GLOBAL WASTE TRADE

Introduction

Electronic waste i.e. e-waste one of the fastest growing waste stream in India. Growth of information and communication technology sector, faster obsolescence and subsequent up-gradation of electronic products are forcing consumers to discard old products, which in turn accumulate huge e-waste to the solid waste stream.

India is the "*fifth largest electronic waste producer in the world"*; approximately 2 million tons of e-waste along with undisclosed amount of e-waste is imported from other countries around the world. More than 25 countries dumped 1,21,000 metric tons of plastic waste in India, which include the middle east, Europe and the U.S the e-waste which is imported in India is also term as *"Global Waste Business"*. It is an international trade of waste between countries for future treatment, disposal, or recycling. Toxic or hazardous wastes are often imported by developing countries like China, India and Africa from developed countries like U.S, Europe. The purpose behind is that the countries which do not have the production capacity to manufacture high quality products can import waste to stimulate their economy. "people live in developing countries accept increased exposure to hazardous pollutants in exchange for opportunities to increase their productivity"

E-waste is not hazardous if it is recycled by scientific methodology E-waste contains heavy metals, plastics, glass etc. Which can be potentially toxic, poses numerous health and leads to environment risks hazardous wastes are often not properly disposed of or treated, leading to poisoning of the surrounding

Environment and resulting in death in people and animals. Also, poorer or developing nations do not have safe recycling process of facilities, and the people process the toxic waste with their bare hands.

E-waste is growing in India at the rate of 10% per year. Adequate Measures and cost-effective, environmentally friendly, technological solution would be needed to address the issue. This case study provides a basic information on imported electronic waste management in India.

Rapid changes in technologies, urbanization, change in media, planned obsolescence etc. have resulted in a fast growing surplus of electronic waste (E-

waste) around the Globe, About 50 million tons of e – waste are been produced every year, wherein USA discards 3 million tons of each year amounting 30 million computers per year and Europe disposes 100 million phones every year and China leads second with 2.3 million tons of e – waste. Electronic wastes or e – waste or e – scrap or electronic disposal refers to all the discarded electrical or electronic devices like mobile phones, television sets, computers, refrigerators etc. The other definitions are re-usable (working and repairable electronics), secondary scrap (Copper, Steel, Plastic etc.) and others are wastes which are damped or incinerated. Cathode Ray Tubes (CRTs) are considered one of the hardest types to recycle and the United States Environmental Protection Agency (EPA) included CRT monitors as "Hazardous Household Waste" since it contains lead, cadmium, beryllium or brominated flame retardants as contaminants

Review of Literature

E-waste, very trendy yet casual name given to electrical and electronic appliances & gazettes, either discarded or of further use.

According to UNEP, 2005; Greenpeace International, (2005) around 21,00,000
to 51,00,000 tonnes of e-waste produced annually around the globe and this number is very huge as well approximate as there is no clear-cut method or technology to measure the actual quantity of waste produce and discarded. Further author said the percentage of e-waste of that of solid waste is around 5.

- **A Catalog of universal e-waste substances are:**

Items	Weight	Age
PC	35	3
Reproduction M/c	3	5
hi-fi M/c	10	10
Cell phones	0.1	2
Gaming M/c	3	5
Light printing M/c	60	8
Broadcasting M/c	2	10
TV	30	5
VCD	5	5

Washing M/c	65	8
Fridge	35	10
A.C.	55	12
Oven	15	7

the International Association of Electronics Recyclers predictable that according to existing development & slumping trends the all personal and public electronics instruments will find its way to landfills is approximately three billion. Interpretation of current financial drift, budding nations are also going to pour more and more electronic waste into the existing amount.

- **The Problems:**

1. **Increases Consumers Electronic Purchases Cheap Sale:**

Rakesh Johri, (2008) explained as new technology development in the world of electronic leads to more purchases of the electronic item like mobile phone like smart phone, note 1 &2, oven, TV, etc. there should be expansion in the field of electronic, but the cost should be verified directly or indirectly. Expansion in a field should not be achieved at the cost of human being health like kidney diseases or by disturbing environment ecology like natural environment like contamination, etc.

2. More Waste More Toxic:

Toxic waste is any unwanted material in all forms that can cause harm (e.g. by being inhaled, swallowed, or absorbed through the skin). Many of today's household products such as televisions, computers and phones contain toxic chemicals that can pollute the air and contaminate soil and water. Disposing of such waste is a major public health issue.

Kohler et al. (2004) narrated like every wastes affect the health of the human being & environment directly or indirectly e wastes also affect the health of both of human & environment directly & indirectly almost every pert of electronic waste as effect on the human health directly or indirectly like it affect nervous system, development of the children, disturb the natural ecology which is not good from everyone in the world point of view because it direct & indirect effect is on the human being.

The waste can contain chemicals, heavy metals, radiation, dangerous pathogens, or other toxins. Even households generate hazardous waste from items such as batteries, used computer equipment, and leftover paints or pesticides.[1] Toxic material can be either human-made and others are naturally occurring in the environment. Not all hazardous substances are considered toxic.

The United Nations Environment Programme (UNEP) has identified 11 key substances that pose a risk to human health:

- **Arsenic:** used in making electrical circuits, as an ingredient in pesticides, and as a wood preservative. It is classified as a carcinogen.
- **Asbestos:** is a material that was once used for the insulation of buildings, and some businesses are still using this material to manufacture roofing materials and brakes. Inhalation of asbestos fibres can lead to lung cancer and asbestosis.
- **Cadmium:** is found in batteries and plastics. It can be inhaled through cigarette smoke, or digested when included as a pigment in food.

Exposure leads to lung damage, irritation of the digestive tract, and kidney disease.

- **Chromium:** is used as brick lining for high-temperature industrial furnaces, as a solid metal used for making steel, and in chrome plating, manufacturing dyes and pigments, wood preserving, and leather tanning. It is known to cause cancer, and prolonged exposure can cause chronic bronchitis and damage lung tissue.
- **Clinical wastes:** such as syringes and medication bottles can spread pathogens and harmful microorganisms, leading to a variety of illnesses.
- **Cyanide:** a poison found in some pesticides and rodenticides. In large doses it can lead to paralysis, convulsions, and respiratory distress.
- **Lead:** is found in batteries, paints, and ammunition. When ingested or inhaled can cause harm to the nervous and reproductive systems, and kidneys.
- **Mercury:** used for dental fillings and batteries. It is also used in the production of chlorine gas. Exposure can lead to birth defects and kidney and brain damage
- **PCBs**, or polychlorinated biphenyls, are used in many manufacturing processes, by the utility industry, and in paints and sealants. Damage can occur through exposure, affecting the nervous, reproductive, and immune systems, as well as the liver.
- **POPs**, persistent organic pollutants. They are found in chemicals and pesticides and may lead to nervous and reproductive system defects. They can bio-accumulate in the food chain or persist in the environment and be moved great distances through the atmosphere.
- **Strong acids and alkalis** used in manufacturing and industrial production. They can destroy tissue and cause internal damage to the body.

The most overlooked toxic and hazardous wastes are the household products in everyday homes that are improperly disposed of such as old batteries, pesticides, paint, and car oil. Toxic waste can be reactive, ignitable, and corrosive. In the United States, these wastes are regulated under the Resource Conservation and Recovery Act (RCRA).

3. More Hazards Material Everywhere:

Hazardous wastes are discarded materials with properties that make them potentially harmful to human health or the environment. Hazardous wastes can include things such as chemicals, heavy metals, or substances generated as by-products during commercial manufacturing processes, as well as discarded household products like paint thinners, cleaning fluids, and old batteries. Hazardous wastes can be in the form of liquids, solids, contained gases, or

sludges. Much of this hazardous material is stored in landfills or other containment areas. If these hazardous waste sites are not properly designed or managed, their contents can be released into the surrounding environment, posing a threat to public health.

To address this issue, the NIEHS has created a Hazardous Waste Worker Training Program (HWWTP) to support the safety and sand chemical emergency response.

Kohler et al. (2004) further explained the main reasons for hazards material everywhere is divided into two points & they are follows: -

- Rapid development changes slow adaption to changes
- Increases consumers electronic purchases cheap sales

Due to the above reason every day e waste problem is becoming more serious.

Which is not good from everyone point of view?

4. Increasing Human Health Risk "Richer":

Improper handling of e-waste is detrimental to the environment and mankind. Since this waste is nothing but a combination of plastics and toxic chemicals, these get released into the environment. Pollutants such as dioxins and furans from polyvinyl chloride, lead, beryllium, cadmium, mercury, etc. get into our environment and cause the following health hazards:

- Reproductive issues
- Developmental problems
- Damage to the immune system
- Interference with regulatory hormones
- Damage to the nervous system

Hilty L.M., (2005) narrated the main reason in this case is lack of the knowledge about e waste management & handling to this condition in the further government, society citizen everyone as to take some important step before situation goes out of control. As e-waste is likely to touch 5.50 lakh tones by 2012 if measures are not taken at this time than it is more serious problem.

Reusing and recycling are the other ways of dealing with e-wastes. They have been preferable because they increase the lifespan of the products and therefore imply less waste over time. Re-use constitutes direct second hand use, or use after slight modifications are made to the original functioning equipment like memory upgrades, etc. However, they end up as waste eventually as they have limited life span. The reuse of second-hand electronic goods in the developing world including India falls in this category, where the waste ends up locally and where there is no adequate facility and competence to deal with them appropriately.

While recycling appears to be a safe method to utilize or dispose e-wastes, it can be a misleading characterization of disparate practices-including dismantling, shredding, burning, exporting, etc. which are mostly unregulated and often create additional hazards itself. "Recycling" of hazardous wastes, even under the best of circumstances, has little environment benefit as it simply moves the hazards into secondary products that eventually must be disposed of. One view says that unless the goal is to redesign the product to use nonhazardous materials, recycling may be a false solution. On the other hand, the Toxics Link, NGO based in Delhi holds that recycling isn't just good for the environment but also good business practice. Recycling is therefore an important solution, especially if we consider that e-waste contains many valuable and rare materials.

Unless suitable safety measures are taken, these toxic substances can critically affect the health of employees and others in the vicinity – who manually sort and treat the waste – by entering their body

- through respiratory tracts,
- through the skin, or
- through the mucous membrane of the mouth and the digestive tract.

Therefore, the health impact of e-waste is evident. There is no doubt that it has been linked to the growing incidence of several lethal or severely debilitating health conditions, including cancer, neurological and respiratory disorders, and birth defects. This impact is found to be worse in developing countries like India where people engaged in recycling e-waste are mostly in the unorganized sector, living near dumps or landfills of untreated e-waste and working without any protection or safeguards. Many workers engaged in these recycling operations are the urban poor and unaware of the hazards associated with them. For instance, such recycling activities lead to the deterioration of local drinking water which can result in serious illnesses. It was found that a river water sample from the Lijiang river near a Chinese "recycling village" had lead

levels that were 2400 times higher than the World Health Organization Drinking Water Guidelines thereby involving a serious health hazard.

- **Sources of e-waste**

E-waste is being produced by various sources in the country like Govt. sectors, commercial establishments, institutional sectors, research and developments, household and manufacturing sectors of the country.

