SEMINAR REPORT
ON
E-waste Management

Submitted To

UDHNA CITIZEN COMMERCE COLLEGE & S.P.B. COLLEGE OF BUSINESS ADMINISTRATION & SMT.DIWALIBEN HARJIBHAI GONDALIA COOLLEGE OF BCA AND IT

As A Partial Fulfillment for the Degree Of BACHELOR OF COMPUTER APPLICATION (B.C.A.)

Presentation By: - sourabh pandey anil (y-170)

Seat number :- 2019038963

Guided By:- **Dr. Vishal A. Naik**

Udhna Citizen Commerce College
&
S.P.B. College of Business Administration
&
Smt. Diwaliben Harjibhai Gondalia College of BCA & I.T.
(Self Financed College Affilliated To Veer Narmad South Gujarat University, Surat)
(Managed by Udhna Academy Education Trust)

(Bachelor of Computer Application)

CERTIFICATE

This is to Certify that Mr. / Ms. PANDEY SOURABH ANIL

of BCA-6th Semester Seat No. 2019038963 has successfully carried out a Project / Seminar Work entitled as E WASTE MANAGEMENT

in accrodance with technical and theoretical specification for the academic year 20 21 20 22 towards a Partial fulfillment of BCA Programme.

Guide Name : Dr. Vishal A. Naik Examiner Name :

Signature : Signature :

Date : 12-04-2022

Principal

INDEX

What is e waste?

Definition[

E-waste or electronic waste is created when an electronic product is discarded after the end of its useful life. The rapid expansion of technology and the consumption driven society results in the creation of a very large amount of e-waste.

Any item which is considered as Electronic Waste has a Lifetime Profile which differs for different categories of Electrical and Electronic devices. Lifetime Profile includes the information about hazardous quantity present in discarded items, economic value and the effects on environment and health of people if they are not recycled appropriately.

Electronic Waste is dismantled and sorted manually in developing countries unlike developed nations which make use of sophisticated machinery and provides PPE (Personal Protective Equipment) for the people who risk their lives in extraction of different materials from Electronic Waste.

E-waste is a popular, informal name for electronic products nearing the end of their "useful life." Computers, televisions, VCRs, stereos, copiers, and fax machines are common electronic products. Many of these products can be reused, refurbished, or recycled. There is an upgradation done to this E-waste garbage list which includes gadgets like smartphone, tablets, laptops, video game consoles, cameras and many more. India had 1.012 billion active mobile connections in January 2018. Every year the number is growing exponentially.[4]

According to ASSOCHAM, an industrial body in India the, Compound Annual Growth Rate of electronic waste is 30%. With changing consumer behavior and rapid economic growth, ASSOCHAM estimates that India will generate 5.2 million tonnes of e-waste by 2020.[5][6]

While e-waste recycling is a source of income for many people in India, it also poses numerous health and environmental risks. More than 95% of India's e-waste is illegally recycled by informal waste pickers called kabadiwalas or raddiwalas.[what language is this?][3] These workers operate independently, outside of any formal organization which makes enforcing e-waste regulations difficult-to-impossible. Recyclers often rely on rudimentary recycling techniques that can release

Source of e-waste

- Large household appliances, including cooling and freezing appliances
- Small household appliances
- IT equipment, including monitors
- Consumer electronics, including televisions
- Lamps and luminaires
- Toys
- Tools
- Medical devices
- Monitoring and control instruments and
- Automatic dispensers

These include used electronics which are destined for reuse, resale, salvage, recycling, or disposal as well as re-usables (working and repairable electronics) and secondary raw materials (copper, steel, plastic, or similar). The term "waste" is reserved for residue or material which is dumped by the buyer rather than recycled, including residue from reuse and recycling operations, because loads of surplus electronics are frequently commingled (good, recyclable, and non-recyclable). Several public policy advocates apply the term "e-waste" and "e-scrap" broadly to apply to all surplus electronics. Cathode ray tubes (CRTs) are considered one of the hardest types to recycle.[2]

Using a different set of categories, the Partnership on Measuring ICT for Development defines e-waste in six categories:

- Temperature exchange equipment (such as air conditioners, freezers)
- Screens, monitors (TVs, laptops)
- Lamps (LED lamps, for example)
- Large equipment (washing machines, electric stoves)
- Small equipment (microwaves, electric shavers)
- Small IT and telecommunication equipment (such as mobile phones, printers)

Products in each category vary in longevity profile, impact, and collection methods, among other differences.[3]

CRTs have a relatively high concentration of lead and phosphors (not to be confused with phosphorus), both of which are necessary for the display. The United States Environmental Protection Agency (EPA) includes discarded CRT monitors in its category of "hazardous household waste"[4] but considers CRTs that have been set aside for testing to be commodities if they are not discarded, speculatively accumulated, or left unprotected from weather and other damage. These CRT devices are often confused between the DLP Rear Projection TV, both of which have a different recycling process due to the materials of which they are composed.

The EU and its member states operate a system via the European Waste Catalogue (EWC) - a European Council Directive, which is interpreted into "member state law". In the UK, this is in the

form of the List of Wastes Directive. However, the list (and EWC) gives a broad definition (EWC Code 16 02 13*) of what is hazardous electronic waste, requiring "waste operators" to employ the Hazardous Waste Regulations (Annex 1A, Annex 1B) for refined definition. Constituent materials in the waste also require assessment via the combination of Annex II and Annex III, again allowing operators to further determine whether a waste is hazardous.[5]

The high value of the computer recycling subset of electronic waste (working and reusable laptops, desktops, and components like RAM) can help pay the cost of transportation for a larger number of worthless pieces than what can be achieved with display devices, which have less (or negative) scrap value. In A 2011 report, "Ghana E-waste Country Assessment",[6] found that of 215,000 tons of electronics imported to Ghana, 30% were brand new and 70% were used. Of the used product, the study concluded that 15% was not reused and was scrapped or discarded. This contrasts with published but uncredited claims that 80% of the imports into Ghana were being burned in primitive conditions.

Rapid growth of e-waste

Electronic waste (E-waste) is the fastest growing stream of waste — but it is also the most valuable stream of waste. A tonne of E-waste is likely to have more silver than a tonne of silver ore.

As we celebrate the third international E-waste day October 14, 2020, let’s move a step back and take stock of the stark reality of E-waste.

The increase in production of electrical and electronic equipment (EEE) has been attributed to industrialisation, urbanisation and higher levels of disposable income. E-waste generation trends have also moved uphill, which has been majorly imputed to higher and irresponsible consumption, shorter life spans of products and the mandatory obsolescence planned by the producers of EEE.

Nearly 53.6 million tonnes of E-waste was generated in 2019 globally — this was at the rate of 7.3 kilogram per capita. The documented average collection and recycling rates of all continents stand at a meagre 14.66 per cent, with Europe recycling 42.5 per cent of its E-waste and Africa recycling just 0.9 per cent.

We have no clue where 80 per cent of the E-waste produced globally comes from, where it is disposed of and what are the pre-treatment methods used to extract the resource before it is discarded off.

Of this undocumented E-waste, 20 per cent is exported as second-hand products or as E-waste to low- or middle-income countries.

In high-income countries, around 8 per cent of the E-waste is discarded in waste bins along with other streams of waste, which ends up in landfills.

