Name of the committee : International Telecommunications Union
Issue: Reducing and managing e-waste in the context of sustainable development
Names of the chairs: Antonio Badilla Olivas, Charles Hermann Gomez, Marit Pauwelyn

Reducing and managing e-waste in the context of sustainable development

Introduction to the committee:

International Telecommunications Union is the United Nations specialized agency for information and communication technologies – ICTs.

The ITU, as we know it today, was the result of the merger between two organizations, the International Telegraphic Union (1865) and the International Radiotelegraph Union (1906). These two organizations united in 1932 to form the International Telecommunications Unions which started to be part of the United Nations system in 1947.[1] Its aim is to facilitate international connectivity in communications networks, allocate global radio spectrum and satellite orbits, develop the technical standards that ensure networks and technologies seamlessly interconnect and to strive to improve access to ICTs to to communities worldwide which are, as yet, without these facilities. Today the organisation is composed of 193 member states and over 800 private-sector entities and academic institutions.

ITU membership represents a cross-section of the global ICT sector, from the world's largest vendors, manufacturers and telecom operators to small, innovative players and SME's (Small and Medium Enterprises) working with new and emerging technologies, along with leading R&D (Research and Development) institutions and academia.

In addition, the ITU was founded on the principle of **international cooperation between governments (Member States) and the private sector (Sector Members, Associates and Academia)**, making ITU the premier global forum through which parties work towards consensus on a wide range of issues affecting the future direction of the ICT industry[2]

[1] "ICAO and the International telecommunication union", *ICAO,* International Civil Aviation Organization, last modified 2017, https://www.icao.int/secretariat/PostalHistory/icao_and_the_international_telecommunication_union.htm
[2] "About", *ITU,* International Telecommunications Union, last modified 2019, https://www.itu.int/en/about/Pages/default.aspx

Issue

1. Introduction to the topic:

Nowadays, more than any time before, people are connecting to the digital society and economy, enjoying the increasing opportunities therein. Alongside greater and faster networks, new applications and services delivered at increasingly high speeds, new opportunities to many people have been given via all sorts of activities in our daily lives. At the same time, the growth in available income worldwide, industrialization in developing countries and urbanization have led to a rapidly expanding demand for electrical and electronic appliances.

Also, waste equipment of this type such as laptopsand phones contain substances highly dangerous to the environment and health if treated inappropriately. This is especially important as most e-waste **is not properly documented and not treated through appropriate recycling chains and methods**. This leads to a waste of valuable resources and a misunderstanding in the current situation. By 2016, the world had generated **44.7 million metric tonnes (an equivalent of almost 4 500 Eiffel towers) of e-waste and only 20% was recycled through appropriate means**. Although 66% of the world's population is covered by e-waste legislation, the current state of affairs suggests that today's efforts are insufficient, and the problem is increasing in size.[3]

1.1 Key words (Definitions)

I. E-waste WEEE (Waste Electrical and Electronic Equipment): this refers to all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intention of re-use. These are classified in six categories: *Temperature Exchange Equipment*, *Screens, monitors and equipment containing screens* having a surface greater than 100 cm^2, *Lamps*, *Large Equipment* (any external dimension more than 50cm), *Small Equipment* (no external dimension more than 50cm), *Small IT & telecommunication equipment* (no external dimension more than 50 cm).[4]

II. ITCs (Information and telecommunication Technologies): refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT), but focuses primarily on communication technologies. [5]

III. Linear Economy: refers to the current system of economic production, in which goods are produced by extracted and prepared raw materials, then sold on the market until their lifetime expires and finally discarded. In this sense, the resources used to make goods in the first place end wasted, and new materials are needed to be extracted and prepared for producing other goods.[6]

IV. Circular Economy: a circular economy is a system in which all materials and components are kept at their highest value at all times, and waste is designed out of the system. That being

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[3] Baldé, C., Forti V., Gray V., Kuehr R., Stegmann P., *E-waste monitor 2017* (Geneva: ITU, 2017), 2, PDF
[4] Ibid,. 11.
[5] "ICT", *Techterms computer dictionary,* TechTerms, last modified 2019, https://techterms.com/definition/ict
[6] "Economía Circular: descubre lo que es antes de que reviente el Planeta", *YouTube,* Why Maps, https://www.youtube.com/watch?v=Lc4-2cVKxp0

said, this model stands in contrast to a linear economy because it is designed to extract the least and re-use the most resources from the already produced goods.[7]

