



SUSTAINABLE POLICIES FOR E-WASTE MANAGEMENT IN EUROPEAN UNION - AN ANALYSIS OF OPPORTUNITIES FOR INDIA

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ABSTRACT

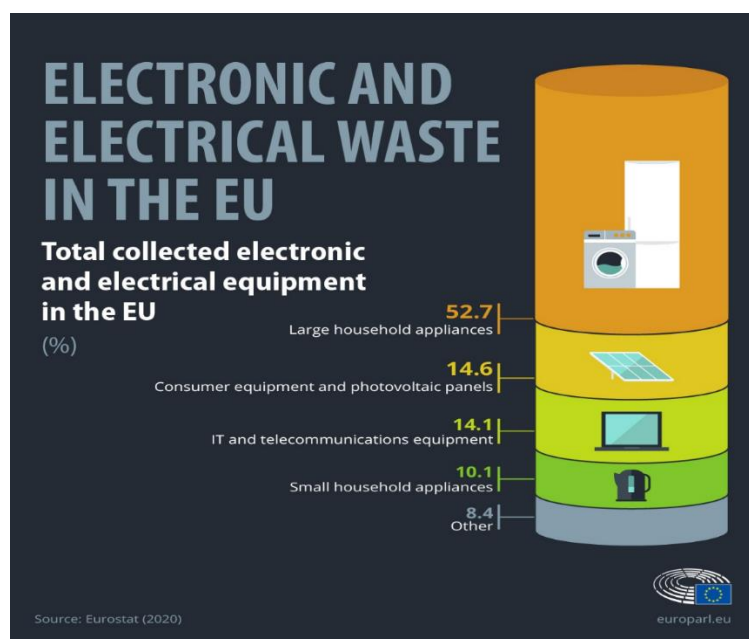
Changing lifestyles coupled with irresponsible consumption due to increasing disposable incomes has increased the usage of electronic items subsequently amplifying the quantity of E-waste which has become the fastest mounting waste stream, trumping over plastic waste. As the global economies are working towards a sustainable future, Countries have begun creating specific policies and facilities for effective management of E-Waste, with the aim of curbing e-waste pollution. Amongst the forerunners of this move are the countries in the European Union (EU). Fuelled by increased customer demand for electric and electronic goods, the member nations of the European Union generate more than 12 million tons of e waste per year (PACE 2019) with less than 40% recycling rate. The new Circular Economy Action Plan implemented by the European Union in 2020, (Eur-Lex 2020), has laid the directives for managing e-waste and is given a special focus among the 54 action plans for sustainable growth. These directives focus on the actions to be taken for longer product lifecycles through repair, recycle and reuse. Based on these directives, the member nations within the EU, execute actions at a macro level, in-order to contribute to the overall goals laid out by the European Commission. With less than 40% of e waste being currently recycled, and with the target of reducing it to half by 2030 (Jordan Davidson 2020), the member states in EU have designed specific policies to deal with the disposal, recycle and reuse of e-waste generated. This paper analyses the specific and unique e-waste policies of the countries in the European Union and the opportunities for India in adopting the successful practices

Key words: E –Waste, European Union, Public polices, Circular economy, India

INTRODUCTION:

Europe Union (EU) ranks one of the top e-waste generating groups of countries for the past 2-3 decades (Baldé, C. P et all 2017). The total quantity of E -waste generated

in 2019 was 53.6 million metric tons, with a sharp hike of 21% since 2014 in European union member states. The predictions for the year 2030 indicate that 74 metric tons would be discarded as e waste by 2030 (Global E-waste Monitor 2020). Analysing the items that are discarded, the majority of the e-waste were the large household items (12 Million tons) including the washing machines, electric stoves etc making up to more than 50% of all collected e-waste in the EU, followed by consumer equipment's, IT equipments and small household appliances like blenders ,toasters, ovens etc .(Lisa Aadill 2021)