As of 2019, 78 countries had a policy, regulation or legislation for scientific and sound management of E-waste. It is, therefore, important to note that approximately 40 per cent of our globe is covered by legislation, policy or regulation that governs proper management of E-waste.

India generated 3.2 million tonnes of E-waste in 2019. Details of 90 per cent of this waste are undocumented. According to the Central Pollution Control Board (CPCB), India has 312 registered E-waste recyclers with a capacity to handle 782,080.62 tonnes of E-waste every year.

This means that if all the E-waste is routed to the authorised recyclers in India, it would take four years for the recyclers to process it. And this is after the optimistic assumption that all recyclers work at full capacity.

The Centre for Science and Environment, a New Delhi-based think tank, visited E-waste recyclers to gauge the situation on the ground. It found that recycling was not happening at the scale the recyclers were authorised to work at.

Clearly, the recycling potential of our country is poor. More than 90 per cent of our E-waste is handled by the informal sector that resorts to non-scientific and dangerous methods to extract the resource from E-waste and dump it irresponsibly later on.

This jeopardises their health and compromises the safety and well-being of people and the environment.

It is quite evident that we, as a global community, have failed miserably to manage our E-waste. The rich are diverting their E-waste to the poor, not only globally, but locally as well. This practice must stop.

We need better implementation methodologies and inclusion policies that provide accommodation and validation for the informal sector to step up and help us meet our recycling targets in an environmentally sound manner.

Global E-Waste - Statistics & Facts

Electronic waste - commonly referred to as e-waste - is discarded electronic devices that are no longer wanted, not functional, or obsolete. This can include small electronic products such as mobile phones and lamps, to large appliances like refrigerators. The rapid pace at which technology advances today, as well as growing consumer demand, means that many devices reach the end of their useful life after only a few years of use. As such, electronic waste is now the world's fastest-growing waste stream.

The rapid growth of E-waste

Global electronic waste generation reached a record high of 53.6 million metric tons in 2019. This was an increase of 21 percent in just five years and worked out at approximately 7.3 kilograms of e-waste per capita. Some of this growth was fueled by Asia, where improving economies and incomes have seen electronic products become far more affordable. Asia accounted for almost half of global e-waste in 2019, having produced 24.9 million metric tons worth. The majority of this was produced in China, which is the world's largest e-waste producer. However, while Asia generates far more e-waste than other regions, on average it produces just 5.6 kilograms per person. In comparison, the

volume of e-waste generated per capita in Europe and the Americas is considerably higher, at 16.2 kilograms and 13.3 kilograms, respectively. Many countries that produce the most e-waste per capita are in Europe, such as Norway, the United Kingdom, and France.

E-waste disposal and treatment

In 2019, the global share of e-waste documented to be collected and properly recycled was just 17.4 percent. This is despite electronic products consisting of valuable materials that can be reused or recycled, such as gold, silver, and cobalt – which is vital for rechargeable batteries. Europe has the highest collection and recycling rate of e-waste, at 42.5 percent. There have been proposals in the European Union for countries to legally be required to recycle critical metals found in e-waste as a way to reduce reliance on imports.

Many countries, however, lack electronic waste legislation and regulations. This results in electronic devices often being dumped at landfill sites. Despite Africa having an e-waste recycling rate of just 0.9 percent, many wealthy countries export their e-scrap there. This is becoming a growing problem, especially in Ghana, where one of the world's largest e-waste sites is located. Electronics can be comprised of harmful substances like mercury, arsenic, and chromium. These toxic substances can leach into the environment when not properly managed, causing adverse health effects in humans as well as environmental damage.

Outlook on global e-waste generation 2019-2030

The volume of electronic waste generated worldwide in 2019 was roughly 54 million metric tons. Several factors such as increased spending power and the availability of electronics has fueled e-waste generation in recent decades, making it the fastest growing waste stream worldwide. This trend is expected to continue, with projections showing that by 2030, annual e-waste generation worldwide will have increased by approximately 30 percent.

How much e-waste do people produce?

Globally, e-waste generation per capita averages roughly seven kilograms a year. However, this differs greatly depending on the region. Although Asia produces the most e-waste worldwide, people in wealthier countries typically produce more e-waste per capita than those in developing countries. For example, per capita e-waste generation in Europe is more than 16 kilograms a year, while in Asia it is five kilograms. In Africa it is even lower at just 2.5 kilograms per person, per year.

E-waste disposal Currently, the global share of documented, collected, and recycled e-waste is just 20 percent. Instead, large volumes often end up in landfill sites. Due to the hazardous materials that are often used in electronics, e-waste is a growing environmental concern worldwide.

Expected growth in upcoming years

E-waste is referred to as the world's fastest growing solid waste stream. Since 2000, e-waste amounts have grown from 20 million to 50 million tonnes per year. A new report from the United Nations University-hosted Solving the E-waste Problem (StEP) Initiative, published together with UN Environment, highlights future e-waste scenarios. Under a baseline scenario, the amount of e-waste will more than double by 2050, to reach approximately 111 million tonnes per year.

But the quantities alone do not tell the whole story. It is really about how industries, policies, and consumers react to the situation. While there is an opportunity to create sustainable production and consumption systems for electronics, this cannot be achieved by continuing the way we do business. In order to meet the growing demand, while also addressing the unexpected nature of technological evolution, a drastic change is needed in the electronics sector.

New technologies are advancing development of materials and alloys that have improved energy efficiency and portability of electronic appliances. However, recycling of these materials has not been easy. In many cases, despite the available technology, there is no economic incentive for recycling materials from e-waste. And although several policies and regulations have been put in place to cover e-waste, the situation has not improved as expected. Moreover, collection rates of e-waste are still lagging at around 20% on average globally despite attempts to substantially increase them. Hence, most of the e-waste generated is not properly treated.

- The volume of electronic waste generated worldwide in 2019 was roughly 54 million metric tons. Several factors such as increased spending power and the availability of electronics has fueled e-waste generation in recent decades, making it the fastest growing waste stream worldwide.

- . This trend is expected to continue, with projections showing that by 2030, annual e-waste generation worldwide will have increased by approximately 30 percent.

- E-waste disposal Currently, the global share of documented, collected, and recycled e-waste is just 20 percent. Instead, large volumes often end up in landfill sites. Due to the hazardous materials that are often used in electronics, e-waste is a growing environmental concern worldwide.

Why it's a problem

- Electronic waste keeps growing and growing: Today people are buying more and more electronic devices and the electronic devices are being retired faster. For example, cell phones usually have a useful life of 18 to 24 months. In 2012, the average U.S. household spent $1,312 on consumer electronic products a year, according to a study by the Consumer Electronic Associations (CEA). More than 20 million tons of e-waste are produced every year.
- Environmental effects of e-waste: The toxic materials from electronic devices are released into bodies of water, groundwater, soil and air, affecting both land and sea animals. When you throw out your e-waste they wind up in landfills, causing toxic materials to seep into groundwater. When e-waste is warmed up, toxic chemicals are released into the air damaging the atmosphere.
- Tons e-waste is shipped overseas: Much of this left in junkyard to polluted the environment or burned for scrap by kids. Informal recycling markets in China, India, Pakistan,Vietnam, and Philippines handle anywhere from 50 percent to 80 percent of the world's e-waste. In Guiyu,

China, one of the largest electronic waste landfill sites in the world. When electronic devices are dumped in these developing countries the impact is detrimental to the environment of the country and the health of the people.

