Committee: Environment Sub-Commission 2

Issue: Addressing the e-waste challenge through an interdisciplinary approach

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INTRODUCTION

Electronic waste, additionally called e-waste, is portrayed as types of electrical and electronic equipment that have ceased to be of significant value to their users and/or no longer fulfill their purpose. Electronic waste items have fulfilled their usefulness incentive through excess, substitution, or breakage given that the information age has exponentially expanded the utilization of a new electronic equipment; it has likewise created increasing amounts of e-waste, one of the quickest developing waste streams. Although electronic waste contains complex harmful substances that pose a threat to wellbeing and nature, many items likewise contain recoverable valuable materials, making it an alternative sort of waste in contrast with common waste.

Globally, e-waste comprises in excess of 5 percent of communal material waste and is expanding with the rise in sales of electronic items in various member states. Recycling organizations in these nations face severe environmental **routines**, and a rising cost of waste transfer. Even though a large percentage of electronics is recycled, specifically 40% globally, the majority becomes e-waste. This amounts to a waste of resources and danger due to many toxic substances that can be found in electronic devices, which cause damage to the environment and global health.

In 2016 alone, 44.7 Metric tons (Mt) of e-waste were created; some 1.7 Mt were disregarded among residual waste in More Economically Developed Countries (MEDCs). In general, only 20% of global e-waste is documented so as to be collected and thus recycled, this is equivalent to 8.9 Mt of e-waste.

Top chart: Amount of e-waste in Metric tons (Mt) generated globally.
Bottom chart: Amount of e-waste per inhabitant (kg/inh.) generated globally.

Electronic devices that are considered to be e-waste vary from temperature exchange equipment, screens, lamps, large and small equipment to telecommunication equipment. Due to this variety and the danger they may pose to the environment, it is vital to face the issue imminently. Additionally, in 2016 the value of materials that could be found in e-waste was estimated at 55 billion Euros. Concluding, in order to achieve sustainability, there is an imminent need to create policies in order to manage the waste and recycle it safely, especially with the large number of devices modern digital citizenship bring.

DEFINITION OF KEY TERMS

Electronic Waste (e-waste)

Electronic waste or e-waste is characterized by electronic devices that have been discarded. The electronic products are usually discarded due to damage, dysfunction etc. Some examples may include mobile phones, computers, and televisions. It is also referred to as Waste Electrical and Electronic Equipment (WEEE), electronic waste or e-scrap.

Digital Age/Information Age

The Information Age or Digital Age is access to and control of information. Also called the Computer Age and the New Media Age, it is closely correlated with the use and ownership of personal computers and electronic devices. Currently, it is rapidly increasing as most information is transmitted and received through a digital form.

Interdisciplinary

Interdisciplinary refers to matters relating to more than one branch of knowledge. An interdisciplinary approach involves finding relating information from different multiple academic perspectives and different fields of expertise.

Planned Obsolescence

Planned obsolescence is a strategy that ensures that the created version of a product will, within a specific known time period, cease to be used. It guarantees future consumerism as people will seek replacements, thus increasing demand. It is achievable by creating replacements that are more effective, or by designing products to dysfunction intentionally, within a specific time frame.