Unlike United States, where there are no specific federal laws to control and manage the e-waste, Europe Union have realized the potential danger of e-waste and accordingly enacted various laws to protect the citizens of this union. To tackle with the issues of growing e-waste and promote a circular economy, the European Union has introduced the waste electrical and electronic equipment (WEEE) Directives (Eur -Lex 2012) and the “Restriction of Hazardous Substances Directive” (RoHS) to be abided by the member states. The WEEE Directives were formulated with an aim to promote sustainable production and consumption practices by preventing the creation of e-waste through effective use of resources. It also focuses on retrieving raw materials by effective recycle and recovery of metals and materials that can be reused by involving every stake holder in the lifecycle of equipment's. To achieve these goals, targets were set for the collection and recycling of E waste. A minimum collection rate of 65% of all the electrical and electronic equipments placed in the market in the previous three years or 85% of the WEEE generated in a member state. (James Langley 2021) has been specified by the WEEE Directives. To protect the public and environmental health, The

“Restriction of Hazardous Substances in Electrical and Electronic Equipment” (RoHS) directives were introduced in 2003 by the European Union (Environment 2011) aiming to control the use of hazardous elements in electrical and electronic equipments. Based on these Directives, the member states in the EU have framed specific policies to manage the E-waste in their countries.

LITERATURE REVIEW

Ramakrishna. S and Patil.R (2020) in their paper on the comprehensive analysis of e-waste legislation worldwide have identified that there are various regulations followed by the countries across the globe and the challenges faced in implementation along with the mechanisms to overcome these challenges were analyzed.

Zeng. X et al (2012) in their paper “Perspective of electronic waste management in China based on a legislation comparison between China and the EU”. The researchers have presented a comparison of approaches from the European Union to the Republic of China in E-Waste Management. It has been identified that EU has established an enhanced management chain with the support of logistical management. The main drawback for China were in the form of weaker laws, and lack of knowledge on the side effects of E-waste on the environment.

Shittu. O et al (2020) in their paper “Global E-waste management: Can WEEE make a difference?” has identified that the European Union is at the front of the WEEE race, followed by Asian countries. Whilst, policies have been formed in African Nations, lack the appropriate execution.

Parajuly. K et al (2019) in their paper “Future E-waste Scenarios” has identified the need for forecasting and using predictive technology to build a sufficient infrastructure for having a stable circular economy, and strategic policy implementation from governments across the world.

Isernia. R et al (2019) in their paper about “The Reverse Supply Chain of the E-Waste Management Processes from Italy” has analysed the role of the waste management centres and efficiency of governmental bodies in the effective collection of E waste.

Arduin. R et al (2019) in their paper on “The Influence of recycling rate calculation on European e-waste extended producer responsibility” have studied the quantitative results of E-waste policies implemented by the European Union and the results of recycling rates varied from 8% to 87%.

Boubellouta. B and Kusch-Brandt. S (2020) in their paper on “Testing the environmental Kuznets Curve hypothesis for E-waste in the EU countries” have identified that E-waste Generation remains proportional to level of Gross Domestic Product within the European Union until a point, where the scale tips and remains no longer proportional.

Sthiannopkao. S and HungWong .M (2012) in their paper “Handling e-waste in developed and developing countries: Initiatives, practices, and consequences” have studied that the first world countries are mass-exporting e-waste to poorer third world countries, instead of recycling e-waste.

Salhofer.S (2017) in his paper “E-Waste Collection and Treatment Options: A Comparison of Approaches in Europe, China and Vietnam”. This paper examines the reality of e-waste management around the world, as European Union is identified as the leader of e-waste management. With China having mass- implementation over the last few years, the e-waste management has gained high priority. Whilst countries such as Vietnam, large part of the e-waste is unregulated and managed illegally.

Mihai.F (2019) in the paper “Electronic waste management in Romania: pathways for sustainable practices” focuses on the east European country, Romania. In this paper, we see the nation’s implementation of E-waste management policies in-order to meet the European Union’s goals. The results of the study have indicated that Romania’s e-waste management systems have proved to be highly efficient and have established a ‘circular economy’.

C. J. Zoeteman. B et al (2010) in their paper “Handling WEEE waste flows: on the effectiveness of producer responsibility in a globalizing world” studies the levels of e-waste and also the projected levels of e-waste in the days to come. Its main findings are the need for low level e-waste collection systems and stronger need for reverse logistics.

Andeobu. L et al (2021) in their paper “An assessment of e-waste generation and environmental management of selected countries in Africa, Europe and North America: A systematic review” identifies that the current production of electronics is unsustainable, and extremely hazardous for the environment. To add to that, regulations are difficult to implement, due to unfavorable socio-economic circumstances.