- Health implications of electronic waste: Computers and most electronics contain toxic materials such as lead, zinc, nickel, barium and chromium, specifically with lead, if released is not the environment can cause damage to human blood, kidneys, as well as central and peripheral nervous systems. Residents of Guiyu, China exhibit substantial digestive, neurological, respiratory and bone problems.The impact of electronic waste is detrimental to the health of the people in these developing countries.
- Electronic waste and data security: Managers should be concerned with where their electronic equipment is going after disposal because they are worried about sensitive data loss, identity theft, consumer scams, data breaches and loss of integrity. These are just a few of the problems that can be cause by not properly disposing of your electronic waste due to people stealing information from the hard drives in e-waste.

E-waste Composition

The composition of e-waste is diverse, containing more than 1,000 different toxic and non-toxic substances.5 The onset of technological advancement of electrical and electronic appliances is so rapid that new products quickly replace existing models or make certain items of electronic equipment redundant, useless or nonfunctioning, thereby generating a constant source of e-waste generation. According to Mario and Casey, e-waste can be classified by its physical composition into two types as shown in Figure 1.20 Electrical e-wastes are refrigerators and household appliances such as cables, bulbs, washing machines, dryers, AC units, vacuum cleaners, coffee machines, water heaters, toasters, irons etc. The waste classified as electronics includes TVs, computer monitors, other small consumer electronics such as DVDs, VCRs, CD players, radios, routers, calculators, GPS devices, camcorders, cameras etc., and information and communication products such as PCs, mobile phones, printers, fax machines, photocopiers, pen drives, etc. According to Widmer and Oswald-Krapf, more than 60% of the total weight of e-waste consists of iron, gold, aluminum and copper, of which 2.7% are pollutants, i.e. toxic heavy metals and other chemical compounds.4 Sum reported that e-wastes typically consist of metals, plastics and refractory oxides (Figure 2).21 Metal scrap consists mainly of copper (Cu), iron (Fe), and tin (Sn) etc.; plastic components are polycarbonates, polyesters, polyethylene and polypropylene; and the major oxides are alumina, silica, barium titanate, and potassium, magnesium and aluminum silicates.

Figure 1

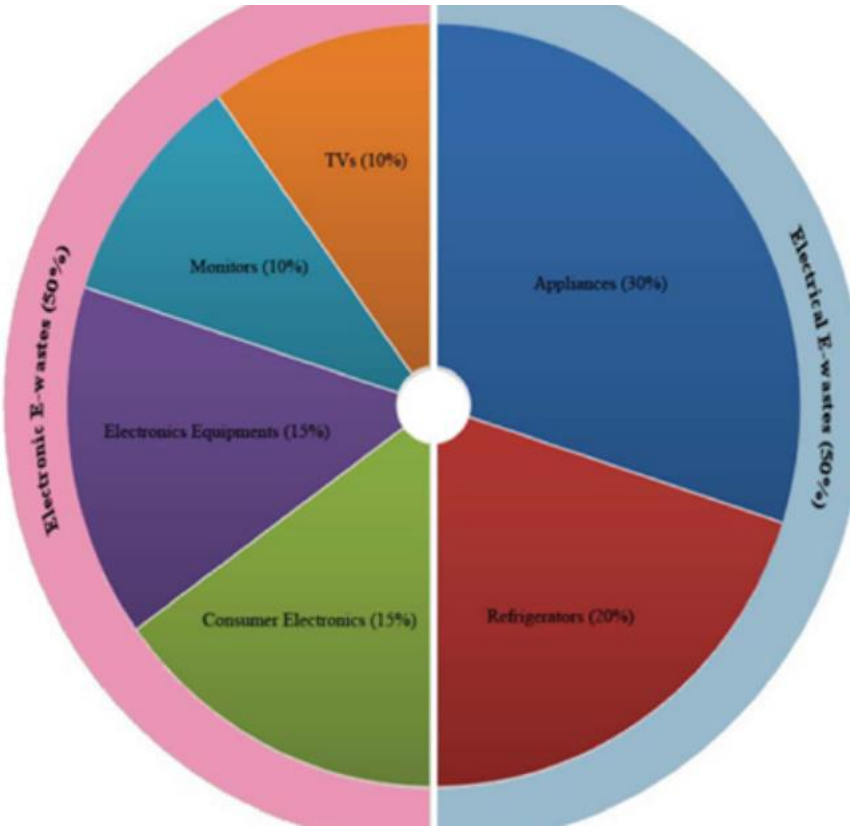
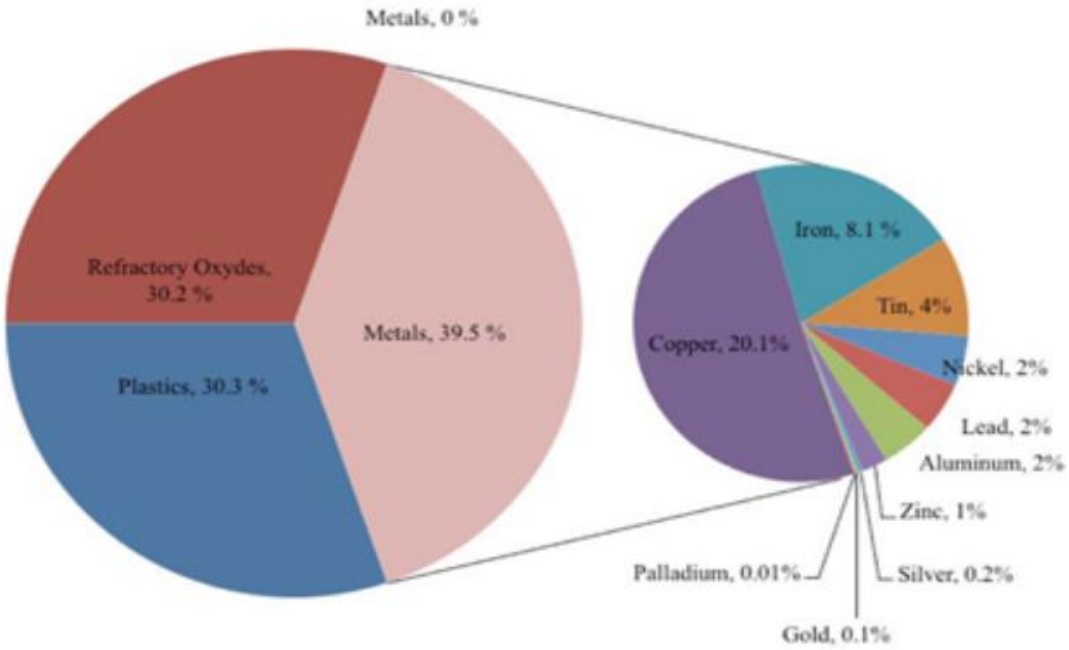