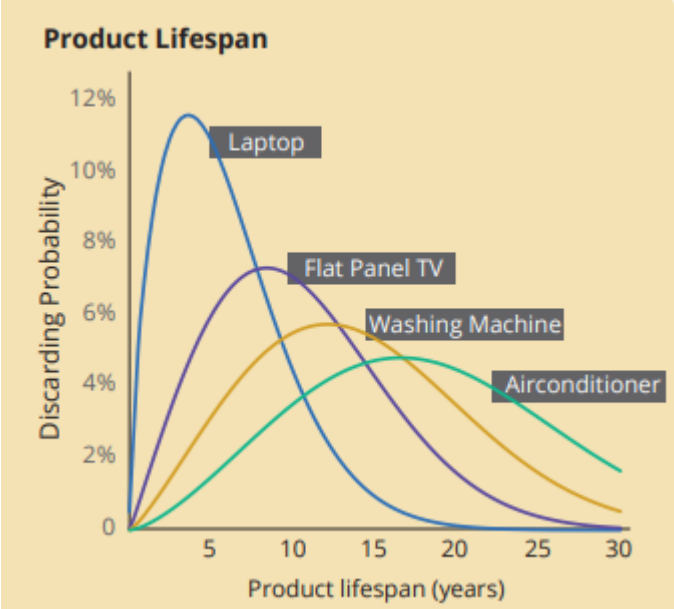

Chart depicting the discarding probability percentage of products per lifespan in years.

Biodegradable

Biodegradable refers to a substance or object that is capable of being decomposed by bacteria or other living organisms and thereby avoiding pollution. A biodegradable object can degrade on its own with the help of the environment and does not cause the release of hazardous materials.

BACKGROUND INFORMATION

Sustainable Development Goals

The 17 Sustainable Development Goals from the 2030 UN Agenda and their respective logos

The issue of e-waste seems to be closely correlated with numerous Sustainable Development Goals (SDGs) and targets included in the 2030 UN Agenda for Sustainable Development. In September 2015, the United Nations adopted the 2030 Agenda that included 17 SDGs and 169 targets to protect the planet and ensure prosperity. The increasing levels of e-waste create immense challenges to the environment and human health, and specifically to the achievement of the SGDs. The topic of e-waste can be closely correlated with goals 3, 6, 11, 12:

Target 3.9 aims to reduce the deaths and ailments caused by dangerous chemicals and pollution, which in this case is caused by e-waste.

Target 6.3 also tries to reduce pollution, but also seeks to eliminate dumping, and reduce the amount of hazardous materials disposed of.

Target 11.6 aims to reduce the per capita environmental hazard of urban areas by closely concentrating on air pollution and waste management as e-waste is being generated in cities. It is of great importance to manage electronic waste in urban areas, improve recycling, and reduce the amount of waste that gets thrown away.

Target 12.4 seeks to manage chemicals and waste and significantly reduce their release into air, water, and soil. Target 12.5 seeks to reduce waste generation as it is vital to make production and consumption more sustainable.

Additionally, SDGs 13, 14 and 15 are closely related to the topic of e-waste and uniquely try to tackle the issue. The 2030 Agenda for Sustainable Development sets the perfect example for an interdisciplinary approach to the matter of electronic waste; however, the cooperation of Member States is imperative in order to bring a halt to the rising issue.

Environmental Impacts

It is a known fact that most electronic items contain hazardous materials such as lead, zinc, nickel, flame retardants, barium, and chromium, which constitute great threats to the environment. When electronic waste is burnt, chemicals are released into the air and thus damage the atmosphere, one of the biggest environmental impacts of e-waste. The environment is exposed to dangerous substances especially with unsafe recycling techniques, such as in the extraction of copper. Electronic waste is often exported to LEDCs where improper recycling techniques, such as acid leaching and cable burning, recover valuable metals.

Another consequence of the unsound disposal of toxic metals and substances occurs when materials enter the soil-crop-food pathway. Since the chemicals that are disposed of do not biodegrade and, thus, reside in the environment for a long time, the risk of harmful exposure increases.

When electronic waste is thrown into landfills, hazardous materials seep into the ground and water. Moreover, when electronics containing metals such as lead, barium, lithium, are improperly disposed of, they pass into the soil and reach groundwater channels which surface as streams or small ponds of water. The chemicals often result in the death of some plants and animals, and lead to poisoning. Local resources are heavily affected when electronic and electrical goods are thrown into landfills as toxins leach into the soil and water.

Global Health Impacts

A child placed in a hazardous amount of dumped electronic waste and cables.

