**E-WASTE MANAGEMENT: NEED FOR ACTION AND A LONG VOYAGE TO GO**

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**ABSTRACT**

E-Waste Management and its necessity in today’s era, gaps and solutions. The paper will be dealing with what is e-waste and e-waste management. The effect of e-waste on the environmental degradational and human health will be discussed in brief. The paper will also be discussing the evolution of various rules, regulation and especially legislations that deal with E-waste management. Some landmark cases with respect to e-waste and its management will be analyzed. The conditions of E-waste management and its implementation during the COVID 19 pandemic will also be looked over. A small case study of e-waste management in Bangalore will be presented in the paper. The paper will be mainly focusing on the gaps of e-waste management regulation, implementation and framework and possible solutions to solve the gaps. The paper will conclude with a personal analysis in regards with gaps and solutions, suggestions, future of the nation if the ineffectiveness continues and the need for action.

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2. Electronic waste (management) Rules, 2016, s. 3(1)(r)

**KEYWORDS:** E-waste, E-waste Management, India, Gaps and Suggestions

**INTRODUCTION:**

E-waste or electronic waste are any electrical or electronic material that has either been discarded or has nearing the end of its useful life. Items like Old computers, fax machines, printers, etc. are some examples of e-waste. Many of these products can be recycled, reused and refurbished. E-Waste (Management) Rules, 2016 defines e-waste as “any 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.” E-waste in India has become a major problem, due to the advancement in technology it has become a huge threat to the environment. If not managed properly e-waste could be hazardous to the health of human beings and to the environment as well. According to the World Health Organization (WHO), health risks can arise from the materials contained in E-waste and the accumulated chemicals in our food and water can seriously deteriorate our health.

India is one of the top generators of E-waste. Indian ranks 177 out of 180 countries in the Environmental Performance Index. India is ranked 5th out of the highest global e-waste producing countries after USA, China, Japan and Germany. India produced almost two million Tonnes of e-waste annually and not only that it also imports e-waste from other countries in the world. As per the study of

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Associated Chambers of Commerce and Industry (ASSOCHAM) and the KPMG it has been discovered that in the e-waste generated annually, 70 percent if computer equipment, 12 percent is telecommunication equipment followed by 8 and 7 percent of electrical and medical equipment including almost 21 types of electrical and electronic equipment (EEE)\(^4\).

Being the 5\(^{th}\) largest generator of e-waste in the world and 95 percent of the E-waste management is handled by informal and unorganized sector and hence there is ineffectiveness in managing the e-waste. Shockingly out of all the e-waste generated in the year of 2018-19 not even 10 percent of it was collected and treated\(^5\). There is a bare minimum of e-waste facilities, people are not aware of it and the workers are being treated harshly and their health is getting affected. The top three cities that generate the most amount of E-waste is Mumbai, Delhi, and Bengaluru.

As discussed, before it is important for a nation to have effective and efficient e-waste management because it is a threat to the environment. If the e-waste is disposed by melting, shredding or dismantling, toxic cases will be released into the air causing air pollution and damaging respiratory health. This will eventually lead to endangering and damaging the biodiversity of animal species that have been exposed to it. If the E-waste has been disposed manually by dumping them in landfills, then the heavy metals can seep into the soil thereby causing soil degradation and contamination of the crops around the area. After this, there is a probability that these intoxicated chemicals may seep and contaminate any water bodies nearby, and hence causing water pollution which becomes unsafe for marine life. This will also affect the clean drinking water by making it unsafe to consume. Eventually from affecting the environment it will lead to damaging the health of human beings as they contain toxic components like mercury, lead, cadmium, etc. Hence E-waste management is a necessity and it has to be done properly with safety measures.

**LEGISLATIONS OF E-WASTE MANAGEMENT IN INDIA**

Over the time other legislations dealt with e-waste, the evolution of e-waste management rules in India, and the other laws that can be interpreted to works with e-waste and its management will be discussed. They have been discussed below in brief:

- Hazardous Waste Management Rules, 2016\(^7\);

In India Hazardous Waste Management Rules, have been drafted in order to ensure safe handling and processing of Hazardous


