DIGITAL POLLUTION AND THE LAW: EVALUATING INDIA'S E‑WASTE REGULATIONS

Subashna Tamang
Assistant Professor of Law, Surendranath Law College.

ABSTRACT

Electronic waste (e‑waste) is an emblematic form of "digital pollution" — the material and toxic residue of the digital economy. India has experienced a rapid rise in electrical and electronic equipment (EEE) consumption, producing substantial volumes of end‑of‑life products that pose risks to human health and the environment when managed unsafely. In response, the Union Government notified the E‑Waste (Management) Rules, 2011, 2016 and 2022, introducing a diverse, improved and impactful Extended Producer Responsibility (EPR) regime that sought to recenter producers in the lifecycle of EEE and to bring formal recyclers into compliance frameworks. This article critically evaluates India's regulatory architecture, focusing on effectiveness (increasing collection and safe recycling), equity (the role of the informal sector and workers' rights), and enforceability (monitoring, traceability, and deterrence mechanisms). Drawing on official rules and CPCB guidelines, international data sets (Global E‑waste Monitor), and Indian civil society and research studies, the paper traces legislative design choices, identifies implementation gaps—especially the dominance of informal collection and the incidence of unsafe recycling—and explores institutional frictions that allow paper compliance and leakage. It compares Indian EPR designs to European WEEE/RoHS approaches and offers reformative agenda calibrated for India's political economy, design incentives, formal–informal linkages, measurement and verification upgrades, public procurement levers, and protections for workers. The conclusion argues that legal form must be paired with capacity building, transparent metrics, and distributive measures to convert regulatory intent into reduced digital pollution and dignified green livelihoods.

KEYWORDS : E‑waste, Extended Producer Responsibility, Informal sector, CPCB, Digital pollution..

1. INTRODUCTION: DIGITAL POLLUTION AND THE RISING TIDE OF E‑WASTE

The concept of e-waste is not new for present world as it has been categorized as any other waste product which includes electrical and electronic equipment which are expired and poses a huge problem for ultimate treatment. E-waste has been defined under E-Waste (Management) Rules, 2016, Section 2(r) as electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment and repair processes.[1]

Technology these days occupies a prominent place in every field therefore technological revolution is playing a significant role for the advancement of the countries after industrial revolution.

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[1] E-Waste (Management) Rules, 2016.

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Thus, in India, the period between 1984 and 1990, which has been called as the 'golden period', witnessed continuous and rapid growth in the electronics industry in India.[2]

E-waste as a concern for environment and health issues was and is inevitable with the growing technological advancement and dependency of human kind in technology. Growth of human kind without technology is impossible and realizing the same different world forum (institutions) and countries has initiated minimal steps towards the proper treatment of the e-waste in international, national and regional level. While, concerns of e-waste has not been taken seriously by every countries and as such only 61 countries of the world legislated the regulations regarding e-waste which has increased in present by 78 countries.[3] India as a country has framed legislation through the Ministry of Environment, Forest and Climate Change (MoEFCC) on e-waste such as Environment Protection Act 1986, Hazardous Handling Management, E-Waste (Management and Handling) Rules 2011, E-Waste Management Rules 2016, E-waste (Management) Rules, 2018(amended).[4]

Hence, the concern of e-waste is not solved through making laws only while implementation of laws in a proper way is to be ensured by the central government and the state government through its agencies. According to the report of UN's Global E-Waste Monitor 2020, India is the third largest e-waste generator contributing 3.2mt., capacity limited to treat only one fourth of its waste, after China(10mt) and USA (6.9mt.) together contributing 38% of total 53.6 million tons of e-waste in 2019 worldwide.[5] Following the current growth of e-waste, an ASSOCHAM-EY joint report, titled 'Electronic Waste Management in India' estimated India to generate 5 million tons by 2021.[6]

In India 60% of the total e-waste generates from major cities and states such as Maharashtra ranks first followed by Delhi, Tamil-Nadu, Karnataka, Andhra Pradesh, Uttar Pradesh, West Bengal, Gujarat, Madhya Pradesh and Punjab.[7]Central Pollution Control Board (CPCB) in 2005 estimated 0.147 million tons (Mt) of e-waste in the country and simultaneously had projected 0.80 Mt of e-waste generation in the year 2010.[8] India emerged as fifth biggest producer of e-waste in the world discarding 1.7 Mt of electronic and electrical equipment in 2014(Economic Times, 2015).[9] The e-waste quantity reached 2.0 Mt during 2016.[10] This rapid growth of e-waste is at alarming rate in India, which necessitates proper implementation of the legislation in every level of the e-waste management procedures for sound management of e-waste.