2. Overview of the issue

Since electricity has become available on a large scale around the world, Electric and Electronic Equipment has grown in quantities on the grounds that it performs tasks with more efficiency, helps humans to more easily develop different kinds of work and allows society to be interconnected worldwide. These three elements are related usually to high standards of living and, in this sense, the increase of disposable income around the globe in the last century and especially since the 70s-80s until today[8] has fed a rapid increase in the amount of EEE produced and consumed[9]. Indeed, even when e-waste is an old date problem, nowadays it has become one of the most important and less attended issues globally.

2.1 Global situation

In the last *Global E-Waste Monitor 2017* published by the ITU in collaboration with the United Nations University and the International Solid Waste Association, as mentioned before, it was shown that all the countries in the world combined generated a staggering **44.7 million metric tonnes (Mt), or an equivalent of 6.1 kilogram per inhabitant (kg/inh), of e-waste annually in 2016, compared to the 5.8 kg/inh generated in 2014. This is close to 4,500 Eiffel Towers each year.** In fact, these immense numbers are expected to increase in the next years. It is predicted to increase to **52.2 million metric tonnes, or 6.8 kg/inh, by 2021**, Showing an annual growth rate of 3-4%.[10]

In the next graph the information is presented.

1. Graph. *Global E-Waste*

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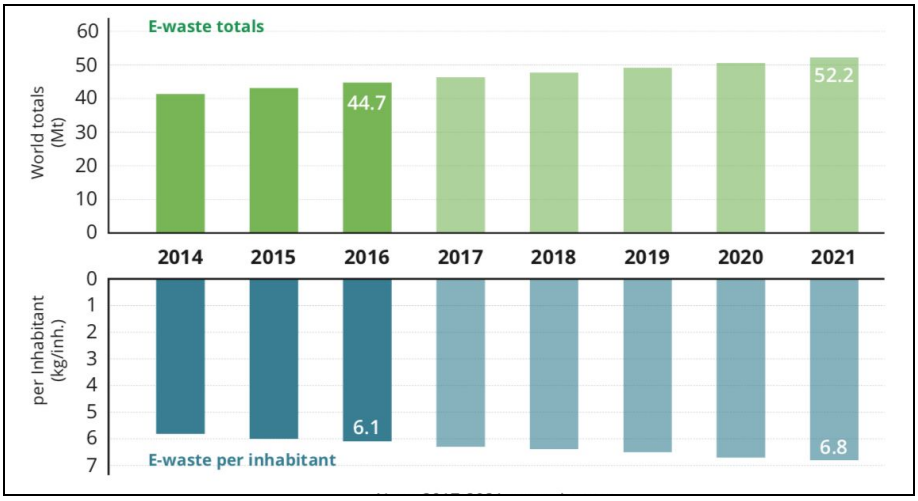
[7] WEF, PACE, *A New Circular Vision for Electronics: time for a global reboot* (Geneva, WEF, 2019), 16, PDF

[8] *"According **to World Bank data**, **global per capita GDP grew by an average of 1.88% annually from 1961 to 2017**. Over this period, the global economy expanded at an average pace of 3.52% annually, while the world's population increased by an average of 1.61% per annum."* "GDP per capita growth (annual %)", *World Bank Data,* World Bank Group, last modified 2018, https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG

[9] Ibid., 4.

[10] Ibid., 38.



Recovered from: Global E-Waste Monitor.

Beside these disquieting figures is the fact previously mentioned, the problem is being left unaddressed. In reality, by 2016 **out of the total 44.7 Mt of E-Waste only 20% (8.9Mt) was properly collected, recycled and documented**, leaving 80%(35.8Mt) undocumented. Out of this, around **4% ended mixed with residual or normal waste and the other 76% has an unknown fate**[11], most probably being dumped in landfill or treated with inappropriate means. This poses a fundamental risk to the environment and human health, because many hazardous materials come inside of this equipment. Typically,these chemicals reach air, water and soil causing profound environmental damage. **Addressing this situation is essential for achieving sustainable development goals due to it direct relation with SDG 3, 6, 8, 11, 12 and 14 mainly.**