1. HOME:
- PC
- Television
- Radio
- Cell phones
- Washing Machines
- Microwave oven
- CD player
- Fan
- Electronic iron

2. HOSPITALS:
- PC
- Monitors
- ECG device
- Microscope
- Incubator

3. GOVERNMENT:
- PC
- CPU
- FAX machine
- Xerox machine
- Fan
- Tube light
- Air conditioner
- Scanner

4. PRIVATE SECTORS:
(restaurants and industries):
- PC

- Boilers
- Mixer
- Signal generator
- Incubator

M. Khurram S. Bhatta et al (2008)[2] explained the reasons behind this tremendous growth behind current e-waste is all organizations like public, private, home, commercial, educational, industrial, hospitals etc. All of these are equally using available automatic products, which ultimately pass on to the dumping sites.

• Individual household and small business as far as PCs emanating from individual households are concerned; it is difficult to know the exact quantity. Individual households are not major contributors in India. They account for 22% of total computers in India. The rest of share, that is 78%, comes from the business sector.

• Large business, institutions, government house and foreign embassies were the earliest users of electronic products; today they account for 78 per cent of total installed PCs. Hence, they are the major producers of obsolete technology in India. It is observed that the total number of obsolete PCs emanating from business as well as from individual households will be around 1.38 million.

• PC manufacturers and retailers are next on the list of contributors to the e- waste segment in India. The waste form this sector comprises defective IC chips, motherboards, cathode ray tubes and other peripheral items produced during the production process. It also includes defective PCs under guarantee procured from consumer as replacement items. It is estimated that around 1050 tons per year of waste comes from this sector.

• E waste from imports has been biggest sources of PC scrap is imports. Huge quantities of e-waste such as monitors, printers, keyboards, CPU's, projectors, mobile phones, PVC wires, etc. are imported. The computers thus imported are of all ranges, models and sizes, and functional as well as junk materials.

• Secondary market waste includes TV, computers, mobiles, electric boards etc.

Ratification by Croatia Seals Entry into Force of Basel Ban Amendment

Seattle, Washington, USA. Croatia's 6th of September deposit of ratification of the 1995 Basel Ban Amendment has allowed this global waste dumping prohibition to finally enter into the force of international law. The Ban Amendment, adopted by the parties to the Basel Convention in 1995, prohibits the export of hazardous wastes from member states of the European Union, Organization for Economic Cooperation and Development (OECD), and Liechtenstein to all other countries.

With Croatia's ratification, a total of 97 countries have now ratified the ban and most crucially the necessary 3/4 of the parties that were present and voting in 1995. The agreement will become a new Article in the Convention and will enter into force for the 97 countries after 90 days -- December 5th, 2019.

The many countries and organizations, including Denmark, Sri Lanka, Indonesia, Switzerland, Greenpeace and the Basel Action Network (BAN), that helped create the Basel Ban Amendment have much to celebrate today. The agreement, called for by European and developing countries, with the strong support from environmental and human rights groups in the early 1990s -- has been hailed as a landmark agreement for global environmental justice. And, in

view of the recent spate of unwanted wastes exported from North American and European countries, currently ending up in Asia and Africa, the pact is considered as relevant today as it was 30 years ago.

"The most important idea ever conceived to promote environmental justice at the global level is now law," said Jim Puckett, who was worked to achieve and implement the ban for 30 years, and now directs the Basel Action Network (BAN) from Seattle. "We applaud Croatia and all of the 97 countries that have ratified the agreement to date and hope that all others will now do so at the earliest opportunity."

Still noticeably absent from the list of countries having ratified the ban are the United States, Canada, Japan, Australia, New Zealand, South Korea, Russia, India, Brazil, and Mexico. The US produces the most waste per-capita, but has failed to ratified the Basel Convention and has actively opposed the Ban Amendment. According to BAN, this lack of adherence to international waste trade rules has allowed unscrupulous US "recyclers" to export many hundreds of containers of hazardous electronic waste each week to developing countries for so-called recycling. This primitive recycling involves the burning, melting and chemically stripping electronic waste by desperate, unprotected workers in highly polluting operations. Also, of great concern today is the fact that the vast majority of shipping companies send their old ships, full of lead, hazardous asbestos, PCBs, and flammable gases and oils to be run up on beaches in South Asia where they create pollution, occupational disease and death due to fires and explosions.

"There can be no excuse for using the developing world as the dumping ground for the toxic effluent of the affluent," said Puckett. "With the Ban Amendment now a legal certainty, we hope the countries that have to date refused to ratify will do so and close the sad chapter of toxic colonialism done in the name of recycling."

GLOBAL WASTE TRADE:

The **global waste trade** is the international trade of waste between countries for further treatment, disposal, or recycling. Toxic or hazardous wastes are often imported by developing countries from developed countries.

The World Bank Report *What a Waste: A Global Review of Solid Waste Management*, describes the amount of solid waste produced in a given country. Specifically, countries which produce more solid waste are more economically developed and more industrialized.[1] The report explains that "generally, the higher the economic development and rate of urbanization, the greater the amount of solid waste produced."[1] Therefore, countries in the Global North, which are more economically developed and urbanized, produce more solid waste than Global South countries.

Current international trade flows of waste follow a pattern of waste being produced in the Global North and being exported to and disposed of in the Global South. Multiple factors affect which countries produce waste and at what magnitude, including geographic location, degree of industrialization, and level of integration into the global economy.

Numerous scholars and researchers have linked the sharp increase in waste trading and the negative impacts of waste trading to the prevalence of neoliberal

economic policy. With the major economic transition towards neoliberal economic policy in the 1980s, the shift towards "free-market" policy has facilitated the sharp increase in the global waste trade. Henry Giroux, Chair of Cultural Studies at McMaster University, gives his definition of neoliberal economic policy:

"Neoliberalism removes economics and markets from the discourse of social obligations and social costs. As a policy and political project, neoliberalism is wedded to the privatization of public services, selling off of state functions, deregulation of finance and labour, elimination of the welfare state and unions, liberalization of trade in goods and capital investment, and the marketization and commodification of society."

Given this economic platform of privatization, neoliberalism is based on expanding free-trade agreements and establishing open-borders to international trade markets. Trade liberalization, a neoliberal economic policy in which trade is completely deregulated, leaving no tariffs, quotas, or other restrictions on international trade, is designed to further developing countries' economies and integrate them into the global economy. Critics claim that although free-market trade liberalization was designed to allow any country the opportunity to reach economic success, the consequences of these policies have been devastating for Global South countries, essentially crippling their economies in a servitude to the Global North. Even supporters such as the International Monetary Fund, "progress of integration has been uneven in recent decades"

Specifically, developing countries have been targeted by trade liberalization policies to import waste as a means of economic expansion. The guiding neoliberal economic policy argues that the way to be integrated into the global economy is to participate in trade liberalization and exchange in international trade markets. Their claim is that smaller countries, with less infrastructure, less wealth, and less manufacturing ability, should take in hazardous wastes to increase profits and stimulate their economies.

- **Why is e waste brought to developing countries?**

"E-waste is a term used to cover all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intent of re-use" (Step Initiative 2014). It is also referred to as WEEE (Waste Electrical and Electronic Equipment).

Many of these out-of-date electrical and electronic devices still have commercial value because they still work or contain expensive materials that can be recycled. For this reason, they are loaded on containers, embarked and shipped from core to peripheral countries. Waiting at the destination there is a widespread turn of intermediaries, dealers, repairers, and merchants who choose, head up the

operation and circulate the electronic waste of the rich countries in the local market.

Recent studies have shown that the majority of WEEE imports derive directly from core areas, especially Europe and North America (Ghana CEPS, 2010), from which they are transported to peripheral areas of development such as China, India, Pakistan and the Philippines (UNEP, 2005; Ha et al., 2009), where there are weaker environmental regulations and the management practices often take place in an unregulated manner with little or no concern for impeding effects on human health or the environment (Vasudev, 2005; Bishop, 2012). In fact, as noted by Wallerstein, international trade is not a trade between equals. Some countries are stronger, both in economic and juridical terms, than others and therefore can trade on conditions that allow surplus value to flow from the weaker countries to the core (Wallerstein, 2004). These relations create not only economic disparities but also geographical consequences as core-like processes tend to be grouped in a few states and to concentrate most of the production activity in such states, whilst peripheral processes tend to be scattered among many countries (Wallerstein, 2004).

As demonstrated by Walter's (1978) investigation of environmental management in developing countries and confirmed by the pollution heaven hypothesis: pollution-intense activities will migrate towards those jurisdictions which are less strict with environmental regulation and in which costs of waste dismantling are lower. In fact, there is a lot of evidence of jurisdictions, in order to receive greater investments, racing to the bottom to flatten out investments costs, reducing also the costs related to pollution control, and thus making peripheral countries more affected by polluting industries (Leask and McNabb, 2010). For these reasons weaker countries end up being "pollution heavens". Developing countries are more likely to become pollution heavens since they might suffer political inadequacies which in turn would set environmental standards inadequately low or not enforced at all (Neumeier, 2001). Moreover, it must be considered that the benefits of investments by polluting industries are highly tangible in terms of goods and services provided and jobs created; whilst, on the other hand, the effects of pollution are severely neglected for they are often invisible and take place in the long run.

The solution for the control and protection of human health and the environment against the dangerous effects of all hazardous waste came with the ratification of the Basel Convention in 1989.

The Basel Convention - which regulates the transboundary movement of hazardous waste with the implicit task of reducing their generation, promoting their environmentally sound management and prohibiting the shipments of

hazardous waste to countries without the capacity to manage them - has been ratified by almost all the peripheral countries, its provisions are yet to be domesticated into national laws by many jurisdictions. The Convention does not ban completely the international trade in waste, but it does provide a framework for the transboundary movements of waste based on the "Prior Informed Consent": it excludes the possibility to export waste to nations that have banned such imports and requires each party of the Convention to introduce national legislation in order to prevent illegal traffic (Osinbajo, 2010).

However, most the shipments of e-waste enter through the various ports of weaker countries under the label of second-hand electronic equipment, which does not present any restrictions or methods of detection at the present stage (Amaya-Osei et al., 2011). The majority of the WEEE shipments which arrive in developing countries are exported by core-like production countries, EU members, which in most cases have domesticated the provisions of the Convention and thus are obliged to ensure that the flow and management of hazardous waste happens in an environmentally sound manner. Because of the absence of any national e-waste management system, there is an increasing presence of an informal sector for the collection and recycling of WEEE, exposing workers to chemical smokes, deteriorating the local environment and ineffectively recovering raw materials.

Thus, as noted in Wallerstein's analysis and easily recognizable from the process of e-waste management depicted above:

*"*strong states tend to emphasize their role of protecting the quasi-monopolies of the core-like processes, whilst the very weak states, which contain a disproportionate share of peripheral production processes, are usually unable to do very much to affect the axial division of labour, and in effect are largely forced to accept the lot that has been given them. Strong states relate to weak states by pressuring them to keep their frontiers open to those flows of factors of production that are useful and profitable to firms located in the strong states, while resisting any demands for reciprocity in this regard.".