Electronic waste causes a large number of health risks resulting from contact with dangerous materials, inhalation of generated fumes and/or consumption of chemicals through soil, water and food. Additionally, if processed, e-waste can result in a rise in toxic products which are likely to have severe consequences on global health. Furthermore, improper recycling techniques increase the potential risk of injury and exposure to dangerous chemicals. Children are in need of special care and protection due to their vulnerability to health risks from e-waste exposure and improper care.

Dangers posed to the environment consequently have impacts on human beings; birth defects, brain, heart, liver, kidney and skeletal system damage. Furthermore, they greatly affect the human nervous and reproductive systems. Finally, when e-waste is burnt, cancer generating dioxins and fumes are produced which are released into the air and atmosphere, causing very dangerous living conditions.

Causes

Higher mobile-cellular demand

In the new digitalized era, where digital citizenship is a very common aspect of most societies, mobile-cellular and broadband networks have seen a rapid increase and allow a higher access to cellular and internet access for rural and remote areas. Almost half of the world population -around 3.6 billion people - uses the Internet and 7.7 billion mobile and cellular subscriptions are predicted. The United Nations Conference on Trade and Development (UNCTAD) estimated that in 2015, in the EU, 40% of large enterprises were receiving orders over the Internet, showing the urbanization of rural areas and demand for electronic devices. Furthermore, the consumption of Electrical and Electronic Engineering (EEE) has also shown rapid growth from 2000 to 2016. Consequently, since there is a higher demand for electronic and cellular devices, there is a high increase in the production of these products that constitute e-waste.

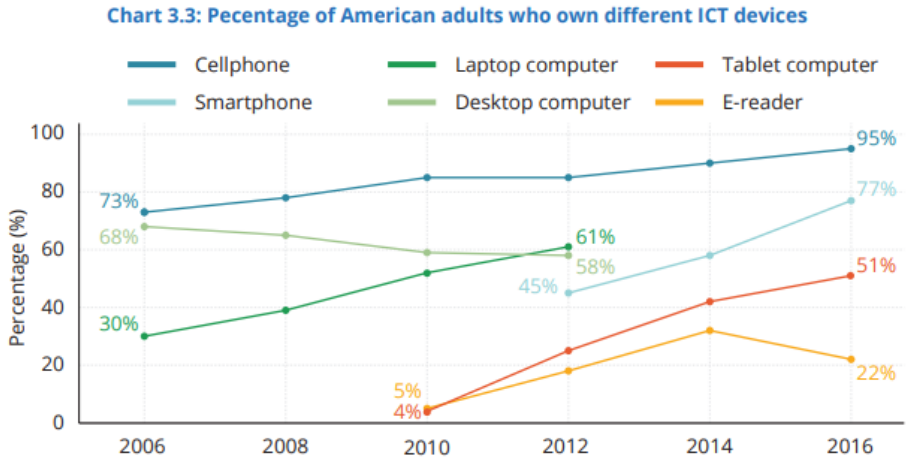

Chart depicting the increase of ownership of ICT devices in the USA during the period of 2000-2016.

Planned obsolescence

A common factor that results in the disposal of electronic items and e-waste is planned obsolescence. In recent years, technologies have begun to become more obsolete

and the decline of sales of certain items has been reported due to old technology being replaced by new and more efficient technology. Furthermore, obsolete equipment is further increased due to short replacement cycles, as technologies change quickly and users switch devices. Between 2013 and 2015, smartphone users delayed phone upgrades, thus the average smartphone lifecycle in the USA, China, varied between 18 months to 2 years. In conclusion, e-waste is being produced more regularly due to companies planning the obsolescence of items to generate an increased profit.

Lower Prices

Without a doubt, key factors that are correlated with the spread of EEE and the Internet are competition, technological advances in computing and broadband technologies, and, most importantly, a decrease in the price of electronic items. Basic devices have become more affordable in many countries and prices continue to decrease. Lower handset prices in LEDCs occur due to increased efforts to offer affordable electronic items, such as mobile phones. In pioneering Member States such as the United States and China, prices seem to decrease greatly, which will result in more people being able to afford new equipment, and that more equipment will eventually be discarded, which will increase e-waste.