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[2] E-Waste In India, Research Unit (Larrdis) Rajya Sabha Secretariat, New Delhi (June), 2011 available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://greene.gov.in/wpcontent/uploads/2018/01/e-waste_in_india-Document.pdf. (last visited on Dec. 02, 2022).

[3]United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) – co-hosted SCYCLE Programme, International Telecommunication Union (ITU) & International Solid Waste Association (ISWA), Bonn/Geneva/Rotterdam, Forti V., Baldé C.P., Kuehr R., Bel G. The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential. available at:
https://ewastemonitor.info/wp-content/uploads/2020/11/GEM_2020_def_july1_low.pdf (last visited on Dec. 02, 2022).

[4] Guidelines on implementation of E-Waste (Management) Rules, 2016 (Central Pollution Control Board, Delhi) available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://cpcb.nic.in/displaypdf.php?id=aHdtZC9HVUlERUxJTkVTX0VXQVNURV9SVUxFU18yMDE2LnBkZg%3D%3D (last visited on Dec. 02, 2020).

[5] *Supra* note 3 at 3.

[6] Sejal Mehta "The why and how of disposing electronic waste", *Mongabay*, Aug. 25, 2020, (last visited on Dec. 02 ,2020).

[7] Israel Cherukuri, Nazia Sultana and Sankara Pitchaiah Podila "Status of E-Waste in India-A Review", IOSR *Journal of Environmental Science, Toxicology and Food Technology (IOSR- JESTFT)* Volume 12 Issue 11 Vol. I, (Nov., 2018).

[8] *Ibid.*

[9] Shreya Punj "76% of e-waste workers suffer from respiratory ailments: Study", *Mint,* June 03, 2015, available at:
https://m.economictimes.com/news/politics-and-nation/76-of-e-waste-workers-suffer-from-respiratory-ailments-study/articleshow/47531421.cms, (last visited on December 02 ,2020).

[10] Sunita Narain (2018) "Report E-Waste management: generation; collection and recycling", *Centre for Science and Environment,* May 19, 2018.

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In *Municipal Council, Ratlam* v. *Vardhichand*[11] and *B.L. Wadhera* v. *Union of India and Ors.*[12] Supreme Court held that clean environment is fundamental right of citizens under Article 21 and it is for the local bodies as well as the State to ensure that public health is preserved by taking all possible steps. For doing so, financial inability cannot be pleaded. Therefore, from above reference, it may be pointed out that in case of e-waste as well, State is to be vigilant, and also to act accordingly contributing to management of e-waste as not only by framing laws to be regulated and to be implemented but as to be significant bodies of such for proper management thereof. Moreover, e-waste is not to be seen as a problem but as an opportunity, as e-waste contains not only hazardous substances but valuable substances which on being properly treated may be extracted for the benefit of the individual and society as a whole.

Hence, digital technologies have transformed contemporary life, but the material consequences of ubiquitous electronics receive far less public attention than data privacy or connectivity. 'Digital pollution' denotes the dispersed environmental and human harms associated with the manufacture, use and disposal of electronic devices: toxic components, polluted soil and water from crude recycling, and the social costs borne by low‑income workers who dismantle and recover valuable parts.

India's rapid uptake of mobile phones, consumer electronics, and affordable appliances has created a substantial and growing e‑waste challenge. By many international assessments, global e‑waste generation rose sharply in the 2010s, with only a minority of waste documented to be collected and recycled in formal processes; much is handled in informal networks that use unsafe techniques and operate outside regulatory oversight.[13] The policy question for India, now is how to make implement effectively legal rules that internalize producer responsibility, leverage formal recycling capacity, and transform informal reach into safe, dignified livelihoods.