Figure 2



E-waste Generation Globally

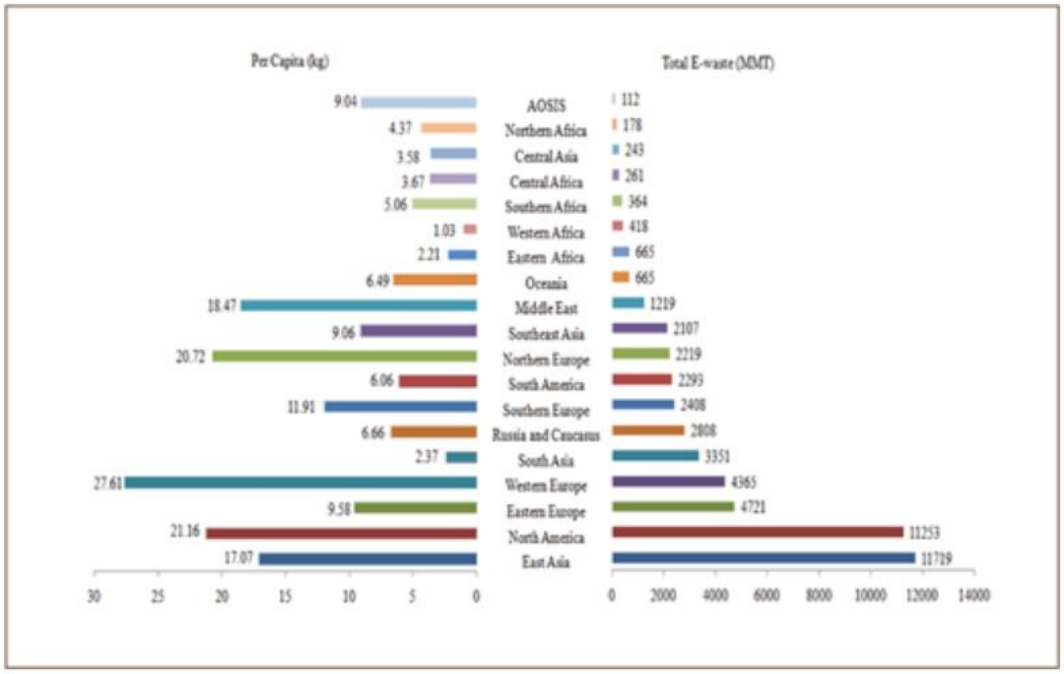
Industrialized and developed nations are the main producers of e-waste. According to the USEPA, the US is the largest e-waste producer in the world today, generating 3.16 million tons in 2008.3 In

addition, 5 million tons were in storage with 2.37 million tons ready for disposal in 2009, and that represents a 120% increase from 1999. The EU generated 8.9 million tons in 2010 and that rate is increasing by 3–5% yearly,and is projected to be 12 million tons by 2020.6,23 The rapidly increasing trend of e-waste production is rising in the biggest and fastest growing economies such as China and India. China is ranked second after the US and generated 2.3 million tons of e-waste in 2010 and is predicted to have a surplus by 2020.24,25 In addition, India generated 400,000 tons in 2011.26

The European Union is also considered to be one of the biggest producers of e-waste. In 2010, the EU produced 8.9 million tons of e-waste.27 This comprised 1–3% of the total MSW in the US, a 16–28% increase every five years, which is 3-times faster than MSW generation. A recent study found that annually, 5 to 7 million tons of e-waste is generated in the EU with a per capita of 14–15 kg and is expected to increase at a 3 to 5% annual growth rate.8

The analysis based on the Solving the E-waste Problem (StEP) database found that a total of 51.37 million metric tons (MMT) of e-waste was generated globally in 2012.28 Among the different regions, East Asian countries are foremost (22.81%) in both total (11.72 MMT) and per capita (17.07 kg) generation, of which China (7.25 MMT) and Japan (2.74 MMT) were the major contributors. The rest of the Asian regions were also significant contributors of WEEE sources. North American countries, the USA (9.36 MMT), Canada (0.86 MMT) and Mexico (1.03 MMT), were in second position in terms of both contiguous (21.91%) and per capita (21.16 kg) generation. Europe as a whole generated 13.71 MMT with an average per capita of 17.45 kg, representing 26.70% of the global total. Oceania and African countries contributed relatively small amounts, and the Alliance of Small Island States' (AOSIS) contribution was smaller in both total and per capita generated.29 The analysis is shown in

Figure 3

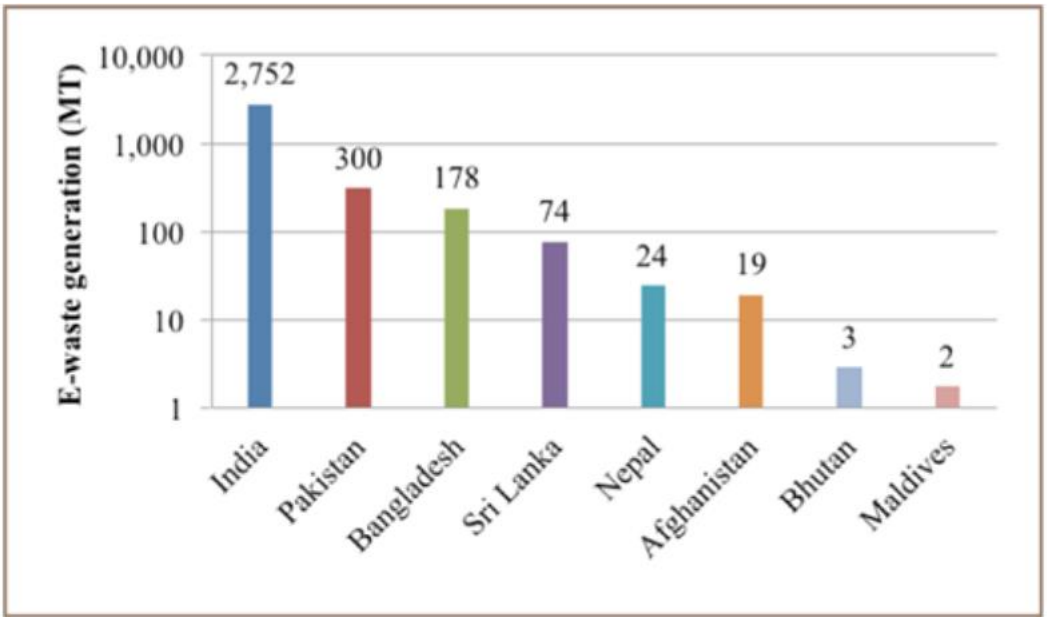


Emerging Markets Case Study: South Asia

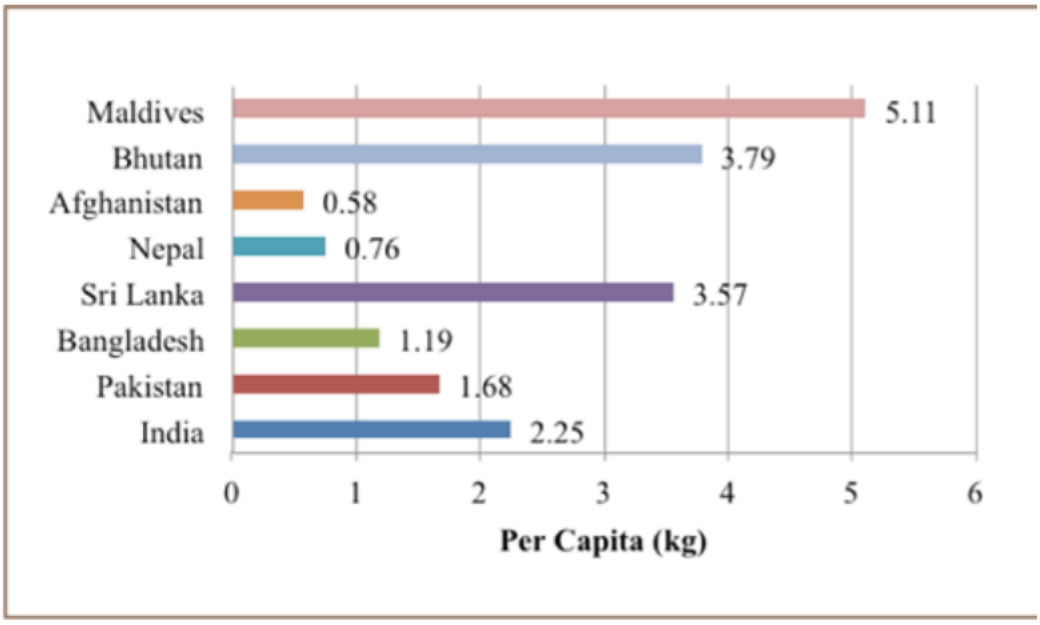
Economic development in South Asian countries has enhanced their industrialization and technological advancement daily. Consequently, the volume of e-waste generated has also been increasing with the importation of lifestyle improvement e-products. Shahriar estimated that Bangladesh generates 2.8 million tons of e-waste every year, out of which 2.5 million tons comes from ship-breaking yards.30

