for collection of e-waste as consumers are not willing to give e-waste for recycling without receiving payment. Majority of stakeholders have not filed annual and quarterly returns in the portal as mandated by the provisions of the Rules and there is no record of e-waste collected, dismantled, recycled and sent to registered recycler on the portal. The stakeholders are not adapting any measures for creating awareness among the consumers regarding e-waste management. This clearly shows the implementation problems in e-waste management which needs immediate attention as e-waste is growing rapidly in India.

The authors suggest a draft legislation which addresses and highlights specific provisions for implementation and constant monitoring of fulfilment of obligations under the legislation. The draft Bill includes all the stakeholders and their responsibilities are specified including creating awareness to consumers. The informal workers have been recognised under the Bill and the need for integration is focussed by giving responsibility to the collection centres. There is provision for registration of all the stakeholders in the portal and compliance is ensured through the system. Specific provisions for effective e-waste management such as advanced recycling fee, reverse logistics, circular economic practices etc. are included. A committee to monitor and supervise the implementation of the law is also included.

Effective e-waste management in India is only possible through effective legislation and participation of all stakeholders. Awareness and easy accessibility to consumers will help in enabling a safe environment for e-waste management.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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