R.K.Gollakota.A et al (2020) in their paper “Inconsistencies of e-waste management in developing nations – Facts and plausible solutions” examines how much e-waste output each continent produces. There is also a clear study of the technology

being used and the ease of recycling. There is also emphasis placed that manufacturers must plan ways to allow easier recycling of materials.

Xu. Y et al (2018) in their paper “Evaluating and managing interactive barriers for sustainable e-waste management in China”. The main out-take in this paper is that China, has taken an integrated approach covering the entire management of e-waste.

OBJECTIVES OF THE STUDY:

1. To analyse the e – waste policies of member states in European Union
2. To study the current e waste policies of India
3. To identify the successful e waste practices and policies that can be adopted by India from the European Union.

SUSTAINABLE E WASTE POLICIES OF EUROPEAN UNION MEMBER STATES:

Germany:

Every year nearly 8 lakh tons of E- waste are collected in Germany (Globalewaste.org 2019). In order to progress in better management of e waste, Germany has introduced the ElektroG law to govern the sale, disposal and recycling of electrical and electronic equipment. All the manufacturers, distributors and importers are mandated to register under ElektroG and also the electronic equipments that need to be registered and labeled is indicated.

Transposing the WEEE Directive into German law ElektroG also regulates placing electronic equipment's in the market, taking back and disposal equipment's to avoid e - waste and strengthen the recycling process. The main focus of ElektroG is to increase the accountability of the manufacturers of electrical appliances. The law also mandates the targets for recovery rates for non-reusable devices (ranging from 75 to 85 %) and the target for recycling rates (ranging from 55 to 80 %) (UBA 2020)

The divided product responsibility mechanism in Germany aims at giving the responsibility of waste disposal to the product manufacturers, recycling companies and also the retailers. For instance, if the customers are buying a new equivalent product type, the retailers are obliged to take the old device while replacing a new one.

The RoHS Directive of the EU was translated to German law though the passing of the “Elektrostoff -Verordnung regulation”, on 9th May 2013 which enforces strict restrictions on the use of hazardous metals like lead, mercury, cadmium, hexavalent



chromium, polybromated biphenyls (PBB) and polybromated diphenyl ethers in new electrical and electronic devices. (Dr. Holger Jacobj 2022)

France:

France recently has taken the initiative of informing the consumers about the easiness of taking a subset of electronic goods and refurbishing the products for reuse. The new French law has established this right to repair movement on 10th February 2020 (ITU 2021). The new French legislation focuses on the repairability index to minimize older products being discarded. The rating for the products is based on the relative ease or difficulty in repairing electronic gadgets like phones, computers, and household appliances etc which are given by the manufacturers. The repairability index was introduced to increase the refurbishing and reusing the electronic goods by consumers instead of disposing them.

The rating given for the products are based on various parameters like the easiness of disassembly, accessibility to tools, Availability of guidelines for repairing the product through video tutorials or instruction manuals as well as availability of spare parts. This new system follows the extended producer responsibility model by placing the responsibility on the manufacturers who are now urged to be more transparent about their products.

By the year 2024, France has planned to introduce Durability Index (PROMPT 2021) along with repairability which requires manufacturers to disclose information regarding not only the repairability of goods but also express the full lifecycle for each product. Apart from this, the Government has also initiated actions to promote the reuse of electronic goods by funding social and community led organizations that are involved in recycling or reuse of goods.

With all these measures France has taken a promising lead among the different member states in the European Union.

Belgium:

Belgium has undertaken various measures to manage e waste effectively. Municipalities that launch waste prevention initiatives get financial support from the government and companies that invest in waste management techniques to reduce waste are also entitled to receive subsidies. From 1st July 2001 onwards, an official system for the collection and processing of electronic waste has been implemented in Belgium, creating a legal obligation of “take-back” for 10 categories of electro-appliances.