Common hazardous recycling techniques

When referring to e-waste, the way electronics are recycled is the biggest aspect of how the waste is handled after it have been discarded. Unfortunately, due to a variety of reasons, the materials e-waste consists of are being disposed of in very dangerous and hazardous ways to both human health but also the environment. Some of the most common improper ways electronic waste is being disposed are pyrolysis, acid leaching, cable burning, and more.

Firstly, pyrolysis can be described as a chemical recycling technique that is most commonly used for recycling synthetic polymers, such as nylon and polyester, resulting in gases, oils and chars being produced. Devices are heated to a high temperature so as to melt binding electrical components. Following pyrolysis, metal substances are dumped, as well as other hazardous chemicals, into the air, soil and water. Furthermore, methods, such as hydrometallurgical, use metals and dissolve them in leaching solutions. Following the dissolving of the metals is the electrorefining of desired materials. With this method, materials and chemicals such as nitric acid, sulfuric acid and cyanide solutions are used, which may have consequences on the environment. The major disadvantage of this method, while it is cost effective, is the poisonous chemicals used and it also leaves high dissolved solids.

Other than these methods, there are ways to recycle physically. Mechanically, dismantled pieces are cut into pieces and turned into powder, which can be hazardous due to the high number of chemicals. Finally, the recycling of non-metallic fractions by gasification can occur when the main process generates hydrogen and carbon monoxide, which is very harmful to the environment.

MAJOR COUNTRIES AND ORGANISATIONS INVOLVED

Russia

It was estimated by the Ministry of Natural Resources and Environment of the Russian Federation that nearly 60 million metric tons of municipal solid waste (MSW) is generated annually. With more than 400 kg per capita, the volume of MSW in Russia has seen an increasing rise. The problem is a direct consequence of the government's, the citizens' and waste disposal firms' capabilities to manage waste and, ergo, protect the environment.

United States of America

In 2014, the USA was in the top 10 of the world's worst e-waste offenders as it generated 48.7 lbs. per inhabitant and additionally 6.3 million tons per annum. In the USA, e-waste includes a variety of practices such as managing recycling, as well as programs involving the dumping and shipping of electronic products. Finally, e-waste compromises 2% of the USA's waste in landfills; however, it consists of 70% of its overall toxic waste.

China

China reportedly produces 7.2 million tons per annum annually. China does not only have a high consumption of electrical items, but also imports e-waste to a great extent. Specifically, the city of Guiyu in China consists of a dumping site for 5,500 businesses which processes discarded electronics. The region recycles and uses 1.5 million pounds of discarded devices every year. The legal system in China is allowing a study into recurring problems in China's e-waste recycling industry, such as the illegal import from MEDCs, the development of unofficial recycling sectors and disposal that impacts the environment and human health.

Norway

Electronic waste collected in Norway since 1999 has sharply risen with more than 147,000 tonnes of E-waste collected in 2011. Annually, a speculated 62.4 lbs. per capita of e-waste is produced in Norway. A record amount of electronic waste was reported in 2014, with a total of 41.8 million tonnes of e-waste. Norway was followed closely by Switzerland and Iceland, where 58.0 lbs and 57.3 lbs per capita were disposed of, respectively.