\(^7\) Hazardous Waste Management Rules, 2016
Waste. Hazardous waste means any type of waste which is any form or shape toxic, explosive, causes danger to health or environment. These rules first came into effect in the year of 1989 and have been amended several times. Waste (Management, Handling and Transboundary Movement) Rules, 2008 was one very important legislation. The Rules lay down corresponding duties of various authorities such as MoEF, CPCB, State/UT Govts., SPCBs/PCCs, DGFT, Port Authority and Custom Authority while State Pollution Control Boards/Pollution Control Committees have been designated with wider responsibilities touching across almost every aspect of Hazardous wastes generation, handling and their disposal. The 2016 rules mainly focused with expanding the ambit of the act by including the term ‘Other Waste’ like waste tyre, paper waste, metal scrap, used electronic items, etc. and are recognized as a resource for recycling and reuse. The rules also make the State authorities responsible for setting up more facilities to treat for hazardous waste. Before a special rule came for E-waste, Hazardous Management and Rules were being followed, and e-waste still comes under its scope along with various rules and legislations.

- Electronic Waste Management Rules:

The Ministry of Environment, Forests, and Climate Change (MoEFCC) is responsible for regulations regarding electronic waste. Additionally, the Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB) produce implementation procedures to ensure proper management of rules set forth by the MoEFCC.

1. Electronic Waste (Management) Rules, 2011:

In response to the Environmental Protection Act, 1986, these rules were drafted in 2011 which came into effect in 2012, and were in specifically about E Waste Management. The rules stated that all the manufacturers and importers who are dealing with e-waste shall plan and come up with a way to manage their respective e-waste. These rules bestowed upon responsibilities like setting up e-waste facilities, providing consumers information with how to dispose their electronic product, spread awareness upon the consumers if the product contains any hazardous material, to collect and dispose e-waste safely and effectively upon the producers and suppliers of electronic products which have a potential to become electronic waste. It was also mandatory for all the entities to keep and maintain records of e-waste and update them to their respective State Pollution Control Boards.

2. E-waste Management Rules, 2016:

These rules replaced the E-waste management rules of 2011. The term e-waste is defined as ‘electrical or electronic equipment, whole or in part discarded as waste by the consumer of bulk consumer as

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8Waste (Management, Handling and Transboundary Movement) Rules, 2008  
9 Central Pollution Control Board, Ministry of Environment, Forest and Climate Change, December 18, 2021 Government of India official website retrieved from https://cpcb.nic.in/rules/.  
11 Electronic Waste (Management) Rules, 2011  
12Environmental Protection Act, 1986  
13E-waste Management Rules, 2016
well as rejects from manufacturing, refurbishment and repair processes. These rules give more clarifications with respect to the responsibilities of different entities. One major change and significance of these rules are the addiction of Extended Producer Responsibility (EPR) which means that the producers shall ensure that their e-waste is given to proper recycling and management facilities for its treatments. Various producers can have a separate Producer Responsibility Organization (PRO) and ensure collection of E-waste, as well as its disposal in an environmentally sound manner. It also provided certain aims and goals for certain industries to reduce their collection or production of e-waste.

3. E-Waste (Management) Amendment Rules, 2018: This amendment just provided more specifically for the provisions under the 2016 rules. It focused on e-waste collection targets and on PRO (Producer Responsibility Organization). These rules provided for the registration rules, role, activities and procedures in regards with PRO. These rules also give the Central Pollution Control Board (CPCB) power for random selection and testing of electronic products and whether they are in compliance with all the rules at present.

- The Air (Prevention and control of Pollution) Act, 1981 and The Water (Prevention and Control of Pollution) Act, 1974:

These two legislations are of utter importance and they indirectly contain provisions of e-waste management. The provisions act provide for Air and Water pollution, and hence when e-waste is not disposed properly and its leads to the degrading of the air and water, these provisions will come into play.

- The Environment Protection Act, 1986 (EPA):

This Act mainly assigns responsibility and authorizes the Central Government to protect and improve the environment and reduce overall pollution. The main purpose of the act is the implement all the decisions of the United Nations on the Human Environment to Human Environment, 1973 which is famously known as the Stockholm Conference. The EPA is an umbrella act and the E-waste rules also come within its extent. There are some general provisions in the act that also can be applied to e-waste and its management.

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14.E-Waste (Management) Amendment Rules, 2018
15.The Air (Prevention and control of Pollution) Act, 1981
16.The Water (Prevention and Control of Pollution) Act, 1974
In this act there are three penal provisions namely section 15\(^{17}\), 16\(^{18}\) and 17\(^{19}\). Section 15 provides for the contravention of the provisions of the Act, rules, orders and even directions passed under EPA. Section 15 deals with the liability of individuals, section 16 provides for the liability of the companies and section 17 creates liabilities on government departments.