To manage e-waste, Belgium has taken innovative measures targeting to reduce waste at the various stages of product life cycle. Students and researchers in the field of environment friendly product designs are awarded for their innovative work. To support the small and medium enterprises to research on the eco-efficient practices, a paid scan programme (A programme by the government to support the small and medium enterprises to identify opportunities for eco-efficient improvements by providing financial support.) is implemented by the government. To promote green procurement by the government, a web application has been developed. The government promotes trial projects with the retail sector to improve the sale of energy efficient electronic equipments. To close the material loops and replace goods by servicing and greening chemistry, the government has formed a network with Industry, NGO's and research centres named as "PLAN C". To promote sustainable consumption practices among general public, the government has introduced a website www.ecoconso.be that recommends best eco-friendly practices that can be followed.

Austria:

Austria handles e-waste in a more judicious way. With 2,000 municipal collection points, the E- waste generated in Austria is recycled or disposed in an eco-friendly manner. Consumers are given the option to drop the used batteries in-store collection boxes which is then taken to the recycling centers.

The Austrian Government, to promote e-waste repair for reuse, introduced a repair bonus scheme called "Reparaturbon" in 2020. This scheme offers 50% subsidy for the repair cost of any e-waste until a maximum of 100 euros per household per year. This bonus is applicable to all the repairable items including electronics. Since the inception more than 35000 items have been repaired leading to a savings of 850 tons of CO2 emissions (Kaja Šeruga 2022). The scheme will be in operation till 2026. Taken from the EU Covid Recovery fund, the Austrian government has provided 130 million euros with an aim to complete nearly 4 lakh repairs under this scheme. To manage with the manpower requirements for handling these repairs, the government organises a 6 month training program for unemployed and fresh graduates in association with Austrian Public Employment Service (AMS) and the Vocational Training Institute (BFI), to impart the skill of repairing equipments thereby increasing the employability rate of citizens.

Apart from focus on repair and replacement, Austria also follows a stringent environmental taxation policy to minimize e waste. As the repair bonus model of Austria

is gaining popularity, Germany and US have also come up with similar schemes to handle e waste

Italy

Italy being one of the oldest members in European Union, has been moving with the same pace as the European Union with its WEEE Ordinance. In 2003, the Italian government implemented its own legislation to manage e-waste, along with sufficient infrastructure in the form of e-waste processing plants (Isidora Berežni 2021). Alongside this, the Italian government has put emphasis on creating an effective circular economy by developing ROMEO (Recovery Of MEtals by hydrometallurgy), a project for recovery of precious metals from old electronic items at room temperature without pretreatment of electronic boards. Through this initiative,

Italy has achieved a recoverability rate of 95% of precious metals like gold, silver, copper, lead etc from e-waste (La Redazione 2020). Italy also maintains a system of connecting the general public along with industries in maintaining an efficient e-waste processing and disposal system (Raffaele Isernia et al 2019). Out of the 44% of the e-waste is collected through municipal collection points and 25 % collected through retailers, a significant share is directly sent to treatment from municipal collection points and retailers while 12.9% is sent to reuse and 8.6 % is actually re-entering the market as second-hand goods

Netherlands

Netherlands managed to implement its initial E-waste policy since 2003, with the primary focus on reducing landfills (Laura Börner 2018). The Dutch government has taken all initiatives for inclusion of all stakeholders for an efficient e-waste management. With importance given to, circular economy, the government gives incentives to developing smart product design and reuse of product components. Government of Netherlands has framed regulations to maximize the rate of reuse and recovery of discarded electronic equipment's. To encourage recovery and decrease the emission of hazardous materials, high recycling standards of 80% (Laura Golsteijn 2017) is made compulsory in the Netherlands.

Representing 1,500 producers and importers, the government works in association with a nonprofit organisation named "Wecycle", to ensure efficient collection and recycling of e-waste, since 1999. Wecycle works with many stakeholders like

municipalities, retailers, shops, and companies to ensure removal, recycling, and destruction of e waste.

Poland

Similar to other European Nations, Poland also follows the WEEE framework laid out by the European Council (Marcin Cholewa et al 2016). The idea of Extended Producer Responsibility and Reverse Logistics are deployed by the Polish Government through a community focused policy. The main focus of the policy is to collect e-waste from individuals at communal levels (Piotr Nowakowski et al 2021). To add to that the collection is done with the usage of containers placed in houses, grocery stores and places of communal gathering with aim of ease of accessibility. The collection is mainly done to re-cycle the easy to re-use components which don't require complex processes for separation and recycling, this is mainly due to the macroeconomic circumstances of the Kingdom of Poland (Marcin Cholewa et al 2016).