2. REGULATORY EVOLUTION: FROM 2011 RULES TO THE 2016 RULES

India's statutory approach to e‑waste moved through consultations, voluntary schemes, and eventually to binding rules. The E-waste (Management & Handling) Rules, 2011 came primarily in to effect to channelize e-waste generated in the country for environmentally sound recycling and disposal as e-waste largely being controlled by the un- organized sector. The E-waste Rules, 2011 gave importance to prevention of generation of e-waste and duty of every manufacturer of electronic equipment to ensure that their products do not contain dangerous elements such as lead, mercury and cadmium above the prescribed limit.[14] Responsibilities of Producer, Collection centers, Consumers/Bulk Consumers, Dismantler, Recycler and Procedure for seeking authorization for handling e-waste was the major initiatives of the E-waste Rules, 2011 which at times felt to become inadequate and needed amendments within for the effective implementation for the regulation of the E-waste management.[15]

The Central Pollution Control Board (CPCB) has been given the responsibility to evolve the guidelines for implementation, and to oversee the progress made in implementing the E-waste Rules, 2011. At the state level, the concerned SPCB or the PCC is the responsible regulatory agencies for implementing the E-waste Rules. SPCB was also responsible for regulating the inter-state movement of e-waste. [16]

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[11] (1980) 4 SCC 162.
[12] (1996) 2 SCC 594.
[13] United Nations University (UNU), International Telecommunication Union (ITU) & International Solid Waste Association (ISWA), *The Global E‑waste Monitor 2017: Quantities, Flows and Resources* (Dec. 2017), available at https://www.itu.int/en/ITU-D/Environment/Pages/Toolbox/Global-E-waste-Monitor-2017.aspx (last visited on Dec. 01, 2020).
[14] E-Waste Management Rules, 2011.
[15] *Ibid.*
[16] *Ibid.*

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After early policy attention and municipal initiatives, the E‑Waste (Management) Rules, 2016 represented a pivot to a target‑based Extended Producer Responsibility (EPR) framework.[17] The 2016 Rules replaced the 2011 e‑waste rules and sought to standardize obligations across producers, dismantlers, refurbishers, and recyclers. The Rules mandated registration and authorization, specified phase‑wise collection targets for producers, and introduced Producer Responsibility Organizations (PROs) as aggregators that could help smaller manufacturers comply.[18]

The Central Pollution Control Board (CPCB) complemented the rules with implementation guidelines in October 2016, setting out reporting templates, verification expectations and a roadmap for targets.[19] These normative steps were significant: they placed producers at the center of the waste stream, emphasized recovery and recycling, and attempted to create institutional tools to track flows.[20]

3. CORE LEGAL COMPONENTS OF THE 2016 AND 2022 RULES

The 2016 Rules created obligations for producers/manufacturers, collection centers, dealers, recycler, e-retailer, consumer/bulk consumer, dismantler, refurbisher to maintain records of e-waste handled and make such records available for scrutiny by the Central Pollution Control Board or the concerned State Pollution Control Board, with responsibilities for producer/ manufacturer take‑back system, collection targets calculated on sales and product lifespan, and the requirement to ensure channelization of end‑of‑life EEE to authorized dismantler and recyclers. The Rules required dismantlers and recyclers to obtain authorization and to meet standards for environmentally sound recycling.[21]

The regime also imposed obligations on consumers and collection centers, and on state pollution control boards to enforce compliance for environmentally sound management of E-waste.[22] Key legal devices included the use of phase‑wise percentage targets to ramp up collection, documentation requirements, and the role of PROs to aggregate compliance for multiple manufacturers.[23] Collectively, these mechanisms sought to create legal clarity and a path towards higher documented recovery rates, but they relied heavily on accurate data, credible authorizations and the willingness of diverse actors to participate.

To meet the demand of the present E-Waste Management Rule, 2016 reflected an inadequacy in due time, therefore the E-Waste (Management) Rules, 2022 were published by the Government of India in the Ministry of Environment, Forest and Climate Change, in the Gazette of India, and came into force from 1st day of April, 2023.[24] Presently existing E-waste Management Rules, 2022 replaced E-waste Management Rules, 2016 with a wider scope of coverage which now includes other types of electronic equipment such as solar panels and tablets, GPS devices, air purifiers etc. under seven broad categories,[25] Producer Responsibility and Registration requires all manufacturers, producers, refurbishers, and recyclers MPRR to register on a portal to be developed by the Central Pollution Control Board (CPCB), with operation prohibited without this registration instead of taking

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[17] Ministry of Environment, Forest and Climate Change, *E‑Waste (Management) Rules*, 2016, G.S.R. 338(E), Gazette of India (Mar. 23, 2016), available at https://cpcb.nic.in/rules-6/ (last visited on Dec. 01, 2020).