- **Global trade in hazardous waste:**

Among all the international agreements, the Basel Convention on the Control of the Trans-boundary Movement of Hazardous Waste and Their Disposal is the most comprehensive global environmental agreement on hazardous and other wastes. It was adopted in 1989 and came into force in 1992 for the purpose of protecting human health and the environment against the adverse effects resulting from the generation, management, transboundary movement and disposal of hazardous and other wastes. Originally, it did not mention e-waste, but later it

addressed the issues of electronic waste along with end-of-life ships at the Conference of the Parties of the Basel Agreement in late 2006. Currently, electronic waste, mobile phones, Polychlorinated Biphenyls (PCBs) and compounds used in industry as heat exchange fluids, in electric transformers and capacitors are among the wastes regulated by the Basel Convention. Many of the global e-waste exports, therefore, are in contrary to the Basel Convention.

- **Rising illegal e-waste exports:**

In August 2006, when the Abidjan Hazardous Wastes Crisis56 exposed the occurrence of illegal hazardous waste exports from. A ship called the Probe Koala, chartered by the Swiss-based oil and commodity shipping company Trafigura Behera BV, offloaded toxic waste at the port of Abidjan in Côte d'Ivoire (Ivory Coast). The waste was then dumped by a local contractor at as many as 12 sites in and around the city of Abidjan in August 2006. According to the UN and the Government of Côte d'Ivoire, the gas caused by the release of these chemicals resulted in the deaths of 17 and the injury of over 30,000 Ivorians with injuries that ranged from mild headaches to severe burns of skin and lungs. Almost 1,00,000 Ivorians sought medical attention for the effects of these chemicals. Europe, the UNEP Executive Director, Achim Steiner stated: "As global trade flows expand, and tough domestic controls raise the costs of hazardous wastes disposal in developed countries, the opportunities and incentives for illegal trafficking of wastes will continue to grow."

It is an affirmation of the rising trend in the export of hazardous wastes by fraudulent means in global trade. Many studies have confirmed and revealed the danger posed by many wastes, their toxicity, carcinogenicity and other characteristics harmful to the human health and environment. This awareness has been the basis of global action leading to the tightening of laws and regulations. This has, in turn, triggered an increase in the cost of hazardous waste disposal through safer means compelling many countries to search for more economically viable ways of disposing waste abroad. As a result, many developed countries, which can circumvent the national legislations, export hazardous wastes including electronic wastes to the developing countries which are having neither the knowledge of the hazardous nature or having rudimentary knowledge, nor the capacity to dispose of the wastes safely. Normally, a computer recycler in the U.S., for instance, would scan the incoming electronic waste materials for its most valuable components and probably sell them in a store or to specially brokers. The rest of the material would be broken down and sorted according to the type of waste (example: circuit boards, wires and cables, plastics, cathode ray tubes (CRTs), and non-recyclables). These are sold to the brokers who then ship them mainly to China

or the South Asian countries—India, Pakistan and Bangladesh. Alternatively, the e-waste materials are sometimes simply sold off in bulk without any separation whatsoever. E-waste brokering is an aggressive and competitive business and buyers for all kinds of e-waste for the Asian market are always available.

- **The 2 Main factors in global waste trade economy**:

Like most waste trade, e-waste export to the developing countries is governed by brute global economics in which market forces, if left unregulated, dictates that the toxic waste will always run "downhill" on an economic path of least resistance.58 Illegal export becomes possible when the environment and occupational regulations are non-existent, minimal, lax or not well-enforced, as they are in some developing countries. Low labour costs in these countries also provide the impetus for the export in wastes. For instance, labour cost in China is $1.50 per day. In addition, exporting e-waste is more lucrative for the exporter country than recycling or disposing it within the country. For instance, waste traders in Europe or USA must pay US $20 to recycle a computer safely in their countries while they can sell it at half the cost to the informal traders in developing countries.60 Again, while it costs Rs. 12,000 to recycle a tonne of rubbish after segregation in the U.K., shipping the rubbish to India costs just about Rs. 2,800.61 The U.S. produced five times more hazardous waste in 2002 (265 million tonnes) than it did in 1975 (57 million tonnes). The cost of managing such waste within the country would be enormous depending on the toxicity and reactivity of the substances. Thus, it would be more economical to ship toxic wastes to the developing countries when the cost is negligible. Considering its cost effectiveness, export is a clandestine option chosen by some companies in the industrialized countries.

The illegal exports are mostly justified as 'charity' or as 'recycling'. Through these. The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC), Exporting Harm. 3methods, obsolete devices find their way from the industrialized countries to the developing countries where they can be used for a few more years. For instance, in 2005, out of nearly 5 million Personal Computers in India, 1.38 million were either model 486s (about eight years old by 2005) or even older. Reuse or recycling may prolong the life span of a product but sooner or later, it would find its way into the waste mainstream. Therefore, while the developed countries legally evade the problem of waste disposal, the developing countries are left to reckon with the ultimate problem of waste disposal.

- **Waste trading as a quintessential part of electronics recycling:**

Importing waste is no doubt a lucrative economy. The main objective behind the import of used electronics is the recovery of valuable metals and elements that are contained in electronic waste, including steel, aluminium, copper, tin, nickel, etc. which are in bulk; cadmium and mercury which are in smaller amounts; and barium, nickel, gold, titanium, cobalt, palladium, manganese, silver and platinum, etc. which are in traceable amounts. These various commodities provide useful raw material feedstock in the manufacture of new products. The largest market of a non-working equipment or e-waste is for the circuit boards that are rich in precious metals, i.e. silver, gold, palladium and platinum. Sound management practices for the recovery of these elements are debatable. However, export and import trade has become an essential aspect of the electronics recycling. Moreover, many of the markets for processed plastics and other raw materials derived from end-of-life electronics equipment are also outside of the U.S. In fact, there are no smelters for copper or for the recovery of precious metals from circuit boards in the U.S.

The five primary copper and precious metal smelters in the world are in Canada, Belgium, Sweden, Germany and Japan. There are no Cathode 62 Ibid n.57. 31 Ray Tube (CRT) glass furnaces in North America and there are less than 20 worldwide. There are approximately 15 in Asia (e.g. South Korea, Malaysia, India, Thailand, Singapore and China) and one in Poland. As the demand for the CRT glass cullet remains strong, the number of glass furnaces continues to be inadequate and insufficient. The challenge is further complicated by the Government restrictions.

- **Free trade agreements as a means of waste trading**:

A muted aspect of the global trade in waste which has raised some concerns is that developed countries like Japan are making full use of the Free Trade Agreements (FTAs) or so called "***Economic Partnership Agreements***" (EPAs) to export their waste to the developing world. Often involved in the EPA arrangements are unspoken quid-pro quo deals such as the Philippines promised access to domestic and nursing labour markets in Japan, or Thailand getting a package mass transit investment for Bangkok. Since 2004, the Governments of Japan and Thailand have been formally negotiating an FTA that seeks to eliminate tariffs on an unprecedented list of Japanese hazardous waste exports to Thailand. The latter would have to accept waste, including slag, residues from incinerated municipal waste, chemical and allied industries and hospital waste. Other industrialized countries which have been exporting waste to the South-east Asian countries including Thailand, Philippines and Indonesia through existing loopholes that permit some forms of waste being shipped for recycling include the United States, Australia, Britain, New Zealand, Canada and South Korea.

It is reported that Japan and the EU are currently negotiating a similar FTA with India which could result in enormous increase in the import of waste severely hampering environmental safeguard measures. A leaked portion of the negotiation text of the FTA between the EU and India has caused some apprehension. The leaked text of the India-EU FTA phrases a new name for waste. It mentions that "nonnew goods shall be understood to include notably used and remanufactured goods" and that "non-new goods" would not have any restrictions such as import or export tariffs. Thus, import of waste could be treated just like import of fresh products. The growing pressure on the developing countries to import waste through bilateral or free trade agreements is a cause of serious concern as it encourages the business of recycling wastes. It could also override the existing national and international laws against the hazardous waste import, especially the Basel Convention and its global Ban Amendment forbidding toxic waste exports to the developing countries.

For instance, despite the international ban, the U.K. could export nearly 23,000 MT of electronic waste "illegally" in 2003 to parts of South- east Asia, India and China.

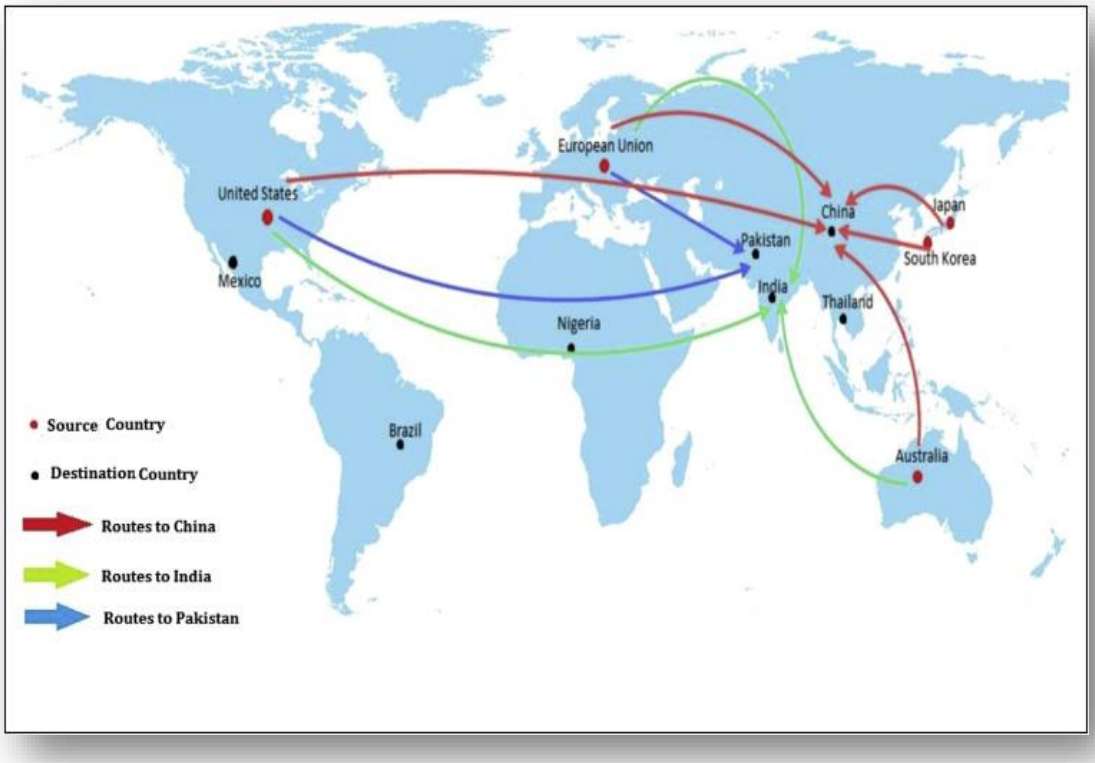
- **Import of hazardous e-waste in India**

India is one of the largest wastes importing countries in the world. All types of wastes are imported into the country, in the form of cheap raw materials including hazardous and toxic wastes. Data released by the Customs Department reveal imports of even prohibited wastes like clinical waste, incineration ash, municipal waste and e-waste, all of which exceed 50 lakh tonnes annually. In 2009, India generated 67 Press Release: '*The e-waste industry in India: CSE exposes what lies beneath*', Centre for Science and Environment, New Delhi, 18 May 2010.5.9 million tonnes of hazardous waste domestically and imported 6.4 million tonnes. It generates about 3,50,000 tonnes of electronic waste every year and imports another 50,000 tonnes. So far, India has been the destination of the hazardous and industrial wastes like mercury, electronic and plastic wastes from the United States; asbestos from Canada; defective steel and tin plates from the E.U., Australia and the U.S.; toxic waste oil from the United Arab Emirates, Iran and Kuwait; zinc ash, residues and skimming, lead waste and scrap, used batteries and waste and scrap of metals such as cadmium, chromium, cobalt, antimony, hafnium and thallium from Germany, Denmark, the Netherlands, the United

Kingdom, Belgium and Norway. These wastes contain toxic components which are damaging to the public health and environment.