EPA also provided for the ‘polluters pay principle’ which is applicable to e-waste management. Under this principle the entity producing the pollution will be liable for paying the damage done to the natural environment. Polluters pay also goes by the name of EPR (Extended Producers Responsibility) which is one salient feature of the E-Waste Management Rules, 2016. Any violations to the above provisions will lead to penalties and compensation.

- Indian Penal Code, 1860\(^{20}\) (IPC):

There are certain penal provisions under the IPC that indirectly deal with environmental protection and E-waste. These provisions were drafted to deal with Environmental protection and deterioration. Chapter XIV (Offences affecting public health, safety, convenience, decency and morals) of IPC has

\[\text{(1)}\]

\[\text{Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a company and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any director, manager, secretary or other officer of the company, such director, manager, secretary or other officer shall also deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.}\]

\[\text{(2)}\]

\[\text{Notwithstanding anything contained in sub-section (1), where an offence has been committed by a Department of Government, the Head of the Department shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly.}\]

17. “S. 15 - Penalty for contravention of the provisions of the Act and the rules, orders and directions (M) Where an offence under this Act has been committed by a company, every person who, at the time the offence was committed, was directly in charge of, and was responsible to, the company for the conduct of the business of the company, as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly: Provided that nothing contained in this sub-section shall render any such person liable to any punishment provided in this Act, if he proves that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence. (2) Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a company and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any director, manager, secretary or other officer of the company, such director, manager, secretary or other officer shall also deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.”

18. “S. 16 - Offences by Companies (1) Where any offence under this Act has been committed by a company, every person who, at the time the offence was committed, was directly in charge of, and was responsible to, the company for the conduct of the business of the company, as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly: Provided that nothing contained in this sub-section shall render any such person liable to any punishment provided in this Act, if he proves that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence. (2) Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a Department of Government and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any officer, other than the Head of the Department, such officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.”

19. “S. 17 - Offences by Government Departments (1) Where an offence under this Act has been committed by any Department of Government, the Head of the Department shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly. Provided that nothing contained in this section shall render such Head of the Department liable to any punishment if he proves that the offence was committed without his knowledge or that he exercises all due diligence to prevent the commission of such offence. (2) Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a Department of Government and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any officer, other than the Head of the Department, such officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.”

20. Indian Penal Code, 1860
various provisions dealing with offences related to pollution of environment and some of these provisions can be applied to pollution caused by electronic wastes also. The provisions are sections 268 (Public Nuisance), 269 (Negligent act likely to spread infection of disease danger), 270 (Malignant act likely to spread infection of disease dangerous to life), 277 (Definition of Water Pollution), 278 (Making atmosphere noxious to health), 284 (Negligent conduct with respect to poisonous substance), 296 (actions against the acts of a water polluter) and 290 (Punishment for committing public nuisance).

JUDICIAL DEVELOPMENTS:

There are certain landmark cases with respect to e-waste management and these played an important role in shaping the e-waste management rules as of today. Some of the landmark cases have been discussed as follows:

- In the case of Shailesh Singh V State of Uttar Pradesh[21], is a case that was decided by the National Green Tribunal (NGT). In this the case a complaint was filed stating that unauthorized recycling/collection/dismantling units, burning, selling of E-waste and other solid waste on the road side/bank of rivers are in violation of E-Waste (Management) Rules, 2016 and Environment (Protection) Act, 1986 (EW Rules) resulting in groundwater contamination, air pollution and soil acidification. After consideration of all the facts, the Tribunal directed the CPCB to clearly spell out review and action report to ensure that all the rules that have been put forward in 2016 under the Environment protection Act, 2016. The decisions were majorly taken by a compliance report that filed by that Ministry of Environment, Forest and Climate Change dated 14 September 2018 that showed that India is the fifth largest producer of e-waste in the world. 95% of e-waste is recycled by the informal sector and only 5% is recycled by the formal sector.

- In the case of Mahendra Pandey V Union of India[22], a status report in regards with hazardous e-waste being disposed into the river of Ramganga was submitted to the NGT. After looking into the report, a fine of Rs. 10,00,00 was imposed on the government of Uttar Pradesh, as adequate action was not taken. The tribunal then stated that after taking the necessary steps to stop the pollution of hazardous e-waste into the river of Ramganga another status reports shall be compiled and sent to them.