[18] *Ibid*.

[19] Central Pollution Control Board (CPCB), *Implementation Guidelines for E‑Waste (Management) Rules*, 2016 (Oct. 1, 2016), available at https://cpcb.nic.in/displaypdf.php?id=aHdtZC9HVUlERUxJTkVTX0VXQVNURV9SVUx FU18yMDE2LnBkZg== (last visited on Dec. 01, 2022).

[20] *Ibid.*

[21] E-Waste (Management) Rules, 2016.

[22] E-Waste (Management) Rules, 2016, Rule 12.

[23] Toxics Link (India), E‑waste Report(s) and resources on informal recycling and health risks (e.g., 'Informal E‑Waste Recycling in India'), (accessed 2015–2019), available at https://toxicslink.org/electronic-waste (last visited on Dec. 1, 2022).

[24] E-Waste (Management) Rules, 2022.

[25] E-Waste (Management) Rules, 2022, Schedule I.

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authorization from their respective State Pollution Control Boards as in E-Waste Management Rules, 2016, centralized registration for manufacturers and recyclers on a portal.[26]

Major changes also include a new, more robust extended producer responsibility (EPR) framework, EPR mechanism now implemented an improved and more robust EPR regime, promoting a circular economy, with provisions for generating certificates for collection, recycling, and refurbishing i.e., roles of other stakeholders were simplified or integrated into the EPR system, with consumers now required to hand over waste to registered producers/recyclers and dealers/e-retailers subsumed under the definition of a producer,[27] the removal of separate categories for consumers and bulk consumers, with duties integrated into the overall system to promote scientific e-waste management and a circular economy and provisions for environmental compensation.[28]

E-Waste Management Rules, 2022 has introduced provisions for environmental compensation, audit, and verification, along with a system to facilitate the integration of the informal sector into the formal recycling process.[29] Further steering committee. - (1) under the Chairmanship of Chairman, Central Pollution Control Board to oversee the overall implementation of these rules and the Steering Committee with other members in addition is constituted[30] with a responsibility of overall implementation, monitoring and supervision of rules and empowered to decide upon the disputes arisen from time to time and on representations and shall refer to the Ministry of Environment, Forest and Climate Change any substantial issue arisen or pertaining to rules.[31] Committee is also empowered to review and revise the guidelines or extended producer responsibility target or addition of new Electrical and Electronic Equipment in Schedule I, in view of the technological advancements and other factors with the approval of the Central Government.[32]

4. THE INFORMAL SECTOR: BACKBONE OR BARRIER

One of the defining features of India's e‑waste reality is the prominence of the informal sector. Studies and civil society reports consistently estimated that the majority of e‑waste in India was processed informally — estimates often cited that 70–95% of e‑waste flowed through informal chains, depending on locality and device category.[33] Informal actors — from door‑to‑door collectors to kabadiwalas and small dismantlers — provide deep collection reach and valuable preprocessing services (component recovery, segregation) but use hazardous practices: open burning of wires, acid baths to extract precious metals, and manual dismantling without PPE.

E-waste is considered to be the fastest-growing waste stream in India and about 70% of the e-waste processed in India comes from abroad. Even though, the import of e-waste is prohibited under the Basel Convention yet the rules can be flouted easily. Developed countries like the USA and Germany have generally exported their e-waste to developing countries like China, India, Pakistan, Ghana, Philippines, Vietnam and Nigeria. Several reports show that about 80% of the total e-waste generated globally is transported or shipped often illegally to developing countries. The informal sector in the developing countries is more active in handling e-waste and uses open incineration and acid leaching

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[26] E-Waste (Management) Rules, 2022, Rules 4, 5, 7, 8, 9.

[27] E-Waste (Management) Rules, 2022, Rules 13, 14.

[28] *Id at 25.*

[29] E-Waste (Management) Rules, 2022, Rules 22, 24.

[30] E-Waste (Management) Rules, 2022, Rule 25(1).

[31] E-Waste (Management) Rules, 2022, Rule 25(2).