New draft rules on the import and the management of e-waste are currently being considered. Till the rules are notified, the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 regulate the export-import trade or transboundary movements of hazardous wastes including e-waste. According to these Rules, import of hazardous wastes for disposal is not permitted. However, import of waste is permitted only for reuse, recycling or reprocessing. Monitoring of units recycling hazardous wastes is the responsibility of the State Pollution Control Board or the Pollution Control Committee in a Union Territory. The Rules also require all import consignments to be accompanied by a movement document and a test report from an accredited laboratory or a pre-shipment inspection certificate from a recognized agency.

The proposed e-waste rules, 2011 do not address the issue of import/export of e-



waste. The transboundary movement of hazardous waste including e-waste is regulated by the Hazardous Waste Rules, 2008. Import of e-waste can be considered for actual users only with the permission of Ministry of Environment and Forests and licence from Directorate General of Foreign Trade.

- **India's stand on liberalizing import rules**:

Global trade in remanufactured products has already crossed $100 billion. Like other Asian countries, India has also felt the pressure from the developed countries to liberalize its import rules to allow access to its markets for their re-manufactured goods. It is argued by the countries like U.S., Switzerland and Japan that promoting trade in re-manufactured goods helps both the developed and the developing countries by increasing access to low cost, superior quality products while helping solid waste management and encouraging transfer of technology and skills. But India is apprehensive that it could lead to a deluge of import of low-quality cheap goods and amount to transfer of waste from the developed to the developing countries. Thus, it has opposed suggestion by some developed countries for more liberal trade in remanufactured goods or refurbished old products apprehending that it could harm the country's domestic industry and have adverse environmental ramifications.

Agreeing with the Government's stand on the issue, Amit Mitra, Secretary-General of the Federation of Indian Chambers of Commerce and Industry (FICCI), has been quoted as saying, "Unrestricted imports of remanufactured goods would adversely impact our Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat, dated 19 April 2011. domestic manufacturing sector and have the risk of diluting safety standards and dumping of e-waste".

- **E-waste regulations in India**:

The environmentally sound management of waste is a significant challenge for India. The Regulations / Rules and Acts for waste control are primarily listed as The Environmental Protection Act 1986

I. The Environmental Protection Rules 1986
II. The Hazardous Waste (Management and Handling) Rules
III. The Batteries (Management and Handling) Rules Bio-Medical Waste (Management and Handling) Rules, 1998
IV. The Water (Prevention and Control of Pollution) Act, 1974, amended 1988
V. The Water (Prevention and Control of Pollution) Cess Act, 1971 amendment 2003
VI. Air (Prevention and Control of Pollution) Act 1981, Amended 1987 and the Air (Prevention and Control of Pollution) Rules, 1982
VII. The Ozone Depleting Substances (Regulation and Control) Rules, 2000
VIII. The Noise Pollution (Regulation and Control Rules) 2000

IX. The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008
X. The Plastics (Manufacture, Usage and Waste Management) Rules, 2009
XI. The E-Waste (Management and Handling Rules) 2011

The growth of EEE and its extensive use and consequent growth of e waste from both domestically produced and imported EEE products needs to be considered. Till mid 2010 neither the central government nor the state governments enacted dedicated legislation for e-waste having comprehensive provisions. The listed acts / regulations / rules affecting the e wastes are well known and important efforts. Important ones of these can be explained as: - After the Bhopal Gas Tragedy as first attempt for comprehensive environmental law ―The Environment (Protection) Act‖ (EPA) was enacted in 1886.

- **Loopholes in legislations**:

However, some provisions contained in some specific policies enable import of e-waste. For instance, India's EXIM (export-import) policy allows import of the second-hand computers not more than 10 years old, besides letting computers in as donations. The Foreign Trade (Development and Regulation) Act, 1992 provides for import of computers and peripherals from zones which have been set up primarily for export, i.e. EOU (Export Oriented Units), EPZ (Exports Processing Zones), STP (Software Technology Parks) and EHTP (Electronics Hardware Technology Parks) at a zero-custom duty. These computers can be donated to the recognized non-commercial educational institutions, registered charitable hospitals, public libraries, public-funded research and development establishments and organizations of the Government of India and State/ UT Governments. Moreover, there is no Exim code for trade in second-hand computers for donation purpose or for resale. Both second hand and new computers are placed under the same EXIM code in the Indian Customs Tariff Act allowing exporters to club new computers with the old ones. Besides, the Directorate-General of Foreign Trade (DGFT) rules are flexible to interpretation enabling the Customs Authorities to take on- the- spot decisions and provide rules exemption. Thus, if a consignment of second-hand computers is found without a license, traders manage to get their shipment released by paying a penalty. Importers also escape full penalty by an under-assessment of illegally imported goods. Amity Sen, 'India vows to fight liberal import of used goods', The Economic Times, New Delhi, 16 August 2010.

Report on Assessment of Electronic Wastes in Mumbai-Pune Area, Maharashtra Pollution Control Board, Mumbai, March 2007. Such provisions in the law can be misused by the developed countries to export hazardous e-waste to the country. In the new draft rules on e-waste, Rule 16 says that 'every

producer, distributor collection centre, refurbishes, dismantler, recycler, consumer or bulk consumer shall not import used electrical and electronic equipment or components in India for use unless it is imported for the purpose of repair or refurbishment or to fulfil obligations under the Extended Producer Responsibility (EPR)'. The fact that e-waste could still be imported under the pretext of metal scrap and second-hand electrical appliances have been a matter of serious concern. As per the proposed e-waste rules, 2011, the clause for import of used electrical and electronic equipment in India for use has been deleted. However, as per the EXIM Policy of Ministry of Commerce import of second-hand computers including personnel computers/lap tops and refurbished/ re-conditioned spares is restricted.

Porous Ports and lack of checking facilities Among all ports, the Mumbai Port Trust and the Jawaharlal Nehru Port Trust have been found to have the largest amount of hazardous goods lying around.77 Much of the global waste which is imported into India and find their way into the ports is labelled as waste or mixed waste paper consignments. Customs officials are unable to check every container because of shortage of men and machinery and resort to random checks. Of the 12 major ports and intermediate ports in India, the Jawaharlal Nehru Port at Nhava Sheva has two scanning machines. It is the largest port in India, handling close to 50 per cent of the country's port traffic. More than a million containers Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4/2011-HSMD, dated 19 April 2011. 'Mumbai Port has largest amount of hazardous material', The Times of India, 16 August 2010.

Arrive at the port and the scanners have limitations. If cobalt-60, a radioactive substance, is packed in a lead box, the scanners would detect the lead only because the metal blocks radiation from cobalt-60. Besides, beaches and small ports have also grown to be hubs for illegal import of the hazardous waste.

- **Procedure of importing e-waste**:

The standard procedure followed for importing a consignment to India involves an importer, an exporter, an agency registered and notified by the Directorate-General of Foreign Trade, a bank and the customs department at the port. First, the importer is required to get a pre-inspection certificate of the import material by a registered agency, which could be an Indian or a foreign company. After the agency issues the certificate, a bill detailing the number of containers, excise duty classification and product details is prepared. Thereafter, the consignment is shipped. When it reaches India, the customs officials at the port

check the certificate, levy a customs duty on the product as specified in the Central Excise Tariff Act and release the consignment to the importer. The e-waste trade is a thriving business in India with strategic port cities like Singapore and Dubai serving as transit centres in the e-waste trade route.

E-waste from Australia, North America, South Korea and Japan is received in Singapore and dispatched again to the importing Asian countries including India. Dubai also serves as a centre where scrap and wastes of all kinds from U.S.A., Europe and the West Asian countries are collected and re-exported. India is a major buyer from Dubai. The Dubai based exporters are aware of the Indian domestic scrap market such that prices of any scrap are kept at par with the Indian market price. '***The great e-waste recycling circus*** 'The transboundary movements of hazardous wastes, including e-waste are regulated under the Hazardous Wastes Rules, 2008. As per these Rules, import of e-waste is permitted to actual users in the country with permission of Moe and licence issued by Directorate General of Foreign Trade (DGFT) for recycling or reprocessing only. Import of e-waste by traders is not permitted 80.

- **Illegal waste imports seized in ports**:

India annually imports approximately 3.5 million metric tonnes of scrap metal worth Rs. 5,500 crores, entering the country at an average of 500 container loads daily. It is unloaded at any of the major and minor ports along the coast and transported to the Inland Container Depots throughout the country from where they enter a flourishing grey market.81 The Custom officials at regular intervals have intervened successfully and seized hazardous goods entering the ports. In 2009, nine containers of hazardous waste imported from Malaysia, Saudi Arabia and Barcelona by three different companies in Tamil Nadu were caught at the port of Tuticorin in Tamil Nadu. In early 2010, twenty containers of hazardous waste from Greece and Reunion, a French colony, imported by a paper factory in Tamil Nadu were sent back from the Tuticorin Port. As recently as in August 2010, more than 120 tonnes of e-waste in eight containers and imported from various countries by different companies were seized in Chennai. Of the total five consignments, one was from Australia, one from Canada, two from Korea and one from Brunei. Subsequent examination of the goods revealed that there were very old, used and unusable computer monitors, CPUs and processors, control panels, electrical motor parts, printers and keyboards.

Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. Shankar Roy Chowdhury, 'Terror from Waste' The Asian Age, 4 May 2010.

A large proportion of the computer monitors were found to be more than ten years old and clearly meant for recycling. These imports were found to be in direct violation of the provisions of the Customs Act, 1962 read with the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008. E-waste economy in the unorganized sector India has the label of being the second largest e-waste generator in Asia. According to a MAIT – GTZ estimate, India generated 330,000 lakh tonnes of e-waste in 2007, which is equivalent of 110 million laptops. More than 90 per cent of the e-waste generated in the country ends up in the unorganized market for recycling and disposal. The unorganized sector mainly consists of the urban slums of the metros and mini metros, where recycling operations are carried out by the unskilled employees using the most rudimentary methods to reduce cost.

A study by the Basel Action Network (BAN) in partnership with the Toxic Link reveals that e-waste is received and processed in India in similar manner as is done in China, or the condition could be even worse. The unorganised sector consists of an assortment of small and informal businesses not governed by any stringent health and environmental regulations. Workers face dangerous working conditions as they may be without protection like gloves or masks. Released gases, acid solutions, toxic smoke 'Imported e-waste seized by customs officials', The Times of India, 20 August 2010. Manufacturers' Association for Information Technology or MAIT was set up in 1982 for purposes of scientific, educational and IT industry promotion in India.