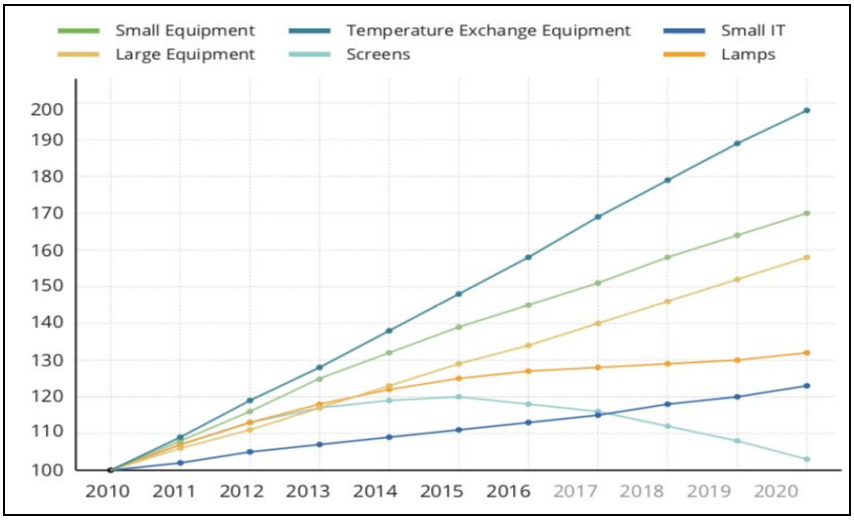
1. Image. *SDG concerned by E-Waste*

Recovered from: Global E-Waste Monitor

Taking into consideration the categories of EEE presented in definition I, following data regarding growth rate of E-Waste is presented.

[11] Ibid., 39.

2. Graph. *E-waste growth rates per category*[12]



Recovered from: Global E-Waste Monitor.

Veritably, the sources of growth in production and dispense of EEE can be listed as follows:

Expanding networks: Today, half of earth's population is covered with internet access connection, and around 80% of this is broadband . Alongside the increase in GDP per capita, more people are rapidly connecting to the internet to develop several kinds of activities, mostly business. Around US$ 22 trillions is the net value of e-commerce. This has led to an increasing need for EEE to supply the demand.[13]

Increase in Gross Domestic Product per capita (GDP per capita): As mentioned before, the annual global growth of GDP since 1964 until today is 3-4% per year. At the same time GDP per capita growth has been around 1.8-2%. As more disposable income comes into the hands of people, more EEE is demanded in the markets, because many devices of EEE are regarded as items for a higher standard of living[14].

Falling Prices of technology and EEE: Each year, as new markets are available with new characteristics of income, developers and manufacturers work for making EEE more affordable in order to enter into new developing markets. This work has had a direct impact on market prices in general, making all sorts of EEE more accessible. [15]

Decrease in the life cycle time of EEE: An Important factor is the change in life time of EEE. Many devices, especially information technologies, such as smartphones and laptops, are decreasing the time in which they should be changed. This reality is led by two factors; one, new state-of-art technologies are appearing more rapidly and therefore new models of devices come

[12] Important to notice the rapid increase in Temperature Exchange Equipment, in **Chair's personal opinion**, this trend is led by the growing temperature around the Globe **caused by Climate Change.**
[13] Ibid., 18.
[14] Ibid., World Bank Group.
[15] Ibid., 19.

out more often onto the market and, two, our system of production is linear, which means that instead of uploading a device, the old one is wasted and a new one is bought.[16]

1. Chart. *Smartphone life cycles by countries, in months, for 2013 - 2015*

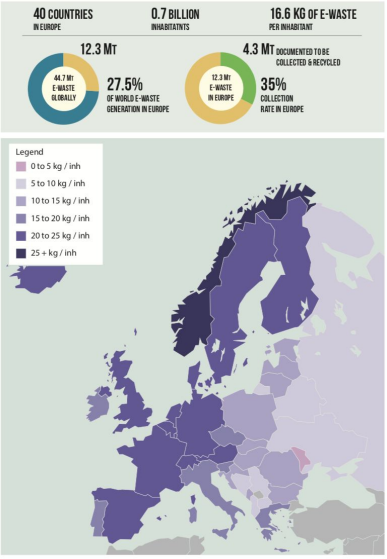
	USA	China	EU5	France	Germany	Great Britain	Italy	Spain
2015	21.6	19.5	20.4	21.6	18.8	23.5	17.7	20.0
2014	20.9	21.8	19.5	19.4	18.2	22.0	18.7	18.2
2013	20.5	18.6	18.3	18.0	17.1	20.0	18.6	16.6

Recovered from: Global E-Waste monitor

Ownership of more devices: as income increases individuals are more likely to acquire extra EEE. Particularly IT devices are owned more, that is, instead of having just a smartphone, people with more purchasing power, have a smartphone, a laptop and a tablet.