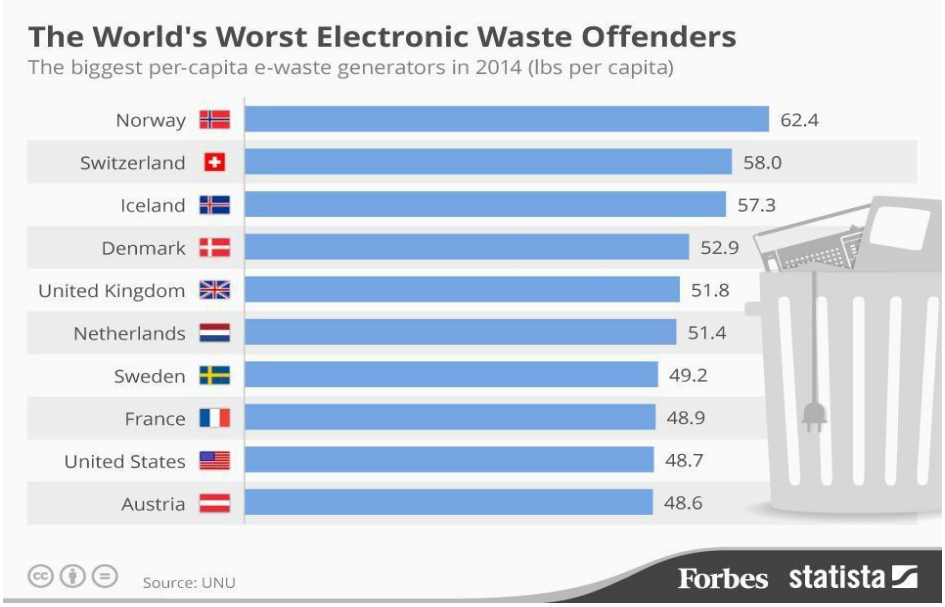

Chart depicting the top ten of the world's worst electronic waste offenders in 2014 by lbs. per capita.

United Kingdom

In Europe alone, the UK is reported to be illegally exporting more toxic electronic waste to Less Economically Developed Countries (LEDCs) than any other Member. Investigations by the environmental watchdog, the Basel Action Network (BAN), placed GPS trackers on EEE units in recycling facilities and was thus able to report exports to countries such as Ghana, Nigeria, Pakistan, Tanzania, Thailand and the Ukraine.

Nigeria

A towering mountain of waste is generated in Lagos, formerly Nigeria's capital. While it is one of Africa's fastest growing economies and it is most populated urban centre with 21 million residents, it simultaneously has pilling amounts of e-waste, which is highly dangerous. Annually, nearly 18,300 metric tonnes of used EEE end up in Lagos through shipping containers from Germany, the UK and Belgium, according to a UN study. Also, the USA contributes 20% to its EEE importation figures.

United Nations Environment (UNE)

The United Nations Environment programme has a very important role in both normative and operational aspects; its aim is to tackle the various stages of EEE and to apply this role all over the world. With this interdisciplinary approach, the UN Environment guarantees to link the UN system with governments by providing the necessary assistance to each Member State. The United Nations Environment Programme, as well the Basel Convention, World Resources Forum and the European Multiple MOOC Aggregator, is launching a Massive On-line Open Course (MOOC) on "e-waste". Its goal will be to help understand why and how electronic waste should be managed safely for the environment and what action on the issue can be taken on a more personal level. The UNE tries to transmit a message upon the sound management of e-waste and the positive effects it can have on the environment in accordance with the Basel, Rotterdam, and Stockholm Conventions. It does so by sharing practices and technological advances that are innovative in the specific sector, explore how e-waste value can be manipulated so as to support local economies and protect people's health and the environment.

International Solid Waste Association (ISWA)

The ISWA believes that there is a rapid transition to a digital world, or citizenship, where most duties are completed automatically by machines. It considers e-waste "the most emblematic by-product of this transition". One of the prime initiatives of the ISWA is arresting e-waste by utilizing technological advances and creating circular economy models. Furthermore, it launched the Global E-waste Monitor 2017, a collaborative effort involving the United Nations University (UNU), shown through the Sustainable Cycles (SCYCLE) Programme, and the International Telecommunication Union (ITU).

