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Growth of Dismantling & Recycling facilities for E-waste in India

Priyanka Chauhan[1]N P Singh[2] Aradhana Sorout[3]

Research Scholar, Pro-Vice Chancellor,Assistant Professor

M.V.N University

Abstract

Background: Electronic waste, or E-waste, which results from the disposal of electrical and electronic equipment at the end of its life cycle, is emerging as a growing global concern. This waste contains valuable materials that can be economically beneficial when recycled properly. Unfortunately, a large portion of e-waste is handled by the unregulated informal sector, exposing workers often women and children to significant risks of toxic exposure during the recycling process. It requires an economically efficient treatment system that can release and refine specific fractions while maintaining environmental sustainability.

Objectives: The research paper has two main objectives, i.e., (i) analysis of secondary data to reach an acceptable figure of percentage of recycled e-waste over the years, and (ii) the impact of new regulation on number of authorised dismantler & recycler and recycling capacity.

Methods: This study relies on secondary data, which has been gathered from various sources, including government reports, articles, and corporate company reports.

Findings: The production of e-waste is growing rapidly, further exacerbated by illegal exports and the inappropriate donation of electronic equipment, especially computers, from developed to developing countries. After studying several reports, it was found out that with time government and even companies are taking corrective measures to dismantle and recycle the e-waste. Number of dismantlers is increasing as years passes by as shown in Table1. Also awareness among individuals is also rising related to recycling of e-waste. Figures in Table2 show the rise in percentage of recycling on yearly basis. Government of India also sets targets for E-waste recycling in India. Government makes sure that annual targets get increased.

Key words: Dismantler, Recycler, Recycling facilities, dismantling process, India

Introduction

E-waste dismantling is the practice of disassembling electronic equipment into its individual components and sorting them for the purpose of recycling. This process includes activities such as crushing, destroying, burning, and melting discarded electronic materials, with only a small amount of plastic being recoverable. Unfortunately, the dismantling process can have negative environmental consequences. However, it is an indispensable step that helps reduce the environmental impact, mitigate toxicity, and create value by separating components into reusable pieces (Corpbiz, 2023).

The primary actors in the e-waste ecosystem within society consist of dismantlers (often referred to as scavengers), repair and maintenance workers, e-waste vendors, and storekeepers. These informal groups are involved in the collection, scavenging, disassembly, purchase, sale, transfer, or storage of various forms of electronic waste. Dismantlers, known locally as 'Qorale,' engage in the collection or purchase of malfunctioning or non-operational electronic devices and electrical equipment from households and commercial areas. They then disassemble these items by breaking them into pieces to recover valuable metals. (Ali et.,al, 2022)

While disposing off electronics, most of the users get confused about how they discard their electronic item. The mantra of RRR (Reduce, Reuse and recycle) is used applied there only. According to the New E-waste (Management) Rules, 2016, the life cycle of our products is defined as follows: For ITEW2 (Personal Computers, including Central Processing Unit with Input and Output Devices), the average life cycle is 6 years. Most of the companies take initiatives and channelize the e-waste through proper channels. One such unit is Wacom India Pvt. Ltd. This follows a specific process i.e.

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Fig1. Channelization of E-waste (Source: Wacom)

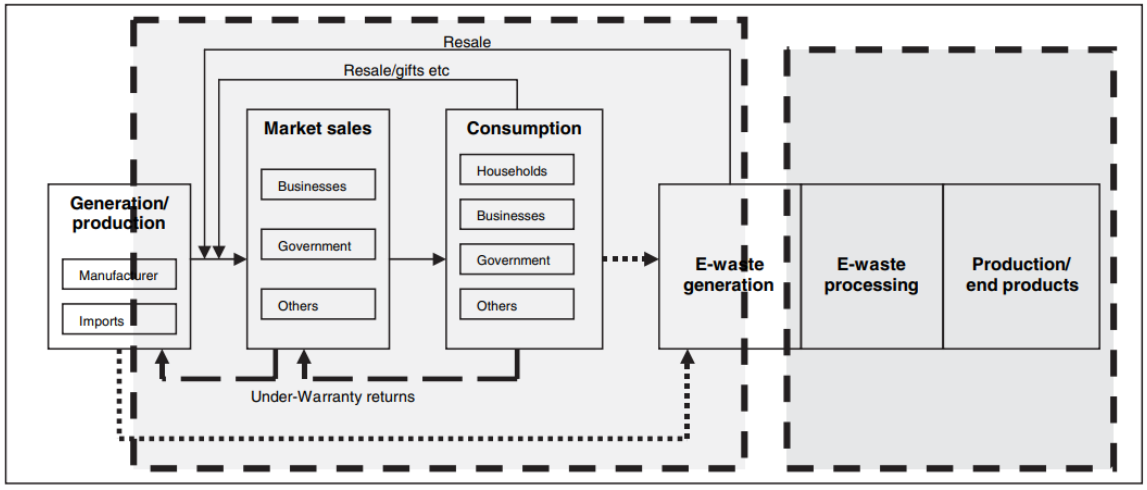

Fig2. E-waste trade value chain (Source: Jain and Sareen, 2006)

The final three participants within the e-waste trade value chain, encompassing e-waste generation, e-waste processing, and e-waste production/end products, operate within the informal sector. E-waste processing involves the initial disassembly of electronic items, such as dismantling a PC monitor to extract the cathode ray tube (CRT) and printed circuit boards. The end products of e-waste processing undergo secondary dismantling procedures, including refurbishing CRTs, metal extraction, and more. The remaining stakeholders' function within the formal sector. Key participants in this process include importers, producers/manufacturers, consumers (both households and businesses), traders, retailers, scrap dealers, disassemblers, and dismantlers. At each stage in this flow, commercial transactions govern the movement of electronic items within the chain (Jain and Sareen, 2006)

Review of Literature

This section is broadly divided into two segments i.e., dismantling of e-waste and recycling facilities for e-waste in India. More than 150 studies were referred and among them the most relevant ones are chosen and reviewed under this paper.