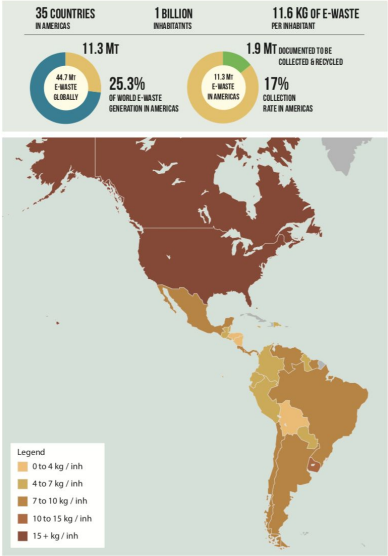
2.2 Study Cases: Regional Situation

3.Graph. *E-Waste in Europe*



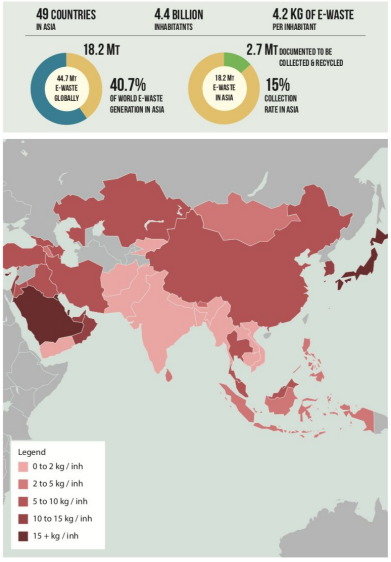
Link to complete map: https://bit.ly/2GRoiFy

4.Graph. *E-Waste in the Americas*



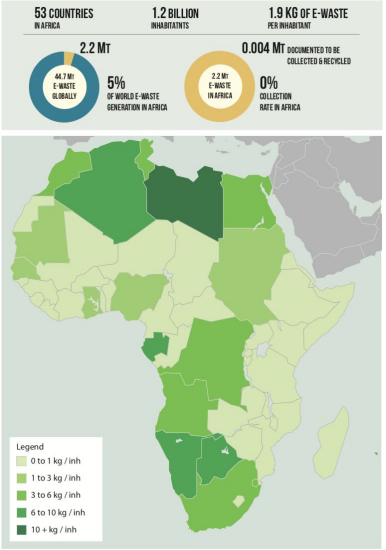
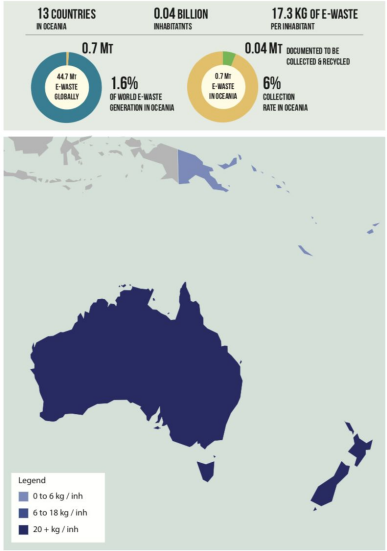
Link to complete map: https://bit.ly/2GUHBB7

5.Graph. *E-Waste in Asia*



Link to complete map: https://bit.ly/2YSxbIa

[16] Ibid., 21.