Denmark

Under the framework created by the European Union, Denmark has managed to create policies and institutional bodies in-order to make sure the successful disposal and recycling of waste (J.Ylä-Mella 2019). Akin to other OECD Countries, Denmark too follows a 'producer-responsibility model'. The Danish government has a private organization, DANSK PRODUCENT ANSVAR (DAP), with the main task of enforcing the 'producer-responsibility model', operating under the Environmental Protection Agency (Ministry of Environment). These come with two functional elements, registering and reporting. All electronic manufacturers and products are registered with the DAP, and the reporting is done to ensure an effective circular economy (Terje Andersen 2020). The Danish Government has allowed implemented waste taxes for companies which fail to meet the e-waste management requirements (Mikael Skou Andersen).

Exporting the E-waste to 3rd world countries has been a problem amongst European Nations for several decades. As a step to counter this exploitation, the Danish Government implemented Article 23, known as "Statutory order on shipments of waste and shipments of used electric and electronic equipment" which mandates the exporter to state the chemical composition of e waste exported and also the production process of the equipment from which e-waste is generated along with a financial guarantee of Danish



Krone 3000 for every ton of E-waste exported. (Global Denmark Translations, April 2014)

Spain

The Spanish Government, has taken a different approach with E-waste management - a non- regulatory and policy focused approach. Their main approach is to provide financial incentives for individuals who are willing to send their old electronics (E-waste) for recycling/management purposes. This is conducted, as they are paid a small fee, with the Government, handling the logistics to ensure swift transfer to recycling units (I. Puig-Ventosa 2008).

Spain also works extensively with other European Nations for the transfer of E-waste to processing facilities. Spain has created a 'Producers Registration Observatory' a complete register of the electronic manufacturers in the country. The country has also invested in technological tools to enable quicker information transfer between the companies and the agents regarding e-waste collection treatment, transportation, treatment and recycling to encourage a complete connectivity among the stakeholders. (Queiruga, D et al 2012)

E-WASTE MANAGEMENT IN INDIA:

India is at the forefront of the developing worlds, and is a rising power in the field of development, and growth. With its rise in the digital world comes the increased output for E waste in the nation. India generated 1,014,961.2 tonnes of E Waste, in 2019-2020 (Central Pollution Control Board 2021). This amount of E- waste ranks third in the world after United States and China (Anushal Agarwal et al 2021) with the informal sector handling over 95% of the ewaste (Daniel Hinchliffe 2020).

In India, the nodal agency for E- waste management is The Ministry of Environment & Forests (MoEF). The rules for E-Waste Management are regularly updated from time to time and the new amendment made in 2018 includes all the stakeholders including producers, importers, retailers and recyclers. According to the provisions of the Environment Protection Act, Financial penalties are also imposed by the government to a tune of one lakh or an imprisonment upto 5 years.

Some of the amendments include

- All the electrical and electronic equipments placed in the market will be randomly checked to observe and authenticate the compliance for ensuring reduction in the hazardous substances used in the equipments.



- The State Pollution Control Board of the concerned state must ensure that manufacturers will maintain records (in prescribed forms) of the e waste generated, handled, recycled and disposed. These records should be available for scrutiny by the concerned state authorities.
- Producers are supposed to provide contact details and helpline numbers to consumers, through their website to assist the return of used electrical and electronic equipments.
- The producers shall opt to implement Extended Producer Responsibility individually or collectively by setting up their own collection centres or tie-up with a "Producer Responsibility Organisation" or with e-waste exchange organizations or both.
- In case of electronic durables, the dealers can be given the task of collection of products on behalf of the producer. The E-waste so collected by the dealer should be send to the collection centre or dismantler or the recycler as instructed by producer.
- In case of wholesale consumption of electrical and electronic equipments, the consumers records of e-waste generated should be available for scrutiny to be done by the concerned State Pollution Control Board.