Dismantling of e-waste

As per the Ministry of Environment, Forest, and Climate change (2016), "Dismantler means any person or organisation engaged in dismantling of used electrical and electronic equipment into their components and having facilities" and according to Collins dictionary, "the act of causing an organization or system to stop functioning by gradually reducing its power or purpose". E-waste dismantling is the process of crushing, destroying, burning, and melting electronic discarded materials during the procedure, a minimal amount of plastic is recovered (Corpbiz,2023).

E-waste dismantling involves decontaminating the waste to make it non-hazardous by separating harmful components and materials. Certain components, which contain hazardous substances, should not be further dismantled. Electronic parts such as mercury switches and polychlorinated biphenyls (PCBs) can be recovered and sent to Treatment, Storage,

and Disposal Facilities (TSDFs) for further processing, according to Enter Climate reports (2022). Recently, the Ministry of Environment, Forest, and Climate Change (E-waste Management Rules, 2022) has introduced a provision to eliminate Producers Responsibility Organizations (PROs) and dismantlers, transferring these responsibilities to recycling companies, which are few. Additionally, 95 categories of e-waste are now specified, up from the previous 21 (Corpseed, 2023).

There are three approaches when it comes toe-waste dismantling. These approaches include manual dismantling, mechanized/automatic dismantling, and a combination of both.
a) **Manual Dismantling** – This involves manual operations using tools and specialized workbenches, typically carried out on a dismantling table.
b) **Mechanized Dismantling** – In this process, e-waste is broken down in a controlled manner using machines, especially when the components are hazardous, volatile, or the process is time-consuming and dangerous.
c) **Manual and Mechanized Dismantling** – This is a hybrid approach that combines both manual handling by workers and automated processes. In this combined operation, the treatment of cooling appliances and small Electrical and Electronic Equipment (EEE) (including IT) are included (Enter Climate,2022). As per the Bihar government report, there are certain guidelines for environmentally sound dismantling of E-waste and these are as follows: - A dismantler must be linked to either producers, a PRO, an e-waste exchange or takeback system, or an authorized recycler. A dismantler has to obtain consent to establish from SPCBs/PCCs under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981 A dismantler has to obtain consent to operate from SPCBs/PCCs under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981 A dismantler has to obtain authorisation from SPCBs/PCCs under E Waste (Management) Rules, 2016, provided that any person authorised/registered under the provisions of the Hazardous Wastes (Management, Handling and Transboundary Movements) Rules, 2008, and the E-waste (Management & Handling) Rules, 2011 prior to the date of coming into force.

Recycling of e-waste

E-waste recycling involves the collection, segregation, dismantling, recycling of usable parts and, finally, the eco-friendly disposal of non-recyclable components (Enter Climate,2022) It is a process that seeks to recover material from electronic waste for use in new electronic products. These electronic wastes can include home appliances such as air conditioners, televisions, electric cookers, heaters, DVDs, fans, microwaves, and radios. (Conserve energy future). According to the rtsblog (2021), Recycling of e-waste includes 5 major steps namely, 1. Collection 2. Storage 3. Manual sorting, Dismantling, Shredding 4. Mechanical Separation 5. Recovery.

To encourage e-waste recycling in India, E-Parisaraa Pvt. Ltd., the country's first government-authorized electronic waste recycler, began operations in September 2005. The company is dedicated to the handling, recycling, and reuse of Waste Electrical and Electronic Equipment (WEEE) in an environmentally friendly manner. The initiative aims to reduce the buildup of discarded and obsolete electronic and electrical equipment, which often end up in landfills or are improperly recycled by informal recyclers under unhygienic conditions, ultimately contributing to environmental damage. The objective of E-Parisaraa is to create an opportunity to transfer waste into socially and industrially beneficial raw materials like valuable metals, plastics and glass using simple, cost efficient, home grown, environmentally friendly technologies suitable to Indian Conditions(E-Parisaraa,2023).

According to the EPA, recycling one million laptops can conserve the same amount of energy that 3,500 homes use in a year. In addition, recycling one million cell phones results in the recovery of 35,000 pounds of copper, 772 pounds of silver, 75 pounds of gold, and 33 pounds of palladium. (Rathore,2018). India produces around 3.2 million tons each extended period of electronic waste, which contains numerous valuable materials like gold, palladium, silver and so forth notwithstanding unsafe materials that can cause hopeless wellbeing perils to the person. To recover valuable metals such as copper, silver and gold from obsolete printed circuit boards (PCBs) in an environment-friendly way, a PCB Recycling facility was inaugurated at the Centre for Materials for Electronics Technology (C-MET), in Hyderabad. (Singhal,2023)

India's Service of Climate, Backwoods and Environmental Change has presented new e-squander guidelines that will produce results on 1 April 2023. The E-Squander (The board) Rules, 2022, include a Drawn-out Maker Obligation (EPR) system for e-squander reusing, which applies to producers, makers, refurbishers, dismantlers, and recyclers.