6.Graph. *E-Waste in Africa*  Link to complete map: https://bit.ly/31ygbZN	**7.Graph.** *E-Waste in Oceania*  Link to complete map: https://bit.ly/31kqmkc	

Europe

Even though Europe has three times less the population of Asia, it is the second biggest generator of E-Waste on the planet, producing in 2016 12.3 Mt (27.5% out of the Global E-Waste). Also, Europe has one of the highest E-Waste generation per inhabitant:individuals in Europe produced on average 16.6 KG per person, less than 1 KG less than Oceania. Nonetheless, Europe has the highest collection rate, documenting and collecting efficiently 35% of E-Waste produced. This high level of collection has been achieved through regional legislation, such as the **European Union EWEE Directive (2012/19/EU)**[17] and by developing management structures allowing processes of the circular economy.[18]

Americas

The Americas produced in 2016 11.3 Mt of E-Waste (25.3% of the Global E-Waste) and with a population of 1 billion people, the average inhabitant E-Waste generation is 11.6 KG. Furthermore, collection and documentation rate is 17%. These numbers must be viewed with care, because America is a region with high disparities. In fact most E-Waste is produced in the northern part of the continent. Just the United States alone generates more than half of the E-Waste produced in the region (6.3 Mt). Collection differs between countries, due to the lack of E-Waste legislation. Today Costa Rica, Colombia, Chile, Bolivia, Ecuador, Mexico, Peru, USA

[17] *European Parliament, DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on waste electrical and electronic equipment,* 197/39, 1-34 (2012). PDF, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:197:0038:0071:en:PDF

[18] Ibid., 72-75.

and Canada have E-Waste legislation (some at national level and other in state-provincial level).[19]

Asia

Asia has most E-Waste generation in the World, accounting for 18.2 Mt (40.7% out of the total E-Waste), but at the same time has the second lowest E-Waste production per inhabitant. On average, one individual in Asia produces 4.6 KG of E-Waste. This region is also filled with disparities between countries with high GDP per capita and low GDP per capita. For example, Japan, Saudia Arabia and the UAE produce 15+ KG of E-Waste per inhabitant, whereas the figure for Viet Nam, Afghanistan and Nepal is just 0-2 KG. Furthermore, it is worth mentioning that China is the biggest producer of E-Waste worldwide, producing 7.2 Mt alone.

Asia as a region plays a key role in E-Waste management due to its population and quickly increasing GDP per capita. In fact, just in China, E-Waste is expected to grow to 27 Mt by 2030. On the other hand, collection rate in the region accounts for 15%, higher in countries like China, Japan and South Korea.[20]

Africa

Africa is the second lowest generator of E-Waste, it produces 2.2 Mt and the lowest per inhabitant (1.9 KG per inhabitant). However, the collection and documentation rate stands at an alarming percentage of 0%. Despite this, the reality is rapidly changing Based on World Bank Data, Africa is the world's fastest-growing continent at 5.6% a year, and GDP is expected to rise by an average of over 6% a year between 2013 and 2023.[21] That being said, the usage of EEE is predicted to grow as disposable income grows, posing a major challenge of E-Waste collection in the region. Today, most E-Waste is treated with informal methods of recycling by individuals who make their living income out of the sale of material found in E-Waste. In many cases, these methods are profoundly dangerous and lack adequate equipment for the job. In other cases, E-Waste ends in large E-Waste graveyards, mostly made out of Ilegal Transboundary movement of E-Waste from developed countries.[22]

1. **Image.** *E-Waste Graveyards in East Africa*

[19] Ibid., 64-66.
[20] Ibid., 68-70.
[21] Ibid., World Bank Group.
[22] Ibid., 60-62.

Recovered From: the New York Times.

Oceania

This region is the lowest generator of E-Waste in the world, producing 0.7 Mt (1.6% out of the Global E-Waste). Likewise, the E-Waste production per Inhabitant is one of the highest, reaching 17.6 KG. Despite the fact that Inhabitant E-Waste production is high, these figures are created mostly in Australia and New Zealand: Australia generated 23.6 kg/inh and New Zealand 20.1 kg/inh. It is also in these countries where the highest regional collection rate is found (7% in Australia), meanwhile in the rest of Oceania collection and documentation rates stand at 0%.