International Telecommunication Union (ITU)

Since there is a high demand for and an increase in the use of electronic products, the ITU aims to protect human health and the environment from the hazardous consequences of the inadequate handling and disposal of these devices. ITU seeks to combat the challenges that derive from e-waste. In general, Information and Communication Technologies (ICTs) offer the opportunity for sustainable development and for combating climate change. ICTs make up a fundamental aspect in the fight to mitigate and adapt to the effects of climate change and manage areas such as energy, waste, and water. However, it is vital to address environmental challenges that the industry presents, as it increases consumption and emission of toxins and raises the amount of e-waste which can cause severe environmental impacts. ITU's objective generally is to maximize the opportunities from ICTs and electronics and wishes to limit the negative impacts that they may cause.

TIMELINE OF EVENTS

Date	Description of Event
1976	Resource Conservation and Recovery Act; principle law in the USA for the disposal of dangerous waste, leading to the dumping of e-waste in LEDCs.
1989	Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal; aims to protect human health.
1990	International Labor Organization (ILO) Convention on Chemicals; concerning safety in the use of chemicals at work.
1991	The first ever e-waste recycling system was developed and installed in Switzerland.
1998	Organization of African Unity adopts motion to declare dumping of e-waste in Africa a crime.
2003	The first US State, California addresses the issue of e-waste by enacting the Electronic Waste Recycling Act.
2006	Nairobi Declaration; environmentally sound management and classification of e-waste.
2007	Electronic Manufacturers Recycling Management Company created by Major electronic corporations; first manufacturer-managed electronic production in the US.

2008	The Libreville Declaration; first conference on health and environment in Africa, which recognised the need for an established framework.
2010	World Health Assembly Resolution (WHA63.25); safe management of waste.
2011	30 leading electronic waste recyclers seek to ensure that e-waste is not being transported to LEDCs / electronics industries kick off nationwide electronics recycling initiative
2015	Paris Climate Agreement under the UN Framework Convention on Climate Change; strengthen global response.
February 2016	United Nations Economic Commission for Europe (UNECE) Secretariat of the Task Force on Waste Statistics; develop a framework for waste statistics.
2016	World Health Assembly Resolution (WHA69.4); health sectors' role on hazardous chemicals and waste.
March 2018	UN Organizations signed a Letter of Intent for coordination and collaboration on the UN support for e-waste management.

UN INVOLVEMENT: RELEVANT RESOLUTIONS, TREATIES AND EVENTS

Paris Climate Agreement (2015) under the United Nations Framework Convention on Climate Change

The Paris Agreement seeks to strengthen the response to climate change threats globally and endorse efforts to limit temperature increases. The agreement aims to strengthen Member States' abilities to combat the impacts of the phenomenon. It refers to sustainable lifestyles and patterns of consumption and production, which is closely related to the responsible collection and disposal of e-waste and its environmental impacts.

UNECE Secretariat of the Task Force on Waste Statistics

Since February 2016, UNECE runs the specific force, established under the auspices of the Conference of European Statisticians. Its main objective is to be able to develop a framework on statistics that concern e-waste. This framework should be considered the basis for a production of statistics on waste in order to be able to help solve problems in waste data collections.

World Health Organisation (WHO)/World Health Assembly Resolutions

Resolution WHA63.25 (2010): On the improvement of global health through sound and environmentally safe waste management.

Resolution WHA69.4 (2016): On the health sector role on toxic substances and waste management and responsible collection.

United Nations Environment Management Group (UNEMG) Issue Management Group on Tackling E-waste

The United Nations System-wide Response to Tackling E-waste shows multiple efforts by the UNEMG, who have had various successful activities in the e-waste spectre. Also, it is highlighted that areas require improving and where there have not been sufficient efforts. The group has the goal to strengthen coordination and promotion of joint initiatives in the UN, in e-waste prevention and environmentally safe management.

PREVIOUS ATTEMPTS TO SOLVE THE ISSUE

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989)

The Basel Convention seeks to improve and protect global health and the environment against the effects of generation, transboundary movement and disposal of waste. The Basel Convention mainly aims to manage, move and minimize waste and waste disposal.