Deutsche Gesellschaft Feuer Technosphere Zusammenarbeit or GTZ has been active in India on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). GTZ cooperates with the Central Government and various State agencies with its priority areas for cooperation being sustainable economic development, energy, environmental policy and conservation and sustainable use of natural resources and contaminated ashes are some of the most dangerous threats for the workers and for the local environment. Many workers function from homes to reprocess waste, further exposing themselves, their families and the environment to dangerous toxins. For instance, to extract metals from circuit boards, gas torches are used to heat a board just enough to melt the solder, which separates the metal parts from the boards. Metals are also extracted by soaking the circuit boards in open acid bath followed by manual scrapping to extract copper and precious materials next to open drains. In this sector, the dismantlers extract metals on their own or work with a big trader, earning about Rs. 100/- per day. Two motherboards usually weighing one-kilogram cost Rs. 230. A profit of 10 per cent is made after selling the metals.

The circuit board recycling process involves either open burning of the circuit boards or using acid stripping. Both processes first involve removal of the

chips, condensers and capacitors from the board. Very often child labour is employed to separate the parts from the circuit boards, utilizing wire cutters and pliers. After some pin straightening, some of the Integrated Circuits (IC) chips and components are sold for reuse. The items that are not worthy of re-use go directly to the open fires to reduce them to metals. Following the chip extraction and burning, the boards themselves are burned in an open pit to retrieve the rest of the metal solder and copper. After burning, the ashes are floated in water to remove lighter ash.

Another process involves utilizing nitric acid on the circuit boards to remove gold and platinum. Both methods, open burning and acid baths, are fraught with occupational health risks as well as risks to the people living in the surrounding community. The circuit boards are sourced from the computer monitors, CPUs, keyboards, television and remote-control sets, radios, cell phones and other electrical appliances. It is estimated that about half the circuit boards used in the appliances in India end up in Moradabad (Uttar Pradesh) also called Petal Negri or the brass city's-waste economy in the organized sector In July 2009, organized recyclers formed the e-waste recycler's association but facing stiff competition from the unorganized sectors, they have been able to capture only 10 per cent of the total share of the e-waste market.

A problem facing the organized sector is the lack of proper collection and disposal mechanisms and appropriate technologies in the face of a large informal sector. Due to lack of proper collection systems, households and institutions at times end up storing obsolete products in their warehouses or storerooms. Even when these are sold or exchanged, they are refurbished and then resold. Only a small proportion of obsolete electronics products find its way into the e-waste processing stream. This is the dilemma facing the 10,000 sq. ft. formal e-waste dismantling unit in Noida (Uttar Pradesh) belonging to the TIC Group India Pt. Ltd which can process up to 500 tonnes of e-waste annually. But since June 2008, when it was launched, the unit has processed only 200 tonnes. Similarly, the Attire recycling unit in Roorkee (Uttarakhand) is a 35-crore plant which can process 36,000 tonnes of waste in a year although it is getting only 600 tonnes currently. The formal sector also lacks refineries for precious metals recovery. Therefore, according to the e-waste recyclers' association formed by organized recyclers in July 2009, the only way to sustain formal business in the current scenario is the license to import. licenses to import e-waste from the developed countries. Applications from other formal agencies are pending with the Ministry of Environment and Forests, Government of India. Opinions however differ on the issue of license to import as the only way to sustain formal business in the current scenario.

The Toxics Link holds that the aim of e-waste management should be safeguarding environment rather than sustaining businesses. Allowing imports would mean many non-recyclable hazardous materials dumped in our landfills, which should not be allowed. The country generates very large quantities of waste and the critical need was to establish a sound collection mechanism and not permit waste import to sustain capacity utilization of plants90. Unlike the informal recyclers, the formal recyclers do not use any chemicals or incinerations and use environmentally sound processes. Clients of the formal recyclers include multinational companies which must keep up with an environment friendly image and those which do not want their products to enter the grey market and compete with their new products. Unlike the organized sector, the informal dealers refurbish and sell a computer, even if it can be classified as e-waste, with some parts of it in working condition. Selling any part of a computer that is functional would fetch more money than selling it as metal parts. About 10 per cent of the e-waste generated every year is recycled and the remaining is refurbished.

Comparison of the e-waste economy between the informal and formal sectors in the table given below provides a comprehensive insight into the methods, safeguards, capital investments and earnings involved in the e-waste business:

- INFORMAL:

    1. Cathode Ray Tubes' (CRTs) are broken manually to separate its components – glass, metal and copper. The glass, comprising lead, is sold to bakeries or bangle makers. Since it retains heat, the glass goes into the base of ovens. Phosphors, if inhaled, can be toxic. The CRTs are sold to nonbranded television makers.
    2. 2. Circuit boards have gold-plated brass pins, microchips and condensers which are separated by heating. Fumes released during heating are toxic. Gold-plated brass pins are soaked in acid to recover the gold and brass separately. Microchips and condensers are heated in big containers filled with acid to extract metallic parts.
    3. 3. No safety precautions followed. Informal recyclers paid Rs.200-300 daily in Solapur; Rs. 100-150 in Moradabad.
    4. 4. Minimal capital investment required. Cost includes price of e-scrap, bribes to transfer it across state borders and set up and run shops and rent for the workspace.

- FORMAL:

    1. Components of the CRTs are separated by heating in a closed chamber, which sucks out phosphors from the components. They are

then crushed in shredder machines. Glass containing lead is sold to the companies that manufacture the CRTs.

2. Circuit boards are crushed in shredder machines. They are sent to approved smelters abroad, where after smelting at 1200°C, the metals in the circuit board collect together. Since smelting is carried out in closed chambers at high temperature, it is not hazardous. The metals—lead, copper, nickel, tin, gold, silver, palladium—are then separated by electro-refining.
3. Protective equipment— gloves, masks, shoes, caps— are provided to employees. Rs. 5,000 per month paid to unskilled workers.
4. Investment for a dismantler is about Rs. 30 lakh and for a recycling plant, about Rs. 25 crores.

As e-waste is a cheap source of raw materials while providing employment to many, there are those who advocate recycling e-waste while stressing the need for safe recycling and for setting up of more plants. Commenting on the benefit of safe recycling, the former President of India, Rd. A.P.J. Abul Kalam also said at the inauguration of the Atterton Recycling Plant in Roorkee in Delhi in January 2010: "With metal prices rising, recycling will help in sustaining our economy as it is much cheaper than extracting metals from its ore."92 In this regard, the UNEP report of July 2009 titled "Recycling From E-waste to Resources" has analysed issues related to e-waste including market potential of recycling of e-waste and transfer of innovative technologies for selected 11 countries, including India.

- **E-waste projection and recycling in four major cities**:

The two main hubs where e-waste is re-cycled in the country are Delhi and Mumbai. The other two major hubs are Hyderabad and Bengaluru which have been the centres of the electronics and information technology industry. They are among the top ten cities in India which have been generating e-waste. Their status as primary centres of the e-waste recycling process - whether it concerns storage, dismantling, recycling, refurbishing, and distribution-has been a predictable fall-out of the electronic industrial growth and development in these cities.

- **Delhi**:

A report by the Toxics Link in 2004 found that 70 per cent of electronic waste collected at recycling units in New Delhi was exported or dumped by the developed countries. According to the last survey conducted in 2007 on the quantity of waste being produced in Delhi, it was 'E-waste causes concern', The Hindu, 23 January 2010, 93 'E-waste', Lok Sabha. estimated that about 5,000 metric tonnes (MT) of hazardous waste was produced annually. The amount of

e-waste generated annually is about 12,000 tonnes. Though not the leading generator, Delhi is the leading processing centre of e-waste in the country. According to the study conducted by the GTZ in 2007, there were about 25,000 workers refurbishing 10,000-20,000 tonnes of e-waste annually.

The work takes place in small illegal units where neither regulations nor environment or health safeguards are in place. Due to lack of any facility for proper storage and disposal of such waste, mishaps like the ones that occurred in Mayapur, where a worker got exposed to the radiation and in Mundra, where a plastic fire broke out, are the kind of risks that the workers face each day. Delhi has the tag of a wholesale scrap market where not only all kinds of waste are brought in but also stored and pre-processed before being sent out to other parts of the country. The Government is in the process of acquiring land in Kahala for the purpose of treating and disposing waste but till such time, waste would continue to be stored at common effluent treatment plants and other generation points, posing a huge risk to those who meet it.

Once e-waste is imported, e-waste dealers in Delhi make bids on the sea-going containers at the inland depot situated at Okhla. The material is taken out, sorted and distributed between various recyclers according to the areas of specialization. Electronic waste in Delhi is mostly processed in Shastri Nagar, Turkman Gate, Solapur, Maipu and Mustafa bad. Eastern parts of Delhi like Mandala are the epicentres of e-waste recycling. Mandalalike is known for all its metal work recovery while areas like Banana and Narula are huge centres for all kinds of recycling and pre-processing work. It is said that only dismantling is done in Delhi. But, as per the reports of the Toxics Link, all the waste created from the pre-processing work gets dumped into the river or dahlias or drains, posing risks to health and environment. The Government's sealing drive and crackdown by the Environment Neha Lalchan ani, 'No facility in city to store, dump hazardous waste'. Department over the past few years resulted in major part of the recycling work shifting out to the satellite towns like Muzaffarnagar, Saharanpur, Meerut, etc. There are many factors that contribute to the thriving e-waste recycling business in Delhi - its status as the capital and hence its connectivity to all parts of the country; the many satellite towns around it where several hundreds of small units treat waste; and availability of cheap migrant labour.

The e waste hub on the north-eastern fringe of Delhi, the Solapur market is also called the largest electronics dismantling market in the country, where over 50 per cent of used computers end up for sale and recycling. Solapur gets e-waste from across northern India and even as far as Bengaluru.

The job of the dismantlers involves getting computers, breaking them into its basic parts and selling motherboards to traders in Moradabad. Apart from e-waste imports and supply from the neighbouring regions, another source of domestic supply of e-waste is the dabbawallas (waste pickers) who buy scrapped electronics from households. Auction News, a biweekly journal in Delhi also publishes advertisements on scrap that offices or the Government departments want to auction. When recyclers gather in the offices concerned, auctions are held. In some cases, scrap is sold by inviting tenders. Since waste processing is illegal in Delhi, the Government does not have an exact estimate of how much waste is produced in the city or how much is brought in for recycling.

Even though officials claim that the units have moved out of Delhi, they cannot be sure of the numbers as the work largely takes place in the unorganized sector. Neha Lalchan ani, "A disaster waiting to happen in waste capital".

- **Mumbai**:

Since liberalization began in India, no other industry has performed so well against global competition than the software industry. The Information Technology industry in India originated in Mumbai. Among Indian cities, Mumbai ranks first among top ten cities generating **WEEE** in India. Mumbai, the financial nerve centre of India, is also India's largest port city. The Mumbai-Pune industrial belt is one of the electronic items manufacturing hubs of the country. As a result, Mumbai is not only the port of import for new and used electronics; it is also home to a large user and manufacturer base, both generating large volumes of e-waste. The e-waste recycling market exists in a major way in Mumbai. The market of e-waste in Mumbai is not concentrated in a single place, but spread over different areas, each handling a different aspect of recycling. The city has a large network of scrap traders, with the main centres in Kurla, Saki Naka, Kamthipura- Grant Road, Jogeshwari and Malad.