Under the new guideline, partners are expected to enroll with the web-based entrance made by the Focal Contamination Control Board (CPCB), with unregistered elements denied from working. Furthermore, e-squander reusing targets have been laid out for informed makers of Electrical and Electronic Gear (EEE), starting with an objective of reusing 60% of recently sold EEE for the long term, as well as cutoff points on the centralization of dangerous substances used to fabricate EEE. The regulation likewise intends to dispense with misleading cases by suggesting that the sum reused be determined in view of the results. To implement the new regulation, a Steering Committee will be established. (Digwatch, 2023)

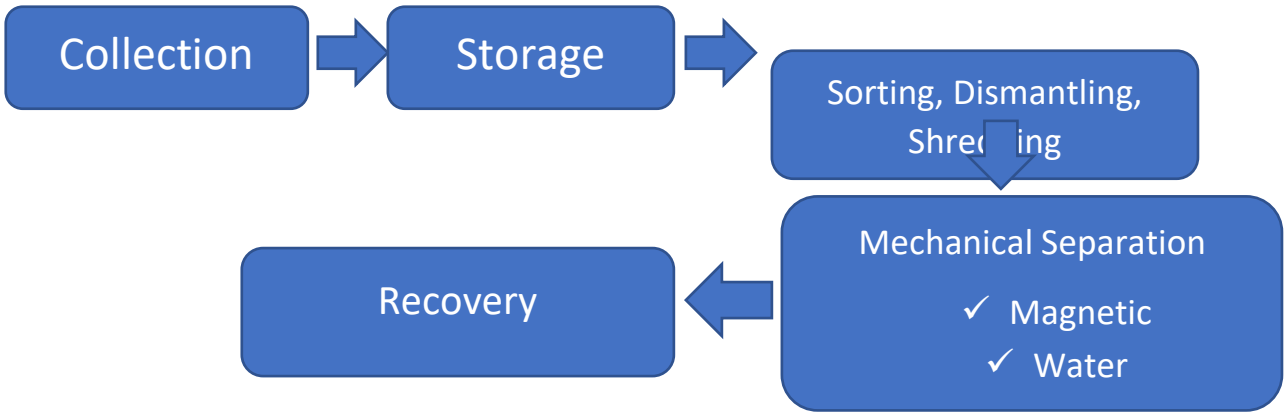

Figure 3. E-waste recycling process flowchart (Source: rtsblog, June,2021)

Research Methodology

Research methodology of the present research paper is mainly exploratory and based on secondary data collected from different sources on the internet. The sources include annual reports of Central Pollution Control Board (CPCB), Press Information Bureau (PIB), websites of state government and reports of research agencies and research articles of academia and industry experts.

Objectives

As mentioned in the introduction that Government of India enacted laws regarding Analysis and Discussion.

The data analysed from various secondary sources is presented below in the form of tables and details the status of recycled e-waste over the years and the impact of new regulation on number of authorised dismantler & recycler and recycling capacity for E-waste in India.

Table 1: Installed capacities of e-waste dismantling and recycling facilities on a State-wise basis in India.

	Number of Authorised Dismantler/Recycler			
States	**2017[1]**	**2019[2]**	**2021[3]**	**2023[4]**
Andra Pradesh	-	1.00	3.00	10.00
Assam	-	-	1.00	1.00
Chhattisgarh	2.00	1.00	2.00	2.00
Delhi	-	-	-	6.00
Gujarat	12.00	16.00	19.00	41.00
Goa	-	1.00	1.00	2.00
Haryana	16.00	28.00	39.00	43.00
Himachal Pradesh	-	1.00	2.00	2.00
Jammu & Kashmir	-	1.00	3.00	3.00
Jharkhand	-	-	2.00	2.00
Karnataka	57.00	71.00	71.00	72.00
Kerala	-	-	-	1.00
Maharashtra	32.00	75.00	99.00	140.00

Madhya Pradesh	3.00	2.00	2.00	3.00
Orissa	1.00	3.00	5.00	7.00
Punjab	1.00	3.00	4.00	8.00
Rajasthan	10.00	26.00	26.00	27.00
Tamil Nadu	14.00	24.00	32.00	42.00
Telangana	4.00	11.00	12.00	23.00
Uttar Pradesh	22.00	41.00	75.00	121.00
Uttarakhand	3.00	4.00	5.00	8.00
West Bengal	1.00	3.00	4.00	5.00
Total	178.00	312.00	407.00	569.00
Sources:[1] Sharma and Kumar (2017) [2] Singh (2022) [3] Office of Commissioner of Income Tax, Chandigarh (2021) [4] CPCB (2023)				

Table 2: Installed capacities of e-waste dismantling and recycling facilities on a State-wise basis in India.