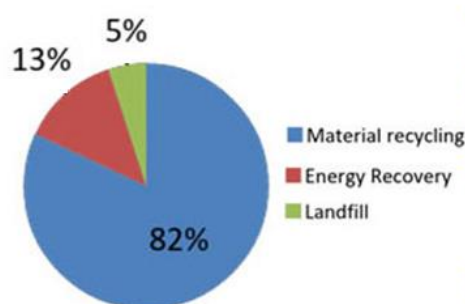
Opportunities for India:

- As like in Germany which collaborates with industry for developing sustainable business models, the government of India can collaborate with the industry to formulate standard operating procedures to reduce e waste.
- Innovation in e-waste management can be introduced by the government, by referring unique methods implemented by countries. For instance Indian government can follow the "repairability index" concept of France to increase the rate of repairs and minimize the older products being discarded.
- The government can encourage new entrepreneurs and corporate to indulge in developing eco friendly solutions the government can provide the necessary financial support and technological guidance as like the paid scan programme introduced by the Belgium government to support the small and medium enterprises to identify opportunities for eco-efficient improvements by providing financial support.
- With over two million graduates in search of jobs (Nishi Shah, 2020), the Indian government can adopt the practices of Austrian government which organizes a 6 month training program for unemployed and fresh graduates in association with Austrian Public Employment Service (AMS) and Vocational Training Institute (BFI),

to impair the skill of repairing equipments thereby increasing the employability rate of citizens and also managing e waste effectively.

- Since the consumers are an important stakeholder in e waste management, they also should be held responsible to play a part in e-waste management, as like in Luxembourg, where customers pay a recycling fee for any new electrical or electronic appliance purchased by them. This fee can be used by the Government to enable financing, collection, treatment and recycling of e-waste discarded by the customers at the end of product life cycle.
- As like in Norway and Denmark, where both the companies and consumers return their e-waste, to the collection points at free of charge, the concept of voluntarily donation of useless electrical and electronic equipment to e-waste drop off points can be encouraged by the government by setting up more authorized collection centers across the country with 178 registered recyclers(Samar Lahiry 2019) being the current number.
- For improved management of e waste, the rate of recycling, reuse and recover should be accurately maintained. For this the government can maintain a national registry of the electronics producers operating and the amount of EEE introduced by them in the market like the government of Norway which manages a WEEE register and maintains all records regarding e-waste in the country initiated in 1999 (Sadia Sohail 2021).

E-waste - Recycling and recovery in Norway



Source: Norwegian Environment Agency, 2014

- Increasing the information campaigns and awareness programs for the stake holders is significant for the success of e-waste management programmes, Indian government can adopt practices followed in Belgium. To promote sustainable consumption practices among general public, the Belgium government has

introduced a website www.ecoconso.be that recommends best eco friendly practices that can be followed.

- Introduction of technology in managing e waste has gained significant progress in the EU countries. In Austria and Germany, smart bins fitted with sensors have been introduced to make waste disposal more efficient using the IoT technology. These Sensors indicate the extent of filling along with temperature monitoring in the bins (Nadja Kirchhof 2019). India can also bring in better technology solutions to enable better management of e-waste.

CONCLUSION:

As a growing sector, Electronic waste or E-Waste poses new challenges for all the countries worldwide. The policies relating to managing the e-waste is quite mature in the European Union countries and individual countries have enacted legislations for managing based on the WEEE (Waste for Electrical and Electronic) Directives initiated by the European Union as early as 2003. Considering the awareness, recycling and reuse rates, Europe has made a huge progress in managing e waste. Even though there are many pitfalls like ineffective regulations, lack of infrastructure, poor awareness and sensitization among the stakeholders, India also has introduced regulations to manage the e-waste by introducing the new EPR (Extended Producer Responsibility) regulation in 2018. On the brightest side, the mindset of Indian citizens is completely different. Unlike Europe which has adopted the concept of "throw away" society, Indians use the products much longer and if the products become obsolete or non usable, they prefer to hand it over to the junk dealers coming to their doorsteps to buy their gadgets. Therefore the collection rates in India are much higher than Europe. But the main problem lies in the recycling that takes place in the informal sector where much of valuable resources are lost due to improper processing. With India being the third largest generator of E-waste and with Prime ministers Mission on "Waste from Wealth" Announced in August 2021, benchmarking the best efforts of the European Union countries will aid India to take a strong lead in this sector of e waste management.

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