Despite the absence of proper technology, each component is disassembled and recycled or reused in Mumbai. The general practices of recycling of the most complex parts of PCs, for instance, circuit boards and PVC wires by open roasting and acid bath to recover different metals, has not been observed in Mumbai. Most of the WEEE generated in the Pune and Pimpri Chinchwad Region is transported to the Mumbai Metropolitan Region (MMR) for further treatment and distribution. The items, which require extraction through wet processes are sold to traders from Delhi. Though it is claimed nothing is dumped in open fields, the report prepared by the IRG Systems South Asia under the aegis of the Maharashtra Pollution Control Board (MPCB) acknowledges that the hazards involved in product recycling can cause environmental damage. Toxics Link,

Mumbai: Choking on E-waste- A study on the status of e-waste in Mumbai, 23 February 2007.

The urgent need to have a well-coordinated mechanism on the collection, treatment and disposal of the e-waste in the MMR has been recognized. E-waste has been identified as a priority area by the MPCB and it has initiated certain initiatives to create awareness among various stakeholders on the e-waste. Started in 2009, the project to set up the first plant for scientific recycling of e-waste generated in the region is expected to be operational from 2010. In the first phase of the project, the capacity of the plant would be around 7,500 tonne per annum, which would later be increased. Once the plant is functional, the contractor would establish e-waste collection channel in the region.

As per country level e-waste assessment study, Mumbai generates maximum wastes among all the cities in India. Total electrical and electronic waste generation in **Maharashtra** is 20270.6 tonnes, out of which Navi Mumbai contributes 646.48 tonnes, Greater Mumbai 11017.06 tonnes, **Pune** 2584.21 tonnes and Pimpri-Chinchwad 1032.37 tonnes.

- **Bengaluru**:

In Bengaluru, the Silicon capital of India, e-waste recycling is a multi-crore market where e-waste is received in Gorily and Medahalli. The e-waste scrap dealers send the segregated and dismantled e-waste parts to Delhi and Mumbai every alternative day. The e-waste recyclers earn around Rs. 2-3 lakhs a month from selling the dismantled e-waste to Delhi. There are a few recycling centres in Karnataka like e- Ward, e- Parisa, K.G. Nandini Recyclers, Ash Recyclers, New Port Computer Services India Pt. Ltd. Report on ‘Assessment of Electronic Wastes in Mumbai-Pune Area, prepared by IRG Systems South Asia Pt. Ltd., New Delhi, Maharashtra Pollution Control Board, Mumbai, March 2007, 49 the formal sector. E-Parihar has been encouraged by the Central and State Pollution Control Board which would like it replicated in all major cities in the country. The Boards’ initiative attempts to carefully recycle old computers, their components and other e-waste, generated by both IT companies and electronic manufacturers.

The centre has equipment to recycle up to three tonnes of waste a day but is dealing with around one tonne right now. According to the owner, many corporates such as IBM, Tate Lexis, ABB and Phillips are among its clients. But many major IT firms are yet to send their e-waste or stipulate difficult conditions for not sending their e-waste.

Formal recycling is yet to take up in a big way as business is more profitable in the unorganised sector. The unorganised sector has little incentive to convert

into formal recycling centres as both the private and the public sector prefer auctioning their e-waste to informal dismantlers and get good price for it.101 According to industry surveys, 8,000 to 10,000 tonnes of e-waste is generated each year by IT firms and electronics manufacturers in and around Bengaluru. While the larger companies have warehouses for storing the waste, others sell them to small-time scrap dealers. The dealers, many concentrated around Mysore Road, often employ women and children to deal with the scrap and remove usable metal. What cannot be used at all is thrown into fields and channels or burned under unsafe conditions. Apart from affecting the 100 K. Asymmetry, 'Managing e-waste without harming environment', The Hindu, 03 April 2006. 101 Jayashree Nandi, 'Will a Draft Law Reboot e-Mess?' health of the employees of the scrap dealers, air, soil and ground water also get polluted.

Annual e-waste generation in Bengaluru from computer and printer, television and mobile phone is 6743.87 MT. In 2010, the total e-waste projection for Bengaluru with a population of 1.71 crore was 1, 23,593 kgs. including 92, 240 computers, 15,371 televisions and 15,982 mobile phones. In 2013, with a projected population of 1.80 crore, the total e-waste volume is expected to reach 1,30,383 kilograms including 97,310 computers, 16,214 televisions and 16, 859 mobile phones.

- **Hyderabad**:

For some time, Hyderabad has been known as the emerging Silicon capital of India. The annual e-waste generation has been estimated for Hyderabad at 3,263,994 MT from computers, printers, television and mobile phones. The break up is as follows: 3111.25 MT from computers, 86.46 MT from printers, 61.0 MT from televisions and 5.284 MT from mobile phones. In 2010, the total e-waste projection for Hyderabad with a population of 74.42 lakh was 98,163 kgs. including 42,869 computers, 53,581 televisions and 1,713 mobile phones. In 2013, with a projected population of 81.8 lakh, the total e-waste volume is expected to reach 1,07,886 kgs. including 47,117 computers, 58,890 televisions and 1,881 mobile phones. Most of the e-waste collectors and recyclers only do size reduction (shredding) and segregation. Earth Sense Recycle Pt. Ltd. and Ramki E-waste Recycling Facility are two formal recycling units in Andhra Pradesh. Report on Envenomization of e-waste in two cities in Andhra Pradesh and Karnataka (Hyderabad and Bengaluru) sponsored by the World Health Organization (WHO), India Country Office, New Delhi; prepared by Environment Protection Training & Research Institute (EPTRI), Hyderabad.

Authorized recycler Earth Sense set up recycling facility in Hyderabad in collaboration with e-Parihar of Bengaluru. The facility does size reduction by dismantling, shredding and segregation. After segregation, Earth Sense sends its

waste to e- Parihar and in turn it gets exported to Belgium along with its waste for precious metal recovery. Resource recovering facility is available only in Belgium. Although the formal recyclers exist, most of the e-waste finds its way into unauthorized recycling centres or to scrap dealers for quick money. In most of these units, workers are mainly women and children.

The report prepared by the Environment Protection Training & Research Institute (EPTRI), Hyderabad under the aegis of the WHO, New Delhi revealed that on an enquiry, the workers stated that there was no health problem, but a study needed to be taken up to find the actual pollution load generated and health problems among the workers. With the fast rate of technological changes and growing dependency on information technology and other modern electronic household items, the quantum of e-waste is set to rise in every electronic item. Since most of the e-waste finds its way to the unorganized sector with profit as the prime motivating factor, e-waste recycling undeniably requires better management and improved working environment guided by strict regulations.

METHODOLOGY

The first step in applying any approach and methodology is to establish the geographical boundaries of the study area. The study area included the state boundaries of Delhi, consisting of municipal boundaries, rural and urban areas, and selected areas of the NCR. The geographical boundaries were fixed considering the location of organized and unorganized markets, places where each item is unloaded, traded, transported, dismantled, recycled, reused, repaired, processed, and disposed of, starting from generation/production to its end of life. These places were identified through a transect walk and preliminary surveys in the study area. The two basic approaches applied for carrying out e-waste assessment in the study area involved quantification using material flow analysis (MFA) followed by site-specific validation.

The MFA and site-specific validation help to establish the e-waste trade value chain. The fundamental e-waste trade value chain based on MFA in the study area is shown in Fig. 1. The last three stakeholders in the e-waste trade value chain, consisting of e-waste generation, e-waste processing, and e-waste production/end products, fall in the informal sector. E-waste processing involves primary dismantling of items from e-waste, e.g., the unscrewing of a PC monitor and removal of the cathode ray tube (CRT) and printed circuit boards.

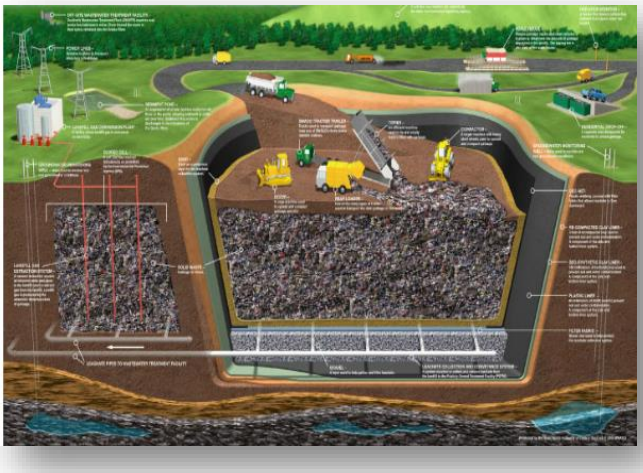
E-waste production/end products involve processes consisting of secondary dismantling of items obtained as output of e-waste processing, e.g., the regunning of CRTs, extraction of metals, and others. The remaining stakeholders fall in the formal sector. This trade value chain has been developed considering that an electronic item “flows” through a region and on its way, it is dismantled and processed in numerous steps until it rejoins the raw material streams or ends in final disposal. Some of the major stakeholders identified along the flow path include importers, producers/manufacturers, consumers (individual households, business sector), traders, retailers, scrap dealers, disassemblers, and dismantlers. At each step in the flow, business transactions define the movement of the electronic item in the flow. One of the ways to quantify the flow is through analysis of sales data of these business transactions.

In this study, sales data of electronic items have been applied to a market supply calculation method to estimate the theoretical waste arising for each item. This market supply method has been used consideration taking into data limitations and the short duration of the study. Further, the findings of the field survey also verify the findings obtained from this method. This method assumes that 100% of electronic units sold in one particular year will become obsolete at the end of their average life. Sensitivity analysis was carried out assuming an average life for each item based on market trends and consumer behavior. Sen Generation/ production Manufacturer Imports Market sales Businesses Government Others Consumption Households Businesses Government Other Resale/gifts etc. E-waste generation E-waste processing Production/ end products Resale Under-Warranty returns.

E-waste trade value chain sitivity analysis for PCs was carried out using 5 years and 7 years as the average life. Sensitivity analysis for TVs was carried out using 10 years and 12 years as the average life. These average lives were fixed based on primary and secondary data from market research agencies and surveys. Further, externalities such as e-waste entering into the study area from outside based on a primary field survey conducted by IRGSSA5 were factored into the final e-waste assessment analysis. The average life of an electronic item assumed in the sensitivity analysis has been validated through site-specific surveys. The validation has focused on the last three steps, i.e., e-waste generation, e-waste processing, and the production/end products of the e-waste trade value chain. The basic approach in this validation is to first identify the waste stream, followed by the specific processes in the waste stream; this method included identification and complete tracking of one component in the waste stream. In this study, the Dismantling of a TV and PC monitor has been taken as the waste stream, in which dismantling the CRT and its regunning has been taken as a process.

In this stream and process, the CRT was identified as one component, which was tracked along the material flow. Different products, by-products, and waste products handled by stakeholders along the material flow have been identified and quantified. The results obtained from this analysis have been compared with the assumptions to validate the average life of the electronic item.

- LANDFILLING:



This is the most common methodology of e-waste disposal. Soil is excavated, and trenches are made for burying the e-waste in it. An impervious liner is made of clay or plastic with a leachate basin for collection and transferring the e-waste to the treatment plant. However, landfill is not an environmentally sound process for disposing off the e-waste as toxic substances like cadmium, lead and mercury are released inside the soil and ground water.