Pervez and Hossain reported that 500,000 PCs were in use in 2004 and increasing at an 11% growth rate per year, and at a rate of 100% for cell phones.31 Consequently, there were 15,323 and 10,504 tons of e-waste generated from PCs and cell phones, respectively, which could be the potential sources of 30,646 tons of e-waste generated in 2013.30,32,33 In addition, India generates e-waste and also imports e-waste from developed countries.34 India is considered to be the second largest e-waste processing country in the world, 70% of which is originated abroad.35 It generates between 146,000–330,000 tons of e-waste yearly and this was expected to rise to 4,700,000 tons by 2011 based on a projected growth of 34% per year.17 In addition, in Sri Lanka, there are about 500,000 mobile phones and these are adding more e-waste to a market that has the potential to generate 60–65 tons annually.9

According to the StEP database, in the context of South Asian countries in 2012, India was the highest e-waste producer (2.75 MMT) within the region.28 Pakistan generated 0.30 MMT and Bangladesh 0.18 MMT. The Maldives was found to be the lowest e-waste producer (1690 MT) with Bhutan (2821 MT) the next lowest producer. E-waste generation volume is shown in Figure 4.



On the other hand, the Maldives was the highest producer of e-waste in terms of per capita production (5.11 kg), although it was in lowest in total volume in this region. Bhutan was in the second position with 3.79 kg and Sri Lanka ranked third, generating 3.57 kg. Furthermore, per capita generations by India, Pakistan and Bangladesh were 2.25, 1.68 and 1.19 kg respectively, in contrast to their total generation. Nepal and Afghanistan were comparatively minor e-waste generators, 0.023 and 0.018 MMT, and per capita, 0.76 and 0.58 kg, respectively (Figure 5).



Impacts of E-waste

Electrical and electronic goods contain a variety of metals, many of which are toxic to humans and ecosystems. More than 60% of e-waste consists of these different metal ions and about 2.7% are toxic metals.4 The proper management (collecting, storage, recycling, disposing) of these wastes is important because of hazardous chemicals in the waste such as aluminum (Al), arsenic (As), bismuth (Bi), cadmium (Cd), chromium (Cr), mercury (Hg), nickel (Ni), lead (Pb) and antimony (Sb). Furthermore, the combustion of these e-wastes releases polycyclic aromatic hydrocarbons (PAH), brominated flame retardants (BFRs), poly-brominated diphenyl ethers (PBDEs), polychlorinated biphenyls (PCBs) and polychlorinated dibenzop-dioxins and furans (PCDD/Fs) gases that effect some or all bio-physical environments (soil, atmosphere, aquatic). Consequently, these releases adversely affect the surroundings and cause detrimental effects to human health.36,37 Brigden and Labunska found that PBDEs and PBDD/Fs contaminate the surrounding soil, air and water causing a depletion of fertility and water quality, as well as acting as neuro-toxicants and endocrine disruptors in infants and children.38,17 These toxic chemical compounds and persistent organic pollutants (POP) affect the environment through the ecological food chain and adversely affect human health and ecosystems. Bioaccumulation (i.e., PBCs, BFRs and several chemical elements) in the food chain affects human health, especially in pregnant and breastfeeding women. In addition, they cause endocrine disruption and this, in turn, affects the nervous system, pre- and postnatal development and genotoxicity. Dioxins may alter the methylation status of deoxyribonucleic acid (DNA).2 Furthermore, they also change the serum levels of mothers and newborns and are a potential hazard to maternal health and child development, as well producing hormonal effects by BFRs and thyroid-disrupting effects in developmental life stages.39,40

The adverse impacts of e-waste on humans and ecosystems is also crucial in South Asian countries undergoing rapid economic growth, lifestyle change, socio-technical transition and transformation, which is in complete contrast to their lack of effective waste management tools. For example, in Bangladesh, only between 20% to 30% of the 3.2 MT generated e-waste each year is recycled and the rest is dumped in landfills.41 There are about 120,000 poor urban people involved in the

informal e-waste trade chain in Dhaka, of which 50,000 are children.42,30 The Environment and Social Development Organization(ESDO) report found that the lack of an efficient e-waste management system in Bangladesh was the cause of death for approximately 15% of the illegal child laborers employed in this sector, and 83% were found to be exposed to long term health problems.8 Furthermore, Chowdhury et al. found that 36.3% of 1,000 women living near the informal recycling sites experienced stillbirths in the Sylhet region of Bangladesh and 64% had hearing and/or vision problems.43 In India, more than 1 million poor people are involved in e-waste handling.44 In addition to these statistics, 50,000 tons of e-waste is dumped in landfills annually, ultimately contaminating the Lyari and Arabian Seas and adversely affecting marine ecosystems.17

Pollutant	Occurrence
Arsenic	Semiconductors, diodes, microwaves, LEDs (Light-emitting diodes), solar cells
Barium	Electron tubes, filler for plastic and rubber, lubricant additives
Brominated flame-proofing agent	Casing, circuit boards (plastic), cables and PVC cables
Cadmium	Batteries, pigments, solder, alloys, circuit boards, computer batteries, monitor cathode ray tubes (CRTs)
Chrome	Dyes/pigments, switches, solar
Cobalt	Insulators
Copper	Conducted in cables, copper ribbons, coils, circuitry, pigments
Lead	Lead rechargeable batteries, solar, transistors, lithium batteries, PVC
	(polyvinyl chloride) stabilizers, lasers, LEDs, thermoelectric elements, circuit boards
Liquid crystal	Displays
Lithium	Mobile telephones, photographic equipment, video equipment (batteries)
Mercury	Components in copper machines and steam irons; batteries in clocks and pocket calculators, switches, LCDs
Nickel	Alloys, batteries, relays, semiconductors, pigments
PCBs (polychlorinated biphenyls)	Transformers, capacitors, softening agents for paint, glue, plastic
Selenium	Photoelectric cells, pigments, photocopiers, fax machines
Silver	Capacitors, switches (contacts), batteries, resistors
Zinc	Steel, brass, alloys, disposable and rechargeable batteries, luminous substances

E-Waste & its Negative Effects on the Environment

A few questions to consider: do you still watch movies from a VCR player? More than likely, no. Are you purchasing the latest cell phone every time a new one is released? If you're like almost 50 percent of iPhone users, the answer is probably yes. How many computers have you gone through in

your lifetime? Probably quite a few. Have you recently updated any large house appliances? Maybe, because studies show people are buying new appliances more than ever.