In this regard, the Pacific Islands Sub-region (PICTs) consisting of 22 countries and territories are especially vulnerable, due to its limited connection to the world and finite space, resulting in scarce possibilities for solutions.[23]

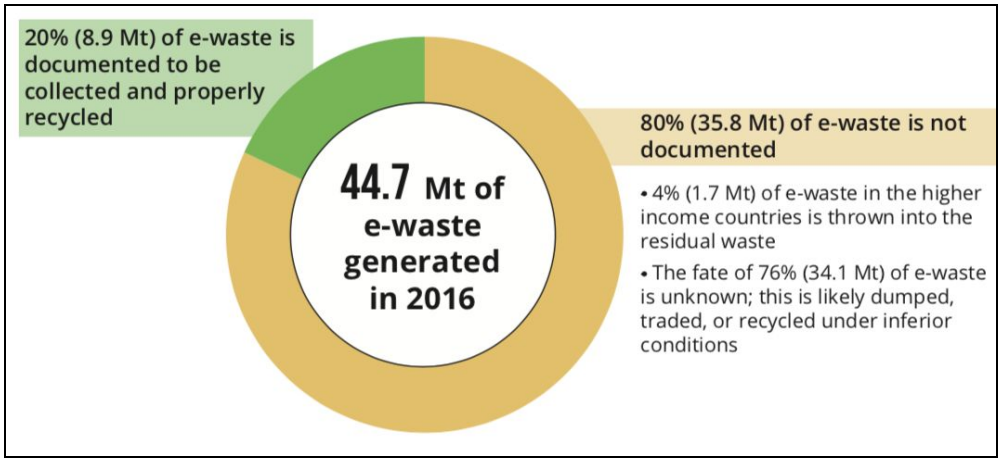
2.3 The problematics surrounding E-Waste

Lack of data and information about E-Waste

One of the biggest and most important problematics with E-Waste today is the lack of information on the topic. Generally, around the world the problematic of E-waste has been ignored and that is what has led to the context in which the world is today. **Just 20% out of the total E-Waste in the world is properly collected and recycled, said in other words, it is uncertain where 80% of Global E-Waste is ending.**

2. Chart. *Collection Methods*

[23] Ibid., 75-73.



Recovered from: Global E-Waste Monitor

This is a sustancial problematic in many ways. First, when E-Waste is not collected and recycled properly the damage it could create is not contained, but also it is not documented, that is to say any data is created. Even when it might not seem like a big problem, it is, because this type of information allows the global community to understand the current state of affairs and to establish politics with which solve it. Likewise, the lack of information and documentation inhibits the development of new markets and industries based upon refurbishing, recycling and collection.

Mostly inappropriate methods and ways of collection

There are three methods by which E-Waste is collected around the world.

1. Official take-back system: E-Waste is collected, under legislation requirements, by designated organizations (public or private). This happens via retailers, municipal collection points, and/or pick-up services. The final destination for the e-waste that is collected is a state-of-the-art treatment facility, which recovers the valuable materials in an environmentally-sound way. This is the ideal scenario, aimed to reduce the environmental impact. Typically also all E-Waste data is collected.[24]

2. Mixed Residual Waste: In this scenario, consumers directly dispose of e-waste through normal dustbins with other types of household waste. As a consequence, disposed of e-waste is then treated with the regular mixed-waste from households. Depending on the region, it can be either sent to a landfill or municipal solid waste incinerator with a low chance of separation prior to its final destination. [25]

3. Collection Outside the Official Take-Back System: This method differs in nature between developed and developing countries. In **countries that have developed waste management laws**, e-waste is collected by individual waste dealers or companies and then traded through various channels. In this scenario, e-waste is often not treated in a specialized recycling facility for e-waste management, and there is the potential for e-waste to be shipped to developing countries. **In most developing countrie**s, there is an enormous number of

[24] Ibid., 32.
[25] Ibid., 32.

self-employed people who are engaged in the collection and recycling of e-waste. They usually work door-to-door to buy e-waste from consumers at home, and then sell it to be refurbished and recycled. These types of informal collection activities provide the basic means for many unskilled workers to make a living. [26] Nonetheless it exposes workers to highly dangerous situation as E-Waste usually contains hazardous material. The inappropriate treatment increases the risk of E-Waste affecting human health and the environment.

As mentioned before, only 20% of Global E-waste is processed by an Official take-Back method. the other 80% is handled or mixed with normal residual waste or in unofficial take-back system, usually lacking correct equipment and facilities to make the most of it. In both scenarios, there are high risks of direct human health impacts and environmental damage due to material inside of E-Waste. Also, dump fills for example leave E-Waste exposed forever allowing chemicals to reach the ground and then leading to filtration of chemicals to underground water sources or to be transported to surrounding spaces as a consequence of natural process of soil washing. Likewise, other scenarios occur when E-Waste is simply thrown to the open ocean with other residual waste, creating gigantic islands made out waste.