Disadvantage:

- Landfills are prone to uncontrolled fires and release toxic fumes.
- Persistence of Poly Chlorinated Biphenyl (Non-biodegradable).

- ACID BATH:

Acid bath involves soaking of the electronic circuits in the powerful sulphuric, hydrochloric or nitric acid solutions that free the metals from the electronic pathways. The recovered metal is used in the manufacturing of other products while the hazardous acid waste finds its ways in the local water sources.

- INCINERATION:

It is a ‘thermal treatment’, i.e. a process requiring very high temperatures for combustion of organic substances present in waste materials. Complete combustion of waste material at high temperature (900 - 1000°C)

Advantages of this process include volume reduction by an estimated of 80-85%, need of land for landfills reduced, decrease in cost of transportation as incinerators can be built near waste dumping stations, Waste-to-Energy process due to incineration producing heat and power can be transferred to nearby areas,

the ash produced can be used by the construction industry, and the problem associated with leachates in landfills can also be minimized.
Disadvantages include high cost, requirement of skilled workers for operating an incinerator, release of dioxins, nitrogen oxides, heavy metals, particulates in the air, and encouraging more waste production to keep the incinerators working.

This is a controlled way of disposing off the e-waste and it involves combustion of electronic waste at high temperature in specially designed incinerators. This e-waste disposal method is quite advantageous as the waste volume is reduced extremely much and the energy obtained is also utilized separately. However, it is also not free from disadvantages with the emission of the harmful gases' mercury and cadmium in the environment.

- Advantage

- Reduction of e-waste volume

- Maximum Utilization of energy content of combustible material

- Hazardous organic substances are converted into less hazardous compounds.

- Disadvantage:

- Release of large number of residues from gas cleaning and combustion.
- Significant emission of cadmium and mercury (Heavy metal removal must be opted).

- RECYCLING OF E-WASTE:

Mobile phones, monitors, CPUs, floppy drives, laptops, keyboards, cables and connecting wires can be re-utilized with the help of the recycling process. It involves dismantling of the electronic device, separation of the parts having hazardous substances like CRT, printed circuit boards etc. and then recovery of the precious metals like copper, gold or lead can be done with the help of the efficient a powerful e-waste recycler. The most crucial thing here is choosing the right kind of recycler that does not break laws and handle the e-waste in the eco-friendly manner.

Nowadays, there are many e-waste recycling companies coming up with the pickup facilities collecting obsolete electronic items from your homes. Moreover, they are also running several recycling programs for the users, retailers and manufacturers for the collection of the electronics. Certain agencies such as EPA, Earth 911, eCyclingCenter, Call2Recycle, Greener Gadgets and Electronic

Industries Alliance are the additional resources for helping people in finding the nearby drop off locations.

- REUSE OF ELECTRONIC DEVICES:

This is the most desirable e-waste recycling process where with slight modifications the mobile phones, computers, laptops, printers can be reused or given as second-hand product to the other person. The old electronic equipment can also be donated in the various charity programs and thus helping the persons in need. Moreover, there is a better way also by selling the old mobile phones or laptops to some recycling and refurbishing companies. Several websites are acting as the middleman between recyclers and electronic users. It is a win-win situation for the users as they not only get rid of the old mobile phones but also get paid after reselling it.

- Reusing and recycling of e waste:

Reusing and recycling of e waste are the other ways of dealing with e-wastes. They have been preferable because they increase the lifespan of the products and therefore imply less waste over time. Re-use constitutes direct second hand use, or use after slight modifications are made to the original functioning equipment like memory upgrades, etc. However, they end up as waste eventually as they have limited life span. The reuse of second-hand electronic goods in the developing world including India falls in this category, where the waste ends up locally and where there is no adequate facility and competence to deal with them appropriately. While recycling appears to be a safe method to utilize or dispose e-wastes, it can be a misleading characterization of disparate practices-including dismantling, shredding, burning, exporting, etc. which are mostly unregulated and often create additional hazards itself. “Recycling” of hazardous wastes, even under the best of circumstances, has little environment benefit as it simply moves the hazards into secondary products that eventually must be disposed of.

One view says that unless the goal is to redesign the product to use non-hazardous materials, recycling may be a false solution. On the other hand, the Toxics Link, NGO based in Delhi holds that recycling isn’t just good for the environment but also good business practice. Recycling is therefore an important solution, especially if we consider that e-waste contains many valuable and rare materials.

- **Composting:**

It is an easy and cheap way to make nutrient rich fertilizer for kitchen gardens, lawns, orchards etc. It is also a great method to get rid of kitchen waste, yard clippings, leaves, and another organic biodegradable waste normally produced in a household.

Advantages include reduction and reuse of household waste, environmentally friendly fertilizer for the vegetable garden, no need of mixing organic waste with recyclables, low cost, no contamination to groundwater, and no adverse health impact while usage.

Disadvantages are not many, though the problem of it being dirty and smelly remains.

Conclusion

All types of waste are not only imported but generated in India hazardous industrial waste, municipal solid waste and e-waste. The quantum of wastes generated over the past several years have posed an ever-increasing threat to environment and public health. Over eighty-eight critically polluted industrial zones have been identified by the CPCB. Pollutants from such zones contaminate water bodies and rivers and even pollute the ground water in many places. Studies have also shown that crops are contaminated through industrial effluents but the scale of such an impact has yet to be identified. As far as e-waste is concerned, it has emerged as one of the fastest growing waste streams world-wide today. The sheer amount of electronic equipment reaching end-of-life poses a huge challenge. Computers and electronics equipment are designed without giving enough attention to the aspects such as downstream impacts, and the ease of recycling. Thus, their dismantling is also extremely labour-intensive. If electronic products continue to contain an assortment of toxic chemicals and are designed without recycling aspects, they would pose a threat to environment and public health at their end-of-life.

As electronic products are currently constituted, e-waste recycling operations in any country will generate polluting residues and emissions. Toxics Link has reported that India has over 1.38 million obsolete computers with manufacturers adding about 1,050 tonnes of electronic scrap every year. It is currently estimated that India produces some 3.8 lakh tonnes of e-waste annually. E-waste now forms over 70 per cent of landfills. When developing countries like India start tightening and enforcing stricter legislation on transboundary movements of e-waste, developed countries may find it harder to avoid the issue of recycling and disposal through export. However, in March 2010, in the journal titled Environmental Science and Technology, author Eric Williams, Assistant Professor in Arizona State University, wrote, “Trade bans will become increasingly irrelevant in solving the problem (of e-waste)”. He argues that a complete ban on export of used and end-of-life electronics to developing countries would fail to solve the problem because the developing world would generate more used and end-of life electronics than the developed countries as early as 2017.

Additionally, by 2025, the developing world would generate twice the amount of electronic scrap as what will come from the developed nations. Considering the future scenario, it is imperative that the safe management of waste is done in an organized manner with enough resources and sustainable recycling technologies on the one hand and effective legislations and monitoring mechanisms on the other.

In Delhi, in the wake of the Mayapur radiation leak incident, the government had issued guidelines and advisories to all heads of hospitals, medical centres, diagnostic centres and medical labs using radioactive equipment and consumables for their safe disposal, as per the directives of the Atomic Energy Regulatory Board (AERB) under the Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987, and the Atomic Energy (Radiation Protection) Rules, 2004. Ironically, under the AERB directives, the rules prescribing detailed guidelines regarding medical exposure, potential exposure, personal monitoring, quality control and even appointing radiation workers and radiological safety officers already exist.

The incident highlights the need to have a clear-cut disaster protocol and to implement effective regulation and monitoring mechanism to ensure that the rules are adhered to. It also calls for the regulatory infrastructure to allow for the protection of workers and community rights. There must be enough rights for citizens to take legal recourse for damages caused to their health, environment and property.

- **Need for stringent health safeguards and environmental protection laws in India**:

Environmental Astringent enough to address the issues relating to either domestic waste or imports of hazardous waste including e-waste.

We do not have appropriate technology to ascertain the quantum and quality of wastes in the imported items. For instance, it has been reported that the problem of toxic waste imports cannot be addressed properly as none of the Indian ports (except the Jawaharlal Nehru Port at Nhava Sheva) has scanners to detect the actual contents of the consignments.184 There are expectations that the proposed E-waste (Management and Handling) Rules, 2010 will lay down explicit laws concerning e-waste and systematize various aspects of the e-waste recycling sector. The Government has consulted various non- governmental organizations (NGOs) in the process of developing a dedicated set of rules, which would govern the management and handling of electronic and electrical waste. Draft rules on e-waste management were jointly proposed and submitted to the Government by the Manufacturers' Association for Information Technology

(MAIT), Detested Gesellschaft Foer Technosphere Zusammenanfeit (GTZ), Greenpeace and Toxics Link in September 2009.It is necessary that the legislation is clear in laying down the responsibility of every shareholder in the management of waste—from the producer to the consumer and the recycler. Besides, any legislation to be effective requires clear specification of the mechanisms to carry out each function. Strategies have been proposed for the effective management and handling of e-waste in the country, many of which are already in force or in consideration in the EU countries and other developed countries like the U.S. and Japan.

Considering the rapid growth of generation of e-waste, the Moe has proposed to notify separate Rules on e-waste under the Environment (Protection) Act, 1986. The salient features of the proposed Rules in brief, provided by the Moe, are as given below:

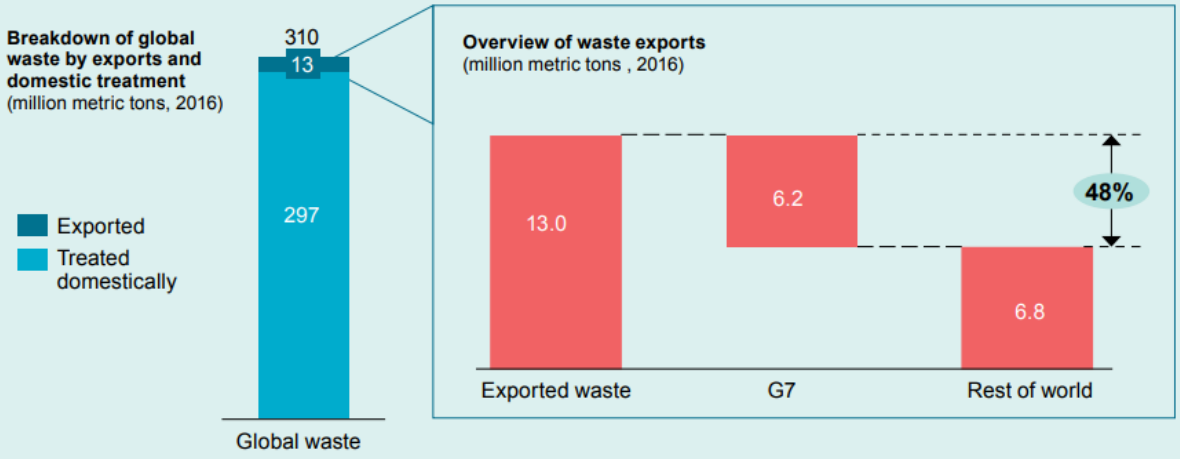
- The concept of Extended Producer Responsibility (EPR) has been enshrined in the proposed Rules.
- (ii) The rules propose to extend producers' responsibility to the post-consumer stage of the product life cycle and fix their responsibility for collection of ends of life products and to ensure that such wastes are channelized for safe handling. In addition, Producers are required to finance, and organize a system to meet the costs involved in the environmentally sound management of e-waste generated from the 'end of life' of their own products and the historical waste available on the date from which these rules come into force.
- Producers, as necessary, can designate agencies to set up an effective take back system for all electrical and electronic equipment at the end of their life.
- The threshold limits prescribed in EU RoHS Directive, which is globally accepted standard for the hazardous substance used in manufacture of electrical and electronics components have been adopted.
- Rules also provide for granting authorization and registration by the State Pollution Control Board or the Pollution Control Committee concerned, to a person's/agency engaged in collection or dismantling or recycling of e-waste; provided that the applicant possesses appropriate facilities to handle e-waste safely. This is to ensure management of e-waste in an environmentally sound manner. (vi) Collection Centres, which are being run by individuals/ jointly or by agencies will be required to take authorization from respective State Pollution Control Boards/Committees and file annual return thereafter providing

details of e-waste collected. Dismantlers and recyclers will have to obtain authorization and registration from the concerned State Pollution Control Board and file annual return regarding e-waste handled by them.