[32] E-Waste (Management) Rules, 2022, Rule 25(3).

[33] GIZ / Govt. of India studies on formal‑informal partnerships and e‑waste in India, *'Building the Link – Leveraging Formal‑Informal Partnerships in the Indian E‑Waste Sector'* (2017), available at https://www.giz.de/en/downloads/giz2017-en-formal-informal-partnerships-e-waste-india.pdf (last visited on Dec. 01, 2023).

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for recovering copper, gold and other useful metals. They dispose of the leftovers along with municipal solid waste in open fields and water bodies resulting in pollution of soil, air and water.[34]

Estimates are that only 5% of the total e-waste in India is collected and recycled by the formal sector while 95% is recycled by the informal sector. The formal e-waste recycling sector in India is authorized by the Central Pollution Control Board (CPCB) and employs educated and trained people. It includes authorized and registered recycling centres in different states of India to handle e-waste without causing damage to the environment. The informal e-waste recycling sector is not authorized by any government agency and no laws and regulations are followed. It involves poor and uneducated men, women and children living in slum areas as workers for handling e-waste. They earn their livelihood by recovering metals using unsafe techniques and procedures resulting in environmental pollution and health hazards for themselves and others.[35]

Proper recycling of e-waste is necessary to recover metals, recycle plastics and other components of e-waste following the zero-waste concept and to prevent damage to the environment. Industrial symbiosis is an important step in which the waste of one industry can be used as raw material by other industries. Another advantage of metal recovery from e-waste or urban mining is to minimize traditional mining activities which damage the environment. Continuous traditional mining leads to deforestation, changes in soil quality, landslides, air pollution and other adverse environmental impacts.[36]

For proper e-waste management, the first step is to estimate e-waste generation rates. No mechanism in the states or Central government for 'real' monitoring of the amount of e-waste generated. E-waste management in India by the formal sector faces several challenges. Most states do not have any mechanisms for regular monitoring of e-waste generation and subsequent activities making it difficult to plan and implement management strategies.[37]

The social and economic logic of the informal sector (low overhead, flexible collection, cash payments) made it both irreplaceable and vulnerable to displacement by rigid formal frameworks. The 2016 Rules recognized informal realities indirectly through PROs and collection targets, but they did not construct clear, funded transition pathways for informal workers to formalize.

5. MEASUREMENT CHALLENGES: ESTIMATING GENERATION AND COLLECTION

The consumption of Electrical and Electronic Equipment (EEE) is strongly linked to widespread global economic development. On average, the total weight (excluding photovoltaic panels) of global EEE consumption increases annually by 2.5 million metric tons (Mt). In 2019, the world generated a striking 53.6 Mt of e-waste, an average of 7.3 kg per capita. The global generation of e-waste grew by 9.2 Mt since 2014 and is projected to grow to 74.7 Mt by 2030 – almost doubling in only 16 years. Since 2014, the number of countries that have adopted a national e-waste policy, legislation, or regulation has increased from 61 to 78. However, regulatory advances in some regions are slow, enforcement is poor, and policy, legislation, or regulation does not yet stimulate the collection and proper management of e-waste due to lack of investment and political motivation.[38]

A persistent implementation challenge is measurement. Reliable national statistics on e‑waste generation and collection are patchy in India. International monitors such as the Global E‑waste Monitor 2020, provided comparative estimates and underlined that only a fraction of global e‑waste is

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[34] Dutta, Deblina, and Sudha Goel. "Understanding the gap between formal and informal e-waste recycling facilities in India." *Waste Management* 125 (2021): 163-171.

[35] *Ibid.*

[36] *Ibid.*

[37] *Ibid.*

[38] *Supra* note 3 at 3.

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formally documented as collected and recycled.[39] India's official estimates relied on 'placed‑on‑market' sales data and average product life to model generation, but the absence of granular, state‑level, and category‑wise data created room for uneven enforcement and for paper compliance. The reliance on self‑reporting and the limited capacity for third‑party independent audits meant that targets could be met on paper while actual material recovery lagged.