So the real question is: where do all of those obsolete, outdated or non-functioning electronics go?

Electronic waste, also known as e-waste, is any electronic product, or product containing electronic components, that has reached the end of its usable life cycle. Unbeknownst to many consumers, electronics actually contain toxic substances - therefore they must be handled with care when no longer wanted or needed. If a product is outdated, consumers can donate it to someone who might still find it valuable. Many retailers also offer trade-in programs or incentives for people looking to upgrade electronics that require the surrender of an older model; the retailers are able to reuse or repurpose the older models. However, if a product is totally unusable or broken, instead of just being thrown in the garbage, it must be thrown away by a certified e-waste hauler or recycler, or taken to a designated drop-off at a government building, school or organization as e-waste can potentially cause harm to humans, animals and the global environment if disposed of improperly.

The consequences of improper e-waste disposal in landfills or other non-dumping sites pose serious threats to current public health and can pollute ecosystems for generations to come. When electronics are improperly disposed and end up in landfills, toxic chemicals are released, impacting the earth's air, soil, water and ultimately, human health.

The Negative Effects on Air

Contamination in the air occurs when e-waste is informally disposed by dismantling, shredding or melting the materials, releasing dust particles or toxins, such as dioxins, into the environment that cause air pollution and damage respiratory health. E-waste of little value is often burned, but burning also serves a way to get valuable metal from electronics, like copper. Chronic diseases and cancers are at a higher risk to occur when burning e-waste because it also releases fine particles, which can travel thousands of miles, creating numerous negative health risks to humans and animals. Higher value materials, such as gold and silver, are often removed from highly integrated electronics by using acids, desoldering, and other chemicals, which also release fumes in areas where recycling is not regulated properly. The negative effects on air from informal e-waste recycling are most dangerous for those who handle this waste, but the pollution can extend thousands of miles away from recycling sites

The air pollution caused by e-waste impacts some animal species more than others, which may be endangering these species and the biodiversity of certain regions that are chronically polluted. Over time, air pollution can hurt water quality, soil and plant species, creating irreversible damage in ecosystems. For instance, an informal recycling hub in Guiyu, China that was formed by parties interesting in extracting valuable metals from e-waste, and subsequently has caused the region to have extremely high lead levels in the air, which are inhaled and then ingested when returned to water and soil. This can cause disproportionate neurological damage to larger animals, wildlife and humans in the area.

The Negative Effects on Soil

When improper disposal of e-waste in regular landfills or in places where it is dumped illegally, both heavy metals and flame retardants can seep directly from the e-waste into the soil, causing

contamination of underlying groundwater or contamination of crops that may be planted near by or in the area in the future. When the soil is contaminated by heavy metals, the crops become vulnerable to absorbing these toxins, which can cause many illnesses and doesn't allow the farmland to be as productive as possible.

When large particles are released from burning, shredding or dismantling e-waste, they quickly re-deposit to the ground and contaminate the soil as well, due to their size and weight. The amount of soil contaminated depends on a range of factors including temperature, soil type, pH levels and soil composition. These pollutants can remain in the soil for a long period of time and can be harmful to microorganisms in the soil and plants. Ultimately, animals and wildlife relying on nature for survival will end up consuming affected plants, causing internal health problems.

The Negative Effects on Water

After soil contamination, heavy metals from e-waste, such as mercury, lithium, lead and barium, then leak through the earth even further to reach groundwater. When these heavy metals reach groundwater, they eventually make their way into ponds, streams, rivers and lakes. Through these pathways, acidification and toxification are created in the water, which is unsafe for animals, plants and communities even if they are miles away from a recycling site. Clean drinking water becomes problematic to find.

Acidification can kill marine and freshwater organisms, disturb biodiversity and harm ecosystems. If acidification is present in water supplies, it can damage ecosystems to the point where recovery is questionable, if not impossible.

The Negative Effects on Humans

As mentioned, electronic waste contains toxic components that are dangerous to human health, such as mercury, lead, cadmium, polybrominated flame retardants, barium and lithium. The negative health effects of these toxins on humans include brain, heart, liver, kidney and skeletal system damage. It can also considerably affect the nervous and reproductive systems of the human body, leading to disease and birth defects. Improper disposal of e-waste is unbelievably dangerous to the global environment, which is why it is so important to spread awareness on this growing problem and the threatening aftermath. To avoid these toxic effects of e-waste, it is crucial to properly e-cycle, so that items can be recycled, refurbished, resold, or reused. The growing stream of e-waste will only worsen if not educated on the correct measures of disposal.

The environmental impact of the processing of different electronic waste components[79]

E-waste Component	Process Used	Potential Environmental Hazard
Cathode ray tubes (used in TVs, computer monitors, ATM, video cameras, and more)	Breaking and removal of yoke, then dumping	Lead, barium and other heavy metals leaching into the ground water and release of toxic phosphor
Printed circuit board (image behind table – a thin plate on which chips and other electronic components are placed)	De-soldering and removal of computer chips; open burning and acid baths to remove metals after chips are removed.	Air emissions and discharge into rivers of glass dust, tin, lead, brominated dioxin, beryllium cadmium, and mercury
Chips and other gold plated components	Chemical stripping using nitric and hydrochloric acid and burning of chips	PAHs, heavy metals, brominated flame retardants discharged directly into rivers acidifying fish and flora. Tin and lead contamination of surface and groundwater. Air emissions of brominated dioxins, heavy metals, and PAHs
Plastics from printers, keyboards, monitors, etc.	Shredding and low temp melting to be reused	Emissions of brominated dioxins, heavy metals, and hydrocarbons
Computer wires	Open burning and stripping to remove copper	PAHs released into air, water, and soil.

Electronic waste classification

The market has a lot of different types of electrical products. To categorize these products, it is necessary to group them into sensible and practical categories. Classification of the products may even help to determine the process to be used for disposal of the product. Making the classifications, in general, is helping to describe e-waste. Classifications has not defined special details, for example when they do not pose a threat to the environment. On the other hand, classifications should not be too aggregated because of countries differences in interpretation.[115] The UNU-KEYs system closely follows the harmonized statistical (HS) coding. It is an international nomenclature which is an integrated system to allow classify common basis for customs purposes.

Some computer components can be reused in assembling new computer products, while others are reduced to metals that can be reused in applications as varied as construction, flatware, and jewellery. Substances found in large quantities include epoxy resins, fiberglass, PCBs, PVC (polyvinyl chlorides), thermosetting plastics, lead, tin, copper, silicon, beryllium, carbon, iron, and aluminum. Elements found in small amounts include cadmium, mercury, and thallium.[116] Elements found in trace amounts include americium, antimony, arsenic, barium, bismuth, boron, cobalt, europium, gallium, germanium, gold, indium, lithium, manganese, nickel, niobium, palladium, platinum, rhodium, ruthenium, selenium,[117] silver, tantalum, terbium, thorium, titanium, vanadium, and yttrium. Almost all electronics contain lead and tin (as solder) and copper (as wire and printed circuit board tracks), though the use of lead-free solder is now spreading rapidly. The following are ordinary applications:

Hazardous

Generally non-hazardous [edit]

Recycling non-hazardous waste[131]

E-waste component	Process used
Aluminum	Nearly all electronic goods using more than a few watts of power (heatsinks), ICs, electrolytic capacitors.
Copper	Copper wire, printed circuit board tracks, ICs, component leads.
Germanium[117]	1950s–1960s transistorized electronics (bipolar junction transistors).
Gold	Connector plating, primarily in computer equipment.
Lithium	Lithium-ion batteries.
Nickel	Nickel-cadmium batteries.
Silicon	Glass, transistors, ICs, printed circuit boards.
Tin	Solder, coatings on component leads.
Zinc	Plating for steel parts.