- In the case of Research Foundation for Science, Technology and Natural
resource Policy V Union of India\textsuperscript{23}, the grievance of the Writ Petitioner was in regards with the import of toxic wastes from industrialized countries to India, despite such wastes being hazardous to the environment and life of the people of this country. The Writ Petitioner sought to challenge the decision of the Ministry of Environment and Forests permitting import of toxic wastes in India under the cover of recycling, which, according to the Petitioner, made India a dumping ground for toxic wastes. It was alleged that these decisions were contrary to the provisions of Articles 14 and 21 of the Constitution and also Article 47, which enjoins a duty on the State to raise the standards of living and to improve public health. In the writ petition it was also contended that Article 48A provides that the State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.

The BASEL and MARPOL conventions were referred and was stated that India was a signatory to both of them. The BASEL Convention prohibited the import of certain hazardous substances on which there was a total ban, therefore, under an obligation to ensure that the same are duly implemented in relation to import of hazardous wastes into the country. The provisions of the Hazardous Wastes (Management & Handling) Rules, 1989, should be declared as unconstitutional, cannot be granted, since the same are in aid and not in derogation of the provisions of Articles 21, 39(e), 47 and 48A of the Constitution\textsuperscript{24}.

All the above cases have played an important role in regards with determining the importance of e-waste and hazardous waste. E-waste is a significant problem and there is a need for a remedy, however judicial developments are not sufficient to do something about it. Cases are rare with respect to e-waste and its management. E-waste needs a strategic response and plan where every aspect of e-waste has been addressed. Local bodies and authorities play a major role in regards with e-waste management and focus should be in making sure that all the rules are implemented by the bodies in this regard. There have to be authorities looking over these bodies and hence ensure the effective implementation of the rules and regulations.

**E-WASTE AND COVID 19 PANDEMIC:**

Covid 19 impacted every single one of us at a large scale. Because of the deadly virus, people were forced to stay at home and go on with their daily activities. Because of the confinement at home, and jobs that were yet to be done, a high amount of work was digitized, enabling work from home and the children could be taught from home via online classes. This led to high increase in the usage of electronic items and products, and nevertheless over time it became a necessity. Hence, Covid 19 not only affected our human lives but also affected the environment in certain ways especially through digitization.

\textsuperscript{23} Research Foundation for Science, Technology and Natural resource Policy V Union of India, 2012 7 SCC 769

\textsuperscript{24} Abhijay Negi, Smita Gupta, Electronic Waste Management-A crisis everyone saw coming, RGNUL

Student Research Review, Retrieved on Dec 19, 2021
In the first three quarters of the Covid 19 pandemic, shockingly there was actually a reduction in the amount of e-waste that was produced. Due to the pandemic, many people lost their jobs and hence reducing the purchase of electronic products, however during this time there was a rise in the purchase of small electronic products like mobiles, laptops, gaming consoles leading to the reduced consumption and purchase of larger equipment like desktops, TV’s, home appliances and so on\(^25\).

However, this happiness lasted short as after the third quarter the purchase of electronic products has increased significantly. The study that was conducted by Blancco revealed that almost all organization had to buy laptops and new electric devices to deal with the pandemic and to shit to home office environments. The study also found that Covid 19 caused many people to buy unnecessary electronic products and various investments in technology\(^26\).

As a result of purchasing electronic products, this also led to mass production of e-waste and consequences were being faced. However, there were some e-waste policies and initiatives that were taken by the organizations. Understanding these new challenges that are to be overcome, almost 40 percent of the organizations have implemented e-waste policies for end-of-life devices. E-waste and electronic products were not only a consequence for the environment but also increased the spread of the virus by acting as mediums. To control and to dispose the e-waste generated in an environment friendly manner, new regulations and recycling facilities are being adopted for better e-waste management. The legislations in India are being updated and new rules are being brought on a public and private level. One good example for taking sustainable initiatives for e-waste management is Accenture. The IT global tech company Accenture declared in the year 2020 that are moving towards zero waste, and they plan to reuse and recycle its e-waste like computers and servers. The company is also donating its IT equipment like laptops and desktops as a part of the “Digital Daan’ initiative. The spokesperson of Accenture stated that because of the pandemic many schools were shut and this led to a wide range of online classes, and hence they will donation to the people who can't afford online devices to support their education\(^27\).