	State Wise Capacity (MTA)				**State Wise Capacity (MTA) (%)**			
States	**2017[1]**	**2019[2]**	**2021[3]**	**2023[4]**	**2017[1]**	**2019[2]**	**2021[3]**	**2023[4]**
Andra Pradesh	-	480	6600	44002.5	-	0.06	0.59	2.45
Assam	-	-	120	120.0	-	-	0.01	0.00
Chhattisgarh	1650	600	6600	6750.0	0.37	0.07	0.59	0.37
Delhi		-	-	1989	-	-	-	0.11
Gujarat	37262	49,053	50507.92	158604.9	8.44	6.27	4.55	8.85
Goa	-	103	103	153.0	-	0.01	0.01	0.00
Haryana	49981	87378	133532.1	157187.7	11.33	11.17	12.03	8.77
Himachal Pradesh	-	1000	1500	1500.0	-	0.12	0.14	0.08
Jammu & Kashmir	-	165	705	705.0	-	0.02	0.06	0.03
Jharkhand	-	-	660	660.0	-	-	0.06	0.03
Karnataka	44620	52,722	52,722	126015.5	10.11	6.74	4.75	7.03
Kerala	-	-	-	1200	-	-	-	-
Maharashtra	47810	78,179	94750.5	118031.5	10.83	9.99	8.54	6.59
Madhya Pradesh	8985	96,00	9600	13600.0	2.03	1.22	0.86	0.75
Orissa	3000	3680	5690	9050.0	0.68	0.47	0.51	0.50
Punjab	150	4850	7250	10092.0	0.03	0.62	0.65	0.56
Rajasthan	68670	90769	90,769	82007.7	15.56	11.60	8.18	4.58
Tamil Nadu	52427	97271	132,049	130636.0	11.88	12.43	11.90	7.29
Telangana	11800	41493	70,893	148115.0	2.67	5.30	6.39	8.27
Uttar Pradesh	86130	243627	424130.7	624219.5	19.52	31.15	38.21	34.86
Uttarakhand	28000	19250	19,971	153068.1	6.34	2.46	1.80	8.54
West Bengal	600	1860	1950	2640.0	0.13	0.23	0.18	0.14
Total	441085	782080	1110103.22	1790348.27	99.92	99.93	100.01	99.69
Sources:[1] Sharma and Kumar (2017) [2] Singh (2022) [3] Office of Commissioner of Income Tax, Chandigarh (2021) [4] CPCB (2023)								

Above table shows the data of four years i.e. 2017, 2019, 2021 and 2023 fetched through government websites and reports. Data shows the number of authorised dismantlers registered in the particular year, State wise installed

capacity in MTA (metric tons per annum) and its percentage. There are plethora's of definitions given for E-waste handler/dismantler some of them are specified below:-

1. "Dismantler" means any person or registered society or a designated agency or a company or an association engaged in dismantling of used electrical and electronic equipment into their components (Ministry of environment and forest,2011)
2. According to the Ministry of Environment, Forest and Climate Change (2022), a 'dismantler' refers to any individual or entity involved in the dismantling of used electrical and electronic equipment into its components, and who holds authorization from the relevant State Pollution Control Board or Pollution Control Committee in accordance with the guidelines set by the Central Pollution Control Board.

Table 2: Statistics of recycling of E-waste in India

Date	**e-waste recycles (%)**	**Comments**	**Source**
2016	1.5%	Under the new GST regime, 1.85 million tonnes of e-waste are not categorized separately.	Kar & Sarkhel (2017)
2016	1.5%	During the year 2014–2015, authorized collection centers collected 88,929.96 kg of e-waste, while the dismantling and recycling capacity, according to the CPCB, was 150 metric tons per annum (MTA) in 2016. As of January 7, 2021, this capacity has increased to 7,250 MTA.	Dutta and Goel (2021)
2017	3.6%	Approximately 95 percent of India's e-waste is recycled in the informal sector, often through crude methods.	Lahiry (2019)
2017	3.5%	India generated 708,445 tonnes of e-waste in 2017-18. According to a report published on December 18, 2020, the collection targets for that period were set at 35,422 tonnes.	DTE Staff (2021)
2017	10%	In comparison, only 9.79 percent of the total e-waste generated in India during 2017–18 was processed and recycled.	Prakash (2023)
2017	10%	The government has reported that the recycling rate, which was 10% in 2017-18, increased to 20% in 2018-19.	Increased recycling of e-waste in India (2020)
2017	10%	The recycling rate, which was 10% in 2017-18, increased to just over 20% in 2018-19.	Koshy (2020)
2017	10%	Government initiatives to boost collection and recycling have led to an improvement in e-waste processing in India, increasing the rate from 10% of total e-waste in 2017-18.	Mohan (2022)
2018	9.79%	India generated 708,445 tonnes of e-waste, but only 25% of it was managed properly.	Jadhav (2022)
2018	20%	A reusing pace of 10% in 2017-18 has ascended to a little more than 20% in 2018-19	Koshy (2020)
2018	10%	India gathered only 10% of the electronic waste (e-squander) assessed to have been produced in the country 2018-19	DTE Staff (2021)
2018	21.35%	the proportion was generally 21.35 percent in 2018-19.	Prakash (2023)
2018	20%	The public authority has detailed that the reusing pace of 10% in 2017-18 has ascended to 20% in 2018-19.	Increased recycling of e-waste in India (2020)

2018	22.5%	According to data from the Central Pollution Control Board (CPCB), 164,663 tonnes of e-waste were collected and processed in the financial year (FY) 2018-19, 224,041 tonnes in FY 2019-20, and 354,291.22 tonnes in FY 2020-21.	PIB (2022)
2018	3.6%	The report found that only 3.6% of e-waste was collected in the country in 2018, and 10% was collected in 2019.	Jain and Tarun (2021)
2019	21.35%	Created 7,71,215 tons. Not just 25% of e-squander oversaw appropriately.	Jadhav (2022)
2019	22.7%	Just 22.7 percent of the 10,14,961.21 lots of electronic trash created in India in 2019-20 was suitably accumulated, dismantled, reused, or discarded.	Prakash (2023)
2019	22%	In 2019-20 India creates 10.1LT of E-squander however just 22% of it was handled.	Mohan (2022)
2019	22%	the second most crowded country on the planet, created more than 3.23 million tons of e-squander in 2019	Sengupta et.,al (2022)
2019	10%	As per a 2020 report by the Focal Contamination Control Board, India created 1,014,961 tons of e-squander in FY 2019-2020.	Sharma & Aryan (2023), Jain and Tarun (2021)
2019	22%	According to the data accessible with Focal Contamination Control Board (CPCB), 1,64,663 tons; 2,24,041 tons and 3,54,291.22 lots of e-squander was gathered and handled during the Monetary Year (FY) 2018-19, 2019-20 and 2020-21 separately	PIB (2022)
2019	22%	a sum of 53.6 million Metric Tons (Mt) of e-squander was produced worldwide in 2019	Kancharla (2020)
2019	10%	According to a 2020 report by the Central Pollution Control Board, India generated 1,014,961 tonnes of e-waste in the financial year 2019-2020, marking a 32% increase compared to FY 2018-2019.	Jain and Tarun (2021)
2019	21%	E-squander volumes are flooding internationally. As per the Worldwide E-squander Measurements Organization (GESP), they developed by 21% in the five years up to 2019	Johnson (2021)
2019	17.4%	In 2019, only 17.4% of the total e-waste generated was recycled.	Atiq et., al (2023)
2020	22.7%	India generated 1,014,961.21 tonnes of e-waste, which comprised 21 types of electrical and electronic equipment.	Jadhav (2022), The Indian express (2023)
2020	22%	The Screen gauges worldwide e-squander age to contact 747LT each year by 2030.	Mohan (2022)
2020	33%	According to data from the Central Pollution Control Board (CPCB), 164,663 tonnes of e-waste were collected and processed in the financial year (FY) 2018-19, 224,041 tonnes in FY 2019-20, and 354,291.22 tonnes in FY 2020-21.	PIB (2022)
2020	11%	India processed over 3.4 lakh tonnes of electronic waste in 2020-2021, a significant increase compared to 69,414 tonnes in 2017-18.	Rana (2021)
2021	33%	In 2021-22, India generated a total of 16.01 lakh tonnes of e-waste. However, only 5.27 lakh tonnes were	Krishnakumar (2023)

		collected and processed.	
2021	33%	India produced an estimated 16.01 lakh tonnes of e-waste in the financial year 2021-22. However, only 5.27 lakh tonnes were collected and recycled.	Prakash (2023)
2021	33%	India collected and processed only 33% of the total e-waste generated in 2021-22. Haryana topped the list, processing 2.45 lakh tonnes of e-waste.	Business news (2023)
2021	32.9%	According to data from the Ministry of Environment, Forest and Climate Change, India recycled only 32.9% of the e-waste generated in 2021-2022.	Gupta (2023)
2021	33%	The ministry stated that there are 468 authorized dismantlers/recyclers across 22 states, with a processing capacity of 13.85 lakh tonnes of e-waste in the country.	Athrady (2022)
2021	32.9%	E-waste contains 17 precious metals, which can be extracted through proper recycling. Currently, only 15-17% of e-waste undergoes formal recycling.	Singhal (2023)
2021	31.25%	In the financial year 2021-22, 1.6 million tonnes of e-waste were generated, while 0.5 million tonnes were collected and processed.	Vibhaw and Pabreja (2023)
2021	32.9%	The nation delivered an expected 16.01 lakh ton of e-squander in monetary year 2021-22. In any case, just 5.27 lakh ton was gathered and reused.	Prakash (2023)

Table 3: Mode value of percentage E-waste recycled in formal sector

Year	**Mode Value**	**Comment**
2016	1.5	Both the sources reported 1.5% E-waste recycled in India
2017	10%	Out of 6 sources, 4 sources reported 10% of e-waste is recycled
2018	20%	Out of 7 sources, 2 sources reported 20% of e-waste is recycled
2019	22%	Out of 10 sources, 5 sources reported 22% figure
2020	22%	Out of 4 Source, 2 sources report 22% e-waste is recycled
2021	33%	Out of 8 sources, 7 sources show same figure i.e., 33%

Table 2 shows the percentage of e-waste recycles year-wise which is collected through numerous websites, government reports, blogs, newspaper articles and many more. Above table clearly shows that with each year percentage of e-waste recycling increases. This shows that individuals, companies and even producers became more conscious about the increasing stacks of e-waste and the importance of e-waste recycling with proper formal channel. Following this Table 3 highlights the mode values of table 2 which clearly shows that for each year the highest no. of frequency will be considered for taking the values under study.

Table 4: Annual E-waste recycling targets of Government of India

S.No.	**Year**	**Percentage of recycling**	**Reference**
1	2016-2017	15%	CPCB,2016
2	2017-2018	30%	CPCB,2016
3	2018-2020	40%	CPCB,2016
4	2019-2020	At least 30%	India filings
5	2020-2022	50%	CPCB,2016
6	2020-2021	At least 40%	India filings

7	2021-2022	At least 50%	India filings
8	2022-2023	70%	CPCB,2016
9	2022-2023	At least 60%	India filings
10	2023-2025	60%	PIB,2022
11	2023 onwards	At least 70%	India filings
12	2025-2027	70%	PIB, 2022
13	2027-2029	80%	PIB,2022

Above table 4 shows the annual e-waste recycling targets set by the government of India. It is clearly visible that starting from the year 2016 with minimum of 15% target till 2029 with 80% target shows the seriousness of government regarding the recycling of e-waste as it is grave concern which should be treated at global level.

Conclusion

E-squander reusing is a significant worldwide worry for various reasons and fundamentally affects our quick climate as individuals, as well as life on Earth overall. According to the investigation the e-squander age has expanded throughout the long term. The government and even companies have begun to take corrective measures for e-waste recycling. The number of dismantlers has increased, and the awareness related to recycling of e-waste among individuals has also raised. As per the new regulation, Government of India sets targets for recycling of e-waste in India and escalate the targets on yearly basis. The number of authorised dismantler & recycling capacity has also improved state-wise, but the level of E-squander reused in proper area is still low, which implies the need to go to vital lengths by the public authority bodies.

References

1. Ali et.,al (2022). E-waste Awareness and Management Among People Engaged in E-waste Selling, Collecting, Dismantling, Repairing, and Storing Activities in Addis Ababa, Ethiopia August,19. Retrieved on October 11 from https://journals.sagepub.com/doi/full/10.1177/11786302221119145#:~:text=The%20major%20role%20players%20in,all%20types%20of%20e%2Dwastes.
2. Athrady (2022). Generation of e-waste in India sees 31% annual growth retrieves on August 24,2023 from https://www.deccanherald.com/india/generation-of-e-waste-in-india-sees-31-annual-growth-1081505.html
3. Atiq et.,al (2023). Maximising resource efficiency and circularity in the electrical and electronic equipment value chain and the e-waste sector retrieved on August 25,2023 from https://www.orfonline.org/research/maximising-resource-efficiency-and-circularity/
4. Bspcb. Guidelines for Environmentally Sound Dismantling of E-Waste. Retrieved on October 5,2023 from https://bspcb.bihar.gov.in/Guidelines%20for%20Dismantlers%20and%20Recyclers_ewaste%20.pdf
5. Business news (2023). Only 33% of e-waste in India processed in FY22: Report retrieved on August 24,2023 from https://www.editorji.com/business-news/only-33-of-e-waste-in-india-processed-in-fy22-report-1680270181140
6. Central Pollution Control Board (2023). List of Dismantlers/Recyclers as per the authorisation issued by SPCBs/PCCs under E-waste (Management) Rules, 2026 (As on 08-06-2023). Retrieved on September19,2023 from https://cpcb.nic.in/uploads/Projects/E-Waste/List_of_E-waste_Recycler.pdf
7. Centre for Science and Environment (2020). E-waste management in India Challenges and Agenda. Retrieved on September 22,2023 from file:///C:/Users/PC/Downloads/http___cdn.cseindia.org_attachments_0.90574500_1609398674_e-waste-management-in-india-final-report%20(12).pdf
8. Collins dictionary. Definition of dismantling. Retrieved on October 4,2023 from https://www.collinsdictionary.com/dictionary/english/dismantling

9. Conserve-energy-future. What is E-waste Recycling and Process of Recycling Electronic Waste. Retrieved on October 5,2023 from https://www.conserve-energy-future.com/e-waste-recycling-process.php
10. Corpbiz (2023). E-waste license for dismantling. Retrieved on October 11,2023 from https://corpbiz.io/e-waste-license-for-dismantling#:~:text=Meaning%20of%20E%2DWaste%20Dismantling&text=It%20is%20the%20process%20of,amount%20of%20plastic%20is%20recovered.
11. Corpbiz. Meaning of E-waste Dismantling. Retrieved on October 4,2023 from https://corpbiz.io/e-waste-license-for-dismantling#:~:text=Meaning%20of%20E%2DWaste%20Dismantling&text=It%20is%20the%20process%20of,amount%20of%20plastic%20is%20recovered.
12. Corpseed. Introduction: E-waste recyclers and Dismantlers. Retrieved on October 4,2023 from https://www.corpseed.com/knowledge-centre/cpcb-registration-for-e-waste-recyclers-and-dismantlers
13. CPCB (2016). Implementation guidelines for E-waste (Management) Rules ,2016. Retrieved on Sep12,2023 from https://cpcb.nic.in/displaypdf.php?id=aHdtZC9HVUlERUxJTkVTX0VXQVNURV9SVUxFU18yMDE2LnBkZg==
14. Digwatch (2023). India's new e-waste rules to take effect next month, March 21. Retrieved on October 5,2023 from https://dig.watch/updates/indias-new-e-waste-rules-to-take-effect-next-month
15. DTE Staff (2021). India collected just 3% e-waste generated in 2018, 10% in 2019: CPCB report retrieved on August 24, 2023 from https://www.downtoearth.org.in/news/waste/india-collected-just-3-e-waste-generated-in-2018-10-in-2019-cpcb-report-75072
16. Dutta, D., & Goel, S. (2021). Understanding the gap between formal and informal e-waste recycling facilities in India. *Waste Management*, *125*, 163-171. https://doi.org/10.1016/j.wasman.2021.02.045
17. Enter Climate (2022). E-Waste Dismantling Equipment Required for A Dismantler Business, September 08. Retrieved on October 4,2023 from https://enterclimate.com/blog/e-waste-dismantling-equipment-required-for-a-dismantler-business/
18. E-Parisaraa (2022). Time to create Sustainable Environment. Retrieved on October 5,2023 from https://ewasteindia.com/
19. Gupta, S. (2023). Recycling has gone up in last 5 years, but 67% of e-waste remains unprocessed, March 31. Retrieved on August 04, 2023 from https://indianexpress.com/article/world/climate-change/recycling-gone-up-last-5-years-67-e-waste-remains-unprocessed-8530613/
20. Increased Recycling of E-waste in India (2020) retrieved on August 25,2023 from https://www.drishtiias.com/daily-news-analysis/increased-recycling-of-e-waste-in-india#:~:text=The%20Ministry%20of%20Environment%2C%20Forest,well%20as%20other%20such%20equipment.
21. India filings (2023). E-Waste Management. Retrieved on September 22,2023 from https://www.indiafilings.com/learn/e-waste-management/
22. Jadhav (2023). Around 78% of India's e-waste is not being collected or disposed by the government, May,12. Retrieved on August 05,2023 from https://www.thehindubusinessline.com/data-stories/data-focus/around-78-of-indias-e-waste-is-not-being-collected-or-disposed-by-the-government/article65406820.ece
23. Jain and Tarun (2021). E-Waste: India Must Take a Closer Look at Extended Producer Responsibility retrieved on August 24,2023 from https://science.thewire.in/environment/e-waste-india-must-take-a-closer-look-at-extended-producer-responsibility/
24. Jain, A., & Sareen, R. (2006). E-waste assessment methodology and validation in India. *Journal of Material Cycles and Waste Management*, *8*, 40-45.
25. Johnson (2021). Soaring e-waste affects the health of millions of children, WHO warns retrieved on August 24,2023 from https://www.who.int/news/item/15-06-2021-soaring-e-waste-affects-the-health-of-millions-of-children-who-warns
26. **Kancharla (2020).** India generated the 3rd highest volume of E-waste even as its per capita generation is 1/3rd the Global Average retrieved on August 24,2023 from https://factly.in/india-generates-the-3rd-highest-volume-of-e-waste-even-as-its-per-capita-generation-is-1-3rd-the-global-average/

27. Kar, S. and Sarkhel, A. (2017). No space for e-waste on the GST rate list, July 31. Retrieved on August 04, 2023 from https://economictimes.indiatimes.com/industry/cons-products/electronics/no-space-for- e-waste-on-the-gst-rate-list/articleshow/59840997.cms
28. Koshy (2020). E-waste recycling has doubled, says centre. Retrieved on August 10,2023 from https://www.thehindu.com/news/national/e-waste-recycling-has-doubled-says-centre/article30983383.ece
29. Krishnakumar (2023). India processed only 33% of e-waste it generated in FY22 ; Haryana, Uttarakhand lead in collection and processing retrieved on August 24,2023 from https://www.moneycontrol.com/news/india/india-processed-only-33-of-e-waste-it-generated-in-fy22-haryana-uttarakhand-lead-in-collection-and-processing-10340491.html
30. Lahiry (2019). Recycling of e-waste in India and its potential. Retrieved on August 10, 2023 from https://www.downtoearth.org.in/blog/waste/recycling-of-e-waste-in-india-and-its-potential-64034
31. Meity(2011). Ministry of Environment and Forests May 12. Retrieved on October 11 from https://www.meity.gov.in/writereaddata/files/1035e_eng.pdf
32. Ministry of Environment, Forest and climate change (2016). Published in the gazette of India, Extraordinary part-II, section -3, sub section (i). Retrieved on October 4,2023 from https://greene.gov.in/wp-content/uploads/2018/01/EWM-Rules-2016-english-23.03.2016.pdf
33. Mohan (2022). Why India needs to ramp up e-waste collection now, Dec,03. Retrieved on August 05,2023 from https://timesofindia.indiatimes.com/india/why-india-needs-to-ramp-up-e-waste-collection-now/articleshow/95953025.cms
34. mppcb(2022). Ministry of Environment, Forest and climate change November 02. Retrieved on October 11,2023 from https://www.mppcb.mp.gov.in/proc/E-Waste-Management-Rules-2022-English.pdf
35. Office of Commissioner of Income Tax, Chandigarh (2021). Broad guidelines for the disposal of e-waste. Retrieved on September 22,2023 from https://incometaxchandigarh.org/admin/pdf/T/Broad%20guidelines%20for%20the%20disposal%20of%20e-Waste.pdf
36. PIB (2022). Ministry of Environment, Forest and Climate Change retrieved on August 08,2023 from https://pib.gov.in/Pressreleaseshare.aspx?PRID=1812032
37. PIB (2022). Recycling of E-waste, December,08. Retrieved on September 12, 2023 from https://pib.gov.in/PressReleasePage.aspx?PRID=1881761
38. Prakash (2023). Only 32% of India's electronic waste recycled retrieved on August 24,2023 from https://www.tribuneindia.com/news/nation/only-32-of-nations-e-waste-recycled-476963
39. Prakash, A. (2023). Reimagining E-Waste: Empowering India's Transition to a Circular Economy on August 24,2023 from https://www.thequint.com/opinion/reimagining-e-waste-empowering-indias-transition-to-a-circular-economy
40. Rana (2021). An alarming environmental concern! Electronic waste processing Up by four times, yet 90% Remains unprocessed, Dec,2022. Retrived on August 05,2023 from https://thelogicalindian.com/trending/electronic-waste-generation-32756
41. Rana (2021). An alarming environmental concern! Electronic waste processing Up by four times, yet 90% Remains unprocessed, Dec,2022. Retrived on August 05,2023 from https://thelogicalindian.com/trending/electronic-waste-generation-32756
42. Rathore (2018). India's largest e-waste recycling facility set up near Bengaluru, May 18. Retrieved on October 5,2023 from https://www.expresscomputer.in/news/indias-largest-e-waste-recycling-facility-set-up-near-bengaluru/24760/
43. Rts (2021). The complete e-waste recycling process, June 21. Retrieved on October 5,2023 from https://www.rts.com/blog/the-complete-e-waste-recycling-process/
44. Rtsblog (2021). The complete e-waste recycling process, June 21. Retrieved on October 11,2023 from https://www.rts.com/blog/the-complete-e-waste-recycling-process/
45. Sengupta, D., Ilankoon, I. M. S. K., Kang, K. D., & Chong, M. N. (2022). Circular economy and household e-waste management in India: Integration of formal and informal sectors. *Minerals Engineering*, *184*, 107661. https://doi.org/10.1016/j.mineng.2022.107661
46. Sharma and Kumar (2017). Electronic waste in India, July. Retrieved on September 22,2023 from https://loksabhadocs.nic.in/Refinput/New_Reference_Notes/English/E-waste_in_India.pdf

47. Sharma,Y. and Aryan, A. (2023). E-waste policy recast to focus on number of products recycled, May,18. Retrived on August 05,2023 from https://economictimes.indiatimes.com/industry/renewables/e-waste-policy-recast-to-focus-on-no-of-products-recycled/articleshow/100337990.cms
48. Singhal (2023). Hyderabad: Indigenously developed 1 ton/day PCB Recycling facility inaugurated at C-MET, January 27. Retrieved on October 5,2023 from https://www.businesstoday.in/latest/economy/story/hyderabad-indigenously-developed-1-tonday-pcb-recycling-facility-inaugurated-at-c-met-367897-2023-01-27
49. Singhal (2023). Will India's bet on new policy to tackle e-waste pay off? Retrieved on August 14,2023 from https://www.businesstoday.in/magazine/deep-dive/story/will-indias-bet-on-new-policy-to-tackle-e-waste-pay-off-385530-2023-06-14
50. The Indian express (2023). E-waste in India, Jan 10,2023. Retrieved on August 05,2023 from https://www.aspireias.com/daily-news-analysis-current-affairs/E-WASTE-In-India
51. The Indian express (2023). E-waste in India, Jan 10,2023. Retrieved on August 05,2023 from https://www.aspireias.com/daily-news-analysis-current-affairs/E-WASTE-In-India
52. Vibhaw and Pabreja (2023). India: E-Waste Management Rules, 2022: An Overview. Retrieved on September 10,2023 from https://www.mondaq.com/india/waste-management/1303420/e-waste-management-rules-2022-an-overview
53. Wacom. E-waste. Retrieved on October 11,2023 from https://www.wacom.com/en-in/e-waste
54. Chauhan, P., & Singh, N. P. (2023). An Immaculate Study on The Challenges, Opportunities and Innovation in Waste Management Industry. *Cosmos: An International Journal of Management*, *12*(2).
55. Chauhan, P., & Singh, N. P. (2023). An Exploratory Analysis of Awareness of E-waste Management. Journal of Chemical Health Risks, Retrieved on July 1,2024 from https://www.researchgate.net/publication/381279631_An_Exploratory_Analysis_of_Awareness_of_E-waste_Management.
56. Chauhan, P., & Singh, N. P. (2022). A STUDY ON THE EFFECTS OF E-WASTE GENERATION ON INDIVIDUAL LIFE. Anvesak. Retrieved on June 28,2024 from https://www.researchgate.net/publication/382061857_A_STUDY_ON_THE_EFFECTS_OF_E-WASTE_GENERATION_ON_INDIVIDUAL_LIFE