March 2019: EPA participated in the launch of the UNIDO-GEF project, "Strengthening of National Initiatives and Enhancement of Regional Cooperation or the Environmentally Sound Management of POPs in Waste of Electronic of Electrical Equipment (WEEE)." With EPA's support, Step developed a tool which will enhance the ability of participating countries to assess how much e-waste is generated, imported and exported.

The meeting took place in San Jose, Costa Rica with participation from the thirteen countries involved in the project, along with experts from around the region and the world.

Cleaning Up Electronic Waste (E-Waste)

EPA works bilaterally with governments and environmental officials around the world on e-waste management. U.S. EPA and Taiwan Environmental Protection Administration (Taiwan EPA) coordinate the International E-Waste Management Network (IEMN), which has brought together environmental officials from Asia, Latin America, the Caribbean, Africa, and North America to exchange best practices on e-waste management since 2011.

EPA efforts support the United States government's National Strategy for Electronics Stewardship, which details the federal government's plan to enhance the management of electronics throughout the product lifecycle.

EPA also collaborates with the to jointly address the e-waste problem in developing countries. Step, formerly known as UNU-Step, was previously an initiative under the United Nations University (UNU). EPA and UNU first signed a cooperative agreement to work together on e-waste in November 2010 and then again in 2015. Some of the work undertaken by UNU-Step included tracking global flows of e-waste, the Person-in-the-Port project in Nigeria, optimization of an e-waste dismantling facility in Ethiopia and the development of a tool to help gather information on volumes of e-waste generated within countries and exported to others. EPA is a founding member of the Step Initiative and serves on the Step Supervisory Committee.

E-waste is one of the fastest-growing waste streams on the planet. Already, we produce something like 50 million tonnes of it each year. And that number's only set to increase as electronics become more accessible worldwide.

So, what is e-waste?

E-waste, or electronic waste, encompasses electrical and electronic equipment that's outdated, unwanted, or broken. That means everything from smartphones to end-of-life refrigerators. Basically, anything that runs on electricity that you've decided to get rid of. Globally, we only recycle 10% of our e-waste, a number that's as shocking as it is depressing. As for the 90% we don't recycle, it ends up getting landfilled, incinerated, or illegally traded.

What makes e-waste so bad?

E-waste contains a laundry list of chemicals that are harmful to people and the environment, like: mercury, lead, beryllium, brominated flame retardants, and cadmium, i.e. stuff that sounds as bad as it is. When electronics are mishandled during disposal, these chemicals end up in our soil, water, and air.

To make matters worse, electronic waste is sometimes illegally exported to countries that don't have laws on handling and disposing of it. Once there, it's dumped. Sometimes, valuable materials are recovered, but often in unsafe working conditions.

What can we do?

Thankfully, lots. By being more mindful about where your e-waste ends up, you can limit how much you produce and the impact it has on the environment.

Reduce: The easiest way to solve the e-waste crisis is to produce less e-waste. I know, easier said than done. Companies are constantly rolling out new products—like Apple, for instance, with its iPhone. Newer products look and function better than their predecessors, but novelty comes at a price. Instead of buying that flashy new gadget, stick to what you've got. Also, by taking care of your electronics you can ensure that they last longer. When you don't have to replace them as often, you end up saving money.

Reuse: Instead of tossing out that old television set or gaming console, consider regifting, selling, or donating it. You could also hold on to it. Who knows, it might end up being worth something someday. Look at the Original Apple 1. It's sold at auction for upwards of $905,000.

Repair: People often throw out and replace broken electronics instead of getting them repaired. True, repairs can be expensive, but for those who aren't afraid of a DIY project, it's a cheap fix. Online resources like iFixit, a website that boasts free repair guides for everything, provide reliable information that'll help you get your tech back in working order. Always remember to be safe, though.

Recycle: As a last resort, you can always recycle your e-waste—just make sure you're doing it correctly! Many communities have e-waste recycling events and drop-off depots that handle these materials. If your city is currently a member of our network, download the Recycle Coach app to find

out how. Organizations like Terra Cycle accept e-waste in the U.S. and Canada. So do some manufactures and retailers, like Apple and Best Buy.

refuse

refuse, also called municipal solid waste, nonhazardous solid waste that requires collection and transport to a processing or disposal site. Refuse includes garbage and rubbish. Garbage is mostly decomposable food waste or yard waste that is highly putrescible, while rubbish is mostly dry material such as glass, paper, cloth, or wood that does not readily decompose. Some forms of rubbish are recyclable, and some municipalities compost yard waste and other garbage on a large scale. Trash is rubbish that includes bulky items such as old refrigerators, couches, or large tree stumps. Trash, especially electronic waste, may require special collection and handling. The sources of refuse include residential, commercial, institutional, and industrial activities. See also solid waste management.

There are mountains of e-waste in China. Some of it is there to be recycled, but most is waiting to be shipped off to e-waste landfills in Africa or other parts of Asia.

While reusing plastic, glass, and metals has become the norm, far less thought is given to recycling electronic items. The term electronic waste refers to any electronic device that is no longer wanted or has become obsolete. Electronics classified as e-waste can either be in perfect working condition or be unusable.

When e-waste is not recycled properly, this leads to the contamination of air, soil and water, which can then eventually affect humans and wildlife. 80% of the world's e-waste is left in this state, while only a mere 20% of it is recycled annually (source).

Think about how many people ditch their old mobile phones for the newer model or how frequently they discard an old TV for a sleeker, more powerful one. Owing to rapidly changing technology, the rise of disposable income, and availability of electronic products, it's no surprise e-waste has become a major concern.

How to Reduce Your E-Waste

Do Something points out that between 20 to 50 million metric tons of e-waste are disposed every year. Unfortunately, only about 12.5% of it is recycled. Even more unfortunate is the fact that most of these consumer electronics can be reused or are in perfect working condition. Most devices such as cell phones, laptops, memory sticks, TVs, tablets and batteries end up in landfills and contribute to air and water pollution.

Minimizing electronic waste is one of the best ways to keep our environment safe. The good news is that it's fairly easy to reduce your e-waste.

Donate or Sell Working Electronics

One simple way to efficiently manage e-waste is to simply sell your working electronics. You may find a buyer via eBay or Craigslist. Many of these buyers will use them, resell them, or use / sell the parts. Otherwise, there are recycling websites and comparison websites that will give you a price for your old gadgets and allow you to send them off, to be repurposed or recycled effectively.

Another great option is Cell Phones for Soldiers. Since 2004 Cell Phones For Soldiers has recycled more than 20 million cell phones, reducing the impact on landfills.