International Labor Organization (ILO) Convention on Chemicals (1990)

The ILO Convention, concerning safety in the use of chemicals in the workplace, seeks to stress the right of workers to information on chemicals in the work environment and impose supplier and employer responsibility to provide information and training. Simultaneously, it sets standards for classification, labeling of chemical safety data sheets, whilst also including procedures for the inclusion of measures.

Nairobi Declaration (2006)

The Nairobi Declaration was adopted by the ninth conference of the parties at the Basel Convention in 2006 and it gave the appropriate mandate to the secretariat of the convention to implement an efficient plan for the safe environmental managing of e-waste. The e-waste work plan consisted of activities in areas such as but not limited to, programs for the management of e-waste in Africa, in Asia Pacific and in South America; the Partnership for Action on Computing Equipment (PACE).

The Libreville Declaration in Africa (2008)

The Libreville Declaration was the first inter-ministerial conference on health and the environment in Africa and it recognized the need for more research of the vulnerability of humans to environmental hazards and also establish policies in order to increase efforts. Additionally, included are factors for bad health which can derive from e-waste.

POSSIBLE SOLUTIONS

Monitoring of e-waste

For organizations and Member States to be able to monitor e-waste at an international level, it is essential to be able to track new developments, set targets and identify policies. Thus, it is essential to develop and collect statistics organized for comparison, so that data is updated, published, etc. Even though e-waste is of growing interest on an international level, there are little to no official statistics, as only 41 countries collect such statistics. Measuring the waste is a highly important step to solve the challenge and statistics will be able to help evaluate developments over time and identify practices for policies. In order for statistics to be collected, it is essential to identify guidelines that will track e-waste, improve regional coverage, etc. Also, a possible solution could be to minimize e-waste generation and stall obsolescence.

Classifications for E-waste

In order to monitor electronic waste, face the challenge and take a step in the right direction it is essential for every product to be classified differently. Electronic devices differ due to their function, environmental relevance, weight, size, and material composition and if taken into account, the categorization of EEE, and thus e-waste, can be grouped. By categorizing electronic items, e-waste disposal and statistical analysis become a lot easier, as they derive from an established and reliable system. EEE could be classified as temperature exchange equipment; screens and monitors; lamps; information technology and more. Additionally, types of e-waste covered by legislation differ from country to country and thus a universal and compliant framework is needed.

Developing Waste Management Infrastructure

In most LEDCs, many people are self-employed and recycle e-waste, usually by buying, reselling, recycling or refurbishing e-waste. This means that domestically generated e-waste is collected, imported and a great amount of e-waste is transported to LEDCs, because they have not developed waste management infrastructure. Methods that are really harmful to the environment and thus human health are being used in these situations. Ergo, it is essential to develop a framework and infrastructure for the environmentally sound management of electronic waste. However, such infrastructure would need direct support and economic funding in order to be developed.

Establishing recycling systems

Undoubtedly and most importantly, it is essential to develop new recycling systems in Member States in order to tackle the e-waste issue. However, when establishing these new systems, it is important to decide upon who will be responsible for retaining the control and operation of the system. It is therefore essential for an entity to be responsible for the coordination of the stakeholders with roles and responsibilities in the system. An entity must also provide that rules are enforced and enforce compliance. Policies and legislation should frame the setting for a recycling system which will be applied globally. Furthermore, illegal dumping and the generation of emissions should be prevented with the help of stakeholders and recycling should be promoted in order to be applied.

Circular economy models

Finally, circular economy models could be adopted in order to encourage closing the loop of materials through the design of components, recycling, reusing, and refurbishing. Through this implementation, environmental pollution could be mitigated. This concept also offers economic opportunities and new employment in e-waste management. For example, the current 55 billion euros of secondary materials previously-mentioned could be taken advantage of and multiplied. Proper legislation needs to be developed to manage e-waste supported by data to show both the environmental and economic benefits.

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