- **Extended Producers Responsibility (EPR)**:

The principle of the Extended Producers Responsibility (EPR) which underlines the current framework of the draft e-waste rules may be an innovative step in the management of e-waste in the country. The concept of EPR aims to place full responsibility of collection of end-of-life electronic products and their

Figure 12: Overview of 2016 global plastic waste trade



Source: Dalberg analysis, Jambeck & al (2014), World Bank (2018), SITRA (2018)

safe disposal on to the producers. It is an environment protection strategy that makes the producer responsible for the entire life cycle of the product, take back, recycle and final disposal of the product. They would have to ensure that the polluting products will be recycled in an environmentally friendly manner by refurbishes, 96 dismantlers or recyclers. It would require the producers and dealers to collect e-waste by providing the consumer a box, bin or a demarcated area to deposit e-waste. It has been suggested that major municipal corporations should take the responsibility of collecting e-waste directly from consumers to be handed over to a recycler. Every dismantler and recycler would also have to be registered with the Government to ensure compliance. However, apprehensions have been expressed by some quarters that EPR may be difficult to implement.

The practicability of such a measure must be examined carefully in a country like India where it would be difficult to track electronic products which may be sold several times by more than one customer after using those products for some time. For instance, it may be impossible for a producer in India to keep track of an electrical or electronic item which he/she might have sold to a customer from the southern part of our country and who in turn might dispose it off to somebody else residing in another distant region. Even the Ministry of MSME has commented that it may not be practically feasible for the producers to collect the e-waste generated at the end of life of the electrical and electronic products, because the consumers may be in different parts of the country, not known to the producers.

In this regard, it has been suggested that almost all major electronic brands have service centres across the country and these can be used as collection points. The incentive, that a customer gets to give an old electronic good for recycling would be key to its success. Moreover, many dismantlers are organizing themselves and have often tried to enter tie-ups with the organized recyclers for carrying out precious metal recovery. However, no such tie-ups have taken place so far because the organized recyclers are awaiting approvals on import licenses for easier access to e-waste.

Notwithstanding the suggestions mentioned above, the most toxic and polluting segments of the electronics industry, namely, the manufacturing and the disposal have mostly migrated to the developing countries. Therefore, it needs to be ensured that the producer responsibility or take-back programme is not used to justify the transboundary movements of wastes. As per the Hazardous Wastes Rules, 2008, import of such wastes for disposal is not permitted in the country. Import of e-waste by traders is also not permitted. Further, import of e-waste is permitted to actual users in the country with permission of Moe and licence issued by Directorate General of Foreign Trade (DGFT) for reuse or recycling or reprocessing only. The draft e-waste rules are applicable to the e-waste generated from IT and telecommunication equipment and Consumer electrical and electronics i.e.

Television sets (including LCD & LED), Refrigerator, Washing Machine, Air-conditioners. Based on the experience in implementation of EPR from the above products, the rules would be reviewed for including other categories of e-waste. As per the draft e-waste rules, the Municipal Authorities are required to take responsibility of collection of e-waste generated from the orphan products.

- **Awareness programme**:

The new draft rules put the onus of creating awareness of the hazardous constituents of e-waste and its management on the producers. The awareness among the consumers regarding hazardous constituents of e-waste can be created through active propaganda in print & electronic media and strong extension programmes. The awareness through media may not be feasible by the producers individually. This task may have to be taken up by agencies like Municipal Bodies/State Pollution Control Boards/ Central Pollution Control Board. Nevertheless, Government needs to undertake a massive awareness programme to encourage e-waste collection for safe disposal and recycling. A partnership among all stakeholders is vital for the success of the process.

The State of Tamil Nadu has made the first move to come up with a separate e-waste policy in the country and the policy of collection of electronic waste by *community- based organizations* (CBOs). However, activists and organizations await specific details. It has been reported that once the rules are in place, key stakeholders including manufacturers, pollution control boards, local bodies, and the *Electronics Corporation of Tamil Nadu Limited* (ELCOT), would be apprised of their roles. The Government would also take up a massive awareness programme to tell consumers of the huge quantities of e-waste they are accumulating and suggesting responsible means of getting rid of them.

The common practice for household refuse disposal in rural areas is to dump solid wastes openly in backyard gardens or in an open space. Such indiscriminate disposal is an environmental hazard and can threaten human health and safety. Solid waste that is improperly disposed of can result in several problems. It can create a breeding ground for pathogenic microorganisms and vectors of disease and cause a public nuisance due to unsightliness and bad smell. It can cause contamination of surrounding soil, groundwater and surface water, and it can also create fire hazards, physical hazards and have poisoning effects (from pesticides and insecticides). However, these problems can be avoided by using appropriate management techniques.

For all waste management issues, your role should be to engage community members and families in awareness of the solid waste problems in their area and try to change their behaviour. In doing so, it should be possible to have a clean, attractive and sustainable environment. Proper management of e-waste will help your community prevent communicable diseases and safeguard the environment in a sustainable manner.

- **MANAGEMENT PROGRAMS:**

- 50-80% of e – wastes collected are exported for recycling by U.S. Export. - Five e-waste recyclers are identified by Tamil Nadu pollution control Board.

- Tritiya Recycling India Pt. Ltd.

- INAA Enterprises.

- AER World Wide (India) Pt. Ltd.

- TESAMM recycler India Pt. Ltd.

- Ultras Solution (I) Pt. Ltd Maharashtra Pollution Control Board has authorized Eco Recon company, Mumbai for e-waste management across India.

- TCS, Oberoi groups of Hotels, Castrol, Pfizer, Aventis Pharma, Tata Facias etc. recycle their e-waste with Eco Recon.

The attempt to observe the e waste problem as passing buck needs to end. The environmental degradation and hazards will see no nation ‘s boundaries and will affect the entire human kind. The newer laws are trying to address initiatives in vigorous manner. The nations need to identify the e waste problem in major way and enact regulations dedicated to these with open eyes and aims to see the environment is safe and livable.

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Introduction Electronic waste i.e. e-waste one of the fastest growing waste stream in India. Growth of information and communication technology sector, faster obsolescence and subsequent up-gradation of electronic products are forcing consumers to discard old products, which in turn accumulate huge e-waste to the solid waste stream. India is the "fifth largest electronic waste producer in the world"; approximately 2 million tons of e-waste along with undisclosed amount of e- waste is imported from other countries around the world. More than 25 countries dumped 1,21,000 metric tons of plastic waste in India, which include the middle east, Europe and the U.S the e-waste which is imported in India is also term as "Global Waste Business". It is an international trade of waste between countries for future treatment, disposal, or recycling. Toxic or hazardous wastes are often imported by developing countries like China, India and Africa from developed countries like U.S, Europe. The purpose behind is that the countries which do not have the production capacity to manufacture high quality products can import waste to stimulate their economy. "people live in developing countries accept increased exposure to hazardous pollutants in exchange for opportunities to increase their productivity" E-waste is not hazardous if it is recycled by scientific methodology E-waste contains heavy metals, plastics, glass etc. Which can be potentially toxic, poses numerous health and leads to environment risks hazardous wastes are often not properly disposed of or treated, leading to poisoning of the surrounding Environment and resulting in death in people and animals. Also, poorer or developing nations do not have safe recycling process of facilities, and the people process the toxic waste with their bare hands. E-waste is growing in India at the rate of 10% per year. Adequate Measures and cost-effective, environmentally friendly, technological solution would be needed to address the issue. This case study provides a basic information on imported electronic waste management in India. Rapid changes in technologies, urbanization, change in media, planned obsolescence etc. have resulted in a fast growing surplus of electronic waste (E- waste) around the Globe, About 50 million tons of e – waste are been produced every year, wherein USA discards 3 million tons of each year amounting 30 million computers per year and Europe disposes 100 million phones every year and China leads second with 2.3 million tons of e – waste. Electronic wastes or e – waste or e – scrap or electronic disposal refers to all the discarded electrical or electronic devices like mobile phones, television sets, computers, refrigerators etc. The other definitions are re-usable (working and repairable electronics), secondary scrap (Copper, Steel, Plastic etc.) and others are wastes which are damped or incinerated. Cathode Ray Tubes (CRTs) are considered one of the hardest types to recycle and the United States Environmental Protection Agency (EPA) included CRT monitors as "Hazardous Household Waste" since it contains lead, cadmium, beryllium or brominated flame retardants as contaminants Review of Literature E-waste, very trendy yet casual name given to electrical and electronic appliances & gazettes, either discarded or of further use. According to UNEP, 2005; Greenpeace International, (2005) around 21,00,000 to 51,00,000 tonnes of e-waste produced annually around the globe and this number is very huge as well approximate as there is no clear-cut method or technology to measure the actual quantity of waste produce and discarded. Further author said the percentage of e-waste of that of solid waste is around 5. • A Catalog of universal e-waste substances are: Items Weight Age PC 35 3 Reproduction M/c 3 5 hi-fi M/c 10 10 Cell phones 0.1 2 Gaming M/c 3 5 Light printing M/c 60 8 Broadcasting M/c 2 10 TV 30 5 VCD 5 5 Washing M/c 65 8 Fridge 35 10 A.C. 55 12 Oven 15 7 the International Association of Electronics Recyclers predictable that according to existing development & slumping trends the all personal and public electronics instruments will find its way to landfills is approximately three billion. Interpretation of current financial drift, budding nations are also going to pour more and more electronic waste into the existing amount. • The Problems: 1 .Rapid technology changes slow adaptation to changes 2.Increases 5 .Increasing consumers human health electronic risks "richer". purchases cheap sales Problems 4.More 3 .More e Hazardous wastes moves material toxics. every where. 1. Increases Consumers Electronic Purchases Cheap Sale: Rakesh Johri,

(2008) explained as new technology development in the world of electronic leads to more purchases of the electronic item like mobile phone like smart phone, note 1 &2, oven, TV, etc. there should be expansion in the field of electronic, but the cost should be verified directly or indirectly. Expansion in a field should not be achieved at the cost of human being health like kidney diseases or by disturbing environment ecology like natural environment like contamination, etc.

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