**E WASTE MANAGEMENT: CASE STUDY IN BANGALORE**

Bangalore also goes by the name Silicon Valley of India as it the IT hub if the nation. Bangalore is ranked first in IT destinations and are filled with software and technological companies that deal with a high number of electronic products thereby producing a lot of e-waste too, and hence e-waste management becomes essential. In Bangalore most of the e-waste management is taken care by the


\(^{26}\) Press Release by Blanco, *Covid is creating a rising tide of E-waste*, E-waste world conference and


formal or organized sectors, as this city has effectively planned E-waste management. Usually in other parts of the nations it is mostly carried on by informal sectors. Bangalore has emerged as a key city, which has identified the different stakeholders and is taking measures so that E-waste and its properly managed and disposed. The three main authorities that deal with E-waste management in Bangalore have been listed as follows:

- The Government: Agencies associated with E-waste that include Karnataka State Pollution Control Board (KSPCB), Bruhat Bengaluru Mahanagar Palike (BBMP), Department of Information Technology, Government of Karnataka. The KSPCB Board ensured that the current rules and legislations are enforced. It directs the disposers to only dispose the E-waste in the landfills authorized by them. KSPCB has also made it mandatory for all new establishments seeking Consent for Establishment (CFE) in order to make the organizations comply with E-waste regulations. Therefore, all the organizations in the city are now aware about the E-waste regulations that are to be followed.

- The Generators (mainly producers and consumers)

The corporate sector, government agencies, educational institutions and small and medium scale industries amounts to the majority of the E-waste that is generated. These companies have adopted policies for safe and effective E-waste management

- The Recyclers (Both formal and informal recyclers):

There are two types of recyclers for e-waste in Bangalore: formal and informal. Majority of the E-waste management is done by formal sector namely E-parisaara and Ash recyclers. Many big brands give their e-waste to these two organizations like HP, IBM, GE, Intel, Motorola, ABB, Philips, Sony etc. On the other hand, there are small informal organizations that usually operate without any license, it is necessary that this sector complies with the current e-waste rules and legislations.

The bE-Responsible program has been initiated by Saahas and Environmental Synergies in Development (ENSYDE) to create awareness and facilitate the collection of household electronic waste (e-waste) in Bangalore by installing E-waste drop boxes in different locations.

In Bangalore the increasing amount of e-waste is a major reason for this green city to deteriorate. Due to generations of e-waste the environment is getting affected in a negative manner, and it is becoming serious day by day. Even with the above planning there is still a large amount of e-waste that is not being treated properly. The city is facing E-waste hazards and it becomes necessary to take more serious actions in regards with e-waste management. The only reason why the

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29 Poornima Kanna, Drop off e-waste at these Bangalore One centres, Citizen Matters Bengaluru , Retrieved on Dec 20, 2021 from https://bengaluru.citizenmatters.in/bangalore-one-centres-e-waste-20541
e-waste generated in Bangalore is huge is due to IT sector. The more income, the more companies, the more the people can afford to buy electronic products like laptops and desktops. As of now there are only few recycling industries and the proportion of the e-waste generated and treated is not equal. As time goes on it becomes essential that more organizations are set up wo meet the rising demand of the e-waste that is generated.

**ANALYSIS (GAPS AND SUGGESTIONS):**

The more we go into the future the more we are becoming dependent on various facets of technology. We are in a state that without it would become difficult for us to survive, and this has led to electronic waste becoming a huge problem. We are in state of deprivation, and if instant actions are not taken it will be difficult to retrieve mother earth. We have to handle the situation of e-waste with utmost care and attentions and we have to ensure that there is punishment for those who are affecting the sound health of the environment.