Consume Less

Of the 3 R's (Reduce, Reuse, Recycle) REDUCE is the most important. It's so easy to purchase a sleek TV, the latest mobile phone, or a brand-new laptop. Most people don't even stop to think if they really need them. Before buying anything, ask yourself whether you really need it. If you're buying a new device even though your old one is in good working condition, why not simply upgrade the software? You can repair your old laptop instead of buying a new one. Being a sensible consumer will go a long way in productively managing your household's e-waste.

Use Your Old Mobile Phone for Music or GPS

Most people swap their old phones for a new one every year. Instead of letting it sit in the desk drawer, or worse, throwing it in the trash, consider using it for some other purpose. You can keep it in your car and use it as a GPS device or music player. Old phones can be converted into universal remote controls or used to monitor security cameras.

Recycle via a Retailer

Major retailers and brands have in-store, online, and drop-off site recycling options. They recycle computers, mobile phones, and TVs. In fact, some will allow you to trade your obsolete equipment for gift cards. Before purchasing electronics, ask the store if they have a buyback program. Most large retailers give that option to customers.

Check E-Cycling Centers in Your State

One way to reduce your e-waste is to give all your electronics that can't be donated or resold to free sites. They have local groups that are moderated by local volunteers. Membership is free. Alternatively, you can collect all your e-waste once a month and give them away at an e-cycling center in your state.

Organize Your Electronics

Given the number of electronics we stash away in drawers and cupboards, it's no wonder we forget what items we have in our house. Instead of buying new devices, organize your existing ones to see if you really need to replace them.

For example, you may be in need of a memory stick but after organizing all your electronics, you may discover that you already have an unused one. Try to share gadgets, cords, and connectors with family members rather than buy the same device or charger multiple times.

Know Your State's Laws About Battery Disposal

Rechargeable batteries contain hazardous waste which is why some states have made it illegal to throw them away in the trash. The good news is that these types of batteries contain lead, plastic, and metal which can be easily recycled.

Safely Store Your Data Online

Why use a memory stick or device when you can now easily store significant amounts of data on the Internet? There are many different types of clouds storage available online such as Dropbox and

Google Drive (free). Some of the paid services will provide a free 30-day trial so you can see what will work best for you.

Buy Energy Star Rated Appliances

The Environmental Protection Agency offers an Energy Star Program that gives rebates when you recycle old appliances and buy new Energy Star models. Energy Star appliances are not only environment-friendly but consume less electricity thereby saving money on your electric bill. Next time you purchase a washing machine, refrigerator, microwave or air conditioner, opt for Energy Star models.

Educate Yourself on the Materials Used in Electronics

Last but certainly not the least, research about the raw materials being used to manufacture your mobile phone, dishwasher or laptop. Some raw materials are easy to recycle while others aren't. Gadgets also contain a number of toxic materials. The more you educate yourself, the better you'll be able to purchase items that will not harm the environment in the long term.

Also, remember to wipe the memory on the device and factory reset your mobile before selling, donating, or giving it away. Being more mindful of the electronics we consume and the role we can play in reducing e-waste can go a long way in helping the planet.

CONCLUSION

E-waste recycling is necessary but it should be conducted in a safe and standardized manor. The acceptable risk thresholds for hazardous, secondary e-waste substances should not be different for developing and developed countries. However, the acceptable thresholds should be different for children and adults given the physical differences and pronounced vulnerabilities of children. Improving occupational conditions for all e-waste workers and striving for the eradication of child labor is non-negotiable.

Ewaste is is a relatively new segment in the global problem of waste removal. It is also the fastest growing segment worldwide in discarded waste. This growing problem in the world is largely ignored or misunderstood. Many people do not understand what it is or how it affects them, the world, or the environment. So the question "What is ewaste" needs to be addressed before any solutions can be effective. Ewaste comes from the improper disposal of any number of electronic devices. These devices include computers, televisions, cell phones, or most other electronic equipment. Consumers in developed nations are quick to replace their devices because of continuous technological advances. This upgrading leads to an excess of unused electronic devices. What is done with old computers and phones is what is contributing to the ewaste problem. Some people understand the importance of properly disposing of these old units, but many more still throw them in the garbage or incinerators.

Most developed nations in the world have laws and regulations requiring that ewaste not be disposed of in landfills or be incinerated. Cities and states have set up programs accross the United States where consumers can drop off used electronic devices to be properly disposed of. The best method of disposal is to recycle this equipment. Many people do not understand that the parts in old devices can be reused in new products. There is a popular mantra used by many recylcing

advocates, "Reduce, Reuse, and Recycle." This slogan has widely been promoted with plastics and glass, but its message is also applicable to the disposal of ewaste. Many electronic stores offer services to help customers bring in old electronics or parts so as to dispose of them safely and properly.

Unfortunately, there is another alternative being used for the removal of ewaste in the world. Much of the ewaste in developing nations is being exported to developing countries. Many developed countries have enacted laws to prevent this from happening, but ewaste is still often being exported. The bulk of the world's ewaste is being shipped to Nigeria, Ghana, Pakistan, India, and China, among others. While it seems odd that a country would willingly import another's waste, the waste is imported, sometimes illegally. This practice provides jobs and valuable scraps. Ewaste is a source of valuable metals such as gold, nickel, copper, iron, and silicon. The countries that are receiving this ewaste have lax laws protecting their workers or the environment. Many of the workers are children, or are working countless hours each day. There is also the reality that much of the refuse from electronic devices is hazardous. The dumping of these materials following the harvesting of scrap can lead to contamination of soil or water, damaging an area's environment and potentially their food sources.

The purpose of this webquest was to alert students and make them aware of the problem. Tons and tons of ewaste is dumped each year and the problems continues to grow. The tasks we have assigned are intended to increase awareness of this global situation and encourage students to research not only the problem, but potential solutions. The numbers are mind blowing and awareness is a good way to begin resolving or attending to the problem

Recycling electronic waste has many costs and benefits. The benefits that we willreceive as a community will outweigh the costs vastly. From the benefits that arehighlighted we see that recycling electronic waste prolongs the availability of scarenatural resources for future generations, recycling also limits potentially dangerouschemicals from entering the ecological system, and lastly recycling electronic wastereduces the carbon footprint and pollution. These are very important benefits that willhelp out the environment and future generations substantially.By making the right decisions as stewards of the earth we need to conserve thesematerials and keep them from harming the environment by disposing of them properly.This would make the world and more enjoyable and cleaner place to live for all those init. Since electronic waste is one of the most rapidly growing issues throughout the worldand many people do not fully understand the consequences of it and the problems it couldcause for future generations it has the potential to be a large issue. The EnvironmentalProtection Agency did a study that predicted that seventy percent of the heavy metals andforty percent of the lead that is now in U.S. landfills is from electronic waste (O'Brien17). This number is just going to keep growing if something is not done soon to stop theamount of electronics that are being sent to landfills.Technology is a growing industry that virtually has no limits of what newproducts and electronics can be produced. The limiting factor of this technology is theprecious metals that are essential in production. When these metals used withinelectronics are recycled we see that for eighteen of them, efficiency is greater than fiftypercent which means that we get almost half of all metals recycled back to be reused(Saphores, Ogunseitan, and Shapiro 50). This also cuts down on the amount of metal that

Reference

- Mygov.in
- WWW.MIETY.GOV.IN
- IMAGES (FROM VARIOUS WEBSITES ON GOOGLE)
- WWW.EPA.GO
- WWW.ROADRUNNERWM.COM
- WWW.NITLIE.COM
- WIKIPEDIA
- STATICFACT.COM