6. INSTITUTIONAL CAPACITY AND ENFORCEMENT

Formerly, E-waste management was enclosed under the Hazardous Waste (Management and Handling) rules until 2010. Management of the e-waste involving environmental issue and thereafter human health concerning issue has demarcated a plot into environmental legislations and therefore Environment Protection Act, 1986 along with E-waste Rules of the time becomes prominent to deal the issues and the role of the Central and State Pollution Control Boards reflects significance in dealing with e-waste as constituting an institution within India for the resolution of the e-waste issues at its depth. Whereas, legislation is only as effective as the institutions that implement it. The 2011, 2016 and 2022 E-Waste Management Rules assigned key roles to the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) for registration, authorization, monitoring and enforcement.[40] However, State Pollution Control Boards (SPCBs) faced resource constraints and competing priorities; many lacked dedicated e‑waste cells or trained inspectors. Auditing recycling yields, monitoring hazardous residuals, and prosecuting illegal operations required technical capacity and laboratory support that were unevenly distributed across states. Civil society and media exposed numerous unregulated clusters operating in residential areas, illustrating enforcement gaps.[41] This institutional shortfall reduced the deterrent value of legal obligations and allowed unsafe practices to persist.

7. MARKET INSTRUMENTS AND PRODUCER RESPONSIBILITY ORGANIZATION

Producer Responsibility Organizations (PROs) emerged as market intermediaries attempting to aggregate small producers, create collection networks, and interface with recyclers. While PROs provided administrative convenience and scale, their governance, transparency and accountability varied.

The inability to reliably source e-waste quantities that create economies of scale restricts entry of private players, such as PROs to set up e-waste management systems in the formal sector. For example, employing effective recycling technologies for e-waste may require significant upfront capital expenditures, which may not be justified for private entities in the absence of certainty around sourcing of enough quantities of e-waste. Also, these markets suffer from information barriers. Firstly, e-waste recycling is a relatively new business, potential lack of information on cost-effective recycling technologies itself could be a market barrier. Secondly, the less awareness, partly because of the lack of reliable information on e-waste management among consumers, affects the functioning of markets. Public policy may have to play a greater role (beyond the current e-waste regulations) in enabling better markets for e-waste.[42]

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[39] Wasim Ayub Bagwan, "Electronic waste (E-waste) generation and management scenario of India, and ARIMA forecasting of E-waste processing capacity of Maharashtra state till 2030", *Waste Management Bulletin,* 2020 (last visited on Dec. 1, 2020).

[40] "CPCB technical guidelines and SOPs on e‑waste management and environmentally sound recycling practices" (Ministry of Environment, Forest and Climate Change, 2016–2019), available at https://cpcb.nic.in/cpcb-technical-guidelines-sops/ (last visited on Dec. 01, 2023).

[41] Press and civil society reporting on e‑waste hotspots and clusters (2015–2020); see reports by Toxics Link and media coverage available at: https://toxicslink.org/media-coverage-2 (last visited Dec. 01, 2023).

[42] Turaga, Rama Mohana R., Kalyan Bhaskar, Satish Sinha, Daniel Hinchliffe, Morton Hemkhaus, Rachna Arora, Sandip Chatterjee et al. "E-waste management in India: issues and strategies."*Vikalpa: The Journal for Decision Makers*, Sep. 20, 44, no. 3 (2019): 127-162.

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8. INVOLVEMENT OF LABOUR DIMENSIONS UNDER E-WASTE MANAGEMENT

E‑waste regulation is not only an environmental instrument but a social one. Informal workers often migrant men and women, and sometimes children bore disproportionate health risks. Legal reform that ignored labor transitions risked deepening inequality. Policy proposals before 2022 included training and certification programs, incentivized formal‑informal partnerships, door‑to‑door collection contracts with municipal bodies, and microfinance for safer equipment. Legal provisions to mandate occupational safety standards and assure compensation were discussed but rarely operationalized at scale, which emerges with it a huge wave of health concerning issues in its way in near future. Non-recognition of the large informal sector practices dealing with collecting, recycling and dismantling e-waste involving huge manpower without appropriate training showcases a setback of the rules and policies proposed to deal e-waste management concerning health issues along with environmental issues.