There are gaps and loopholes that are existing in the system and making all efforts ineffective. India is one of the top five nations for generating the *highest amount of electronic waste* in the nation, however when it comes to managing and recycling the e-waste we stand in the last. As per statistics not even 10 percent of the e-waste that is generated is treated and this has become a major issue, apart from this India also acts as a dumping ground for e-waste. *Ineffective legislations* and rules, there are many rules and laws in regards with e-waste management and there is also a need for many more laws to deal with it. In spite of having these rules, there has been a failure successfully implementing E-waste management rules, and there is no information in regards with where there are recyclers and treatment plants for e-waste and what is going on with respect to e-waste management. Due to ineffective legislation and high amounts of e-waste generation there are *health hazards* that are arising. As to this date there is *lack of awareness* when it comes to e-waste and its management. Many years ago, they started to bring awareness with respect to women’s rights and even to this day some are not aware, in the same if we start bringing awareness about e-waste management now, maybe after a decade or two people will start sensitizing and following and taking part in managing e-waste. One issue that has not been taken under consideration if *security problems*, when old computers or mobiles and anything containing personal and sensitive information is being disposed there is a high chance that this information is not erased, and if it falls in the wrong hands there can be a breach of privacy and a rise in cyber-crimes. There aren't any rules in regards with information in a device during its disposal, and there is a need for rules to be brought in this regard. In India majority of the e-waste management is informal, due to the *non-involvement of local bodies* like municipalities and *lack of coordination* between all the authorities that are responsible for e-waste management. There also isn't enough *funding and infrastructure* that is required to treat e-waste in an effective and efficient manner. There are many more problems in India where attention is needed and as per the official's e-waste isn't one amongst them in present era of pandemics and human right issues and violations. These are the main issues and gaps currently that is in the way of effective e-waste management.
After analyzing the issues, I have come up with certain suggestions and recommendations that can be implemented. I have listed them as follows:

- **Extended Producer Responsibility (EPR):** EPR has recently been adopted in the rules of E-waste management, however its implementation is not exactly in the positive side. EPR is an excellent addition to the rules and regulation however it should be ensuring that this approach is being implemented widely by all the companies and producer at large. EPR has been designed to make the manufacturers internalize the external costs associated with the end-of-life disposal of their products. Regulations and procedures with respect to different entities have been specified in the rules. Producers play a major role in the implementation of EPR, it becomes important that they have an effective e-waste management plan. They need to partner up with the right entities, develop a transparent system, and design standards and rules for e-waste management, and then there can be successful implementation of EPR.

- **Recognizing and formalizing the informal sector and encouraging formal-informal partnership:** Most of the e-waste management in the nation is informal and even where there are cities like Bangalore where majority if it is formal, it is still important to consider the part that informal sector plays. Informal sector organization is highly effective but their techniques are dangerous and polluting. Instead of shutting down these treatment plants, if they are provided with licensing and authorization, they can do the same work under the formal sector and this will prove to be beneficial for the nation. We need to work towards achieving hundred percent e-waste management through the formal sector.

- **Developing online systems:** Due to the massive information and generation of e-waste, it becomes essential to develop an online platform where information is provided with respect to rules and regulations of e-waste and a platform that also accessible to the general population so that they become aware about it. Such a system would serve two objectives of generation of credible data and effective monitoring, thus reducing environmental load and fostering circular economy. This will also ensure credibility and accountability.

- **Increasing the participation of local bodies like municipalities by giving incentive measures.**

- **Updating the existing rules and regulations and coming up with new legislations for the issues that have not been dealt with like security implications, e-waste management treatment plants and so on.**

- **Regulatory authorities:** E-waste management should start from top; measures shall be taken from the stakeholders that are involved, and a regulatory authority for dealing with hazardous waste should be established. Here, research and development have to take place for effective management ideas, and objectives have to be laid down with respect to e-waste disposal, this authority has to ensure that all levels of authorities including the local bodies are playing their part in waste management.

- **Creating awareness:** Awareness programs have to take place to make the public aware about the importance of e-waste management. They have to made
aware on how to dispose e-waste all products should be labelled with the procedure, and warning for hazardous products. Due to the informal sector and lack of efforts with respect to e-waste management, the awareness is almost absent in the society.

- Reuse, Refurbish and Recycle: Disposing e-waste and treating all the hazardous content in it becomes very difficult. However, if the electronic products are reused and recycled half of e-waste management is already done. Reuse can be practiced by increasing the life span with precautions and measures, this can be achieved through research and technology it can be more strengthened. Recycling of the product is difficult especially when there is hazardous material in the products, and initiative can be taken on the part of the creators by substituting hazardous content with more sustainable and ecofriendly material which will ensure easy recycling.

The above suggestions are really important and they can ensure that we live in a better world where there is effective e-waste management. As already stated, the present legislations that are in existence are ineffective and there is need to updated versions and new laws and it should also be made sure that these rules are implemented successfully and reach every single town and city in India. There is a need for strict penal provisions and penalties when the environment has degraded due to ineffective e-waste management. The existing pollution boards at central and state level shall be given more power and strengthened.

India has been taking awareness measures under the Digital India initiative; however, more attention is required. If the current state