9. COMPARATIVE LESSONS: WEEE, ROHS AND BEYOND

The amount of waste electrical and electronic equipment (widely known as WEEE or e-waste) generated every year in the EU is increasing rapidly. EU rules address environmental and other issues caused by the growing number of discarded electronics in the EU. The aim is to contribute to sustainable production and consumption by preventing the creation of WEEE as a priority, contributing to the efficient use of resources and the retrieval of secondary raw materials through re-use, recycling and other forms of recovery and improving the environmental performance of everyone involved in the life cycle of EEE.[43]

The WEEE Directive and the RoHS Directive tackle the issue of the growing amount of WEEE. This Directive lays down rules on the restriction of the use of hazardous substances in electrical and electronic equipment (EEE) with a view to contributing to the protection of human health and the environment, including the environmentally sound recovery and disposal of waste EEE.[44]

EU countries are obliged to report to the Commission every year on the achievement of the targets for WEEE collection, preparing for re-use and recycling and/or recovery. The Commission has mandated the European Standardization Organization (CENELEC) to develop standards for the collection, transport and treatment of waste for all products covered by the WEEE Directive.[45] The standards also cover preparation for reuse. Standards can help treatment operators fulfil the Directive requirements without unnecessary administrative burden.

The EU's WEEE (Waste Electrical and Electronic Equipment) directive mobilized producer schemes with audited clearing houses, set take‑back obligations with clear roles for retailers, and used fees and visible pricing to create consumer incentives, which in India a scheme of Extended Producer Responsibility is applied. RoHS restricted hazardous inputs, easing recycling burdens. India could adapt these models, but adaptation requires attention to context such as high informality, lower formal recycling capacity, and differing fiscal constraints. Thus, hybrid approaches combining targets, market intermediaries, and localized informal integration were advocated in academic and policy discussions.[46]

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[43] European Commission, Waste from Electrical and Electronic Equipment (WEEE) available at: https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en (last visited on Dec. 01, 2023).

[44] *Id* at 12.

[45] European Union: WEEE Directive (2002/96/EC and recast 2012/19/EU) and RoHS Directive (2002/95/EC, amended), for comparative context available at: https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee/implementation-weee-directive_en (last visited on Dec. 1, 2023).

[46] *Ibid.*

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10. PATHWAY FOR REFORMS REGARDING E-WASTE

On the basis of evaluation of the existing legislations in India regarding to the regulation of e-waste management following points as laid down are of immense significance for the effective dealing of the issues of e-waste management:

Strengthen measurement: publish of annual state‑wise generation and collection dashboards with third‑party audit requirements as well participating internationally on this matter.

Formal‑informal integration: franchise models and paid aggregation contracts that recognize kabadiwallas as authorized collectors.

Design incentives: tax breaks or accelerated depreciation for modular, repairable products; mandatory repairability labelling.

Capacity building: fund state e‑waste cells, mobile inspection labs, and recycler certification programs.

Market integrity: transparent PRO reporting, independent clearing houses, and anti‑double‑counting rules.

Consumer nudges: visible take‑back desks at retail outlets/e-retailer and small cash or voucher incentives for returned devices.

Social protections: mandatory ESI/health screenings, occupational safety subsidies, and transition grants for affected workers.

Upstream controls: stricter hazardous substance limits and customs check for non‑compliance of imports regulations.

Public procurement: mandate recycled content in government electronics and prioritize vendors with take‑back schemes.

Research and finance: public funding for safe recycling technology pilots and blended finance for formal recyclers.

Panel Provisions: Certain specific punishments for the non-compliance of rules and regulations must be stipulated for the deterrent effect and to make realize the gravity of adverse action against environment and health concerns of the workforce related thereto and people indirectly involved therein.

Involvement of Local Authorities: In India panchayat system for self-governance are active for various issues and further understanding the importance of advancement of technology and its use regarding e-waste involvement of local authorities into e-waste issues could be of significance to deal with menace of e-waste from every corner not only the urban local authorities.

11. CONCLUSION

The regulatory architecture as it stood marked important progress as India anchored producer responsibility in law, created targets, and legitimized formal recycling. Yet the gap between legal intent and on‑ground practice remained wide. Closing it requires technical capacity, political commitment, credible measurement and above all, an equity lens that protects workers while securing material recovery.

In short, the law alone cannot eliminate digital pollution without institutional investments and social policy. If regulators, producers and civil society align behind transparent metrics, formal‑informal partnerships, and design incentives, India can substantially reduce the toxic footprint of its digital transition and create dignified green livelihoods for those at the frontlines of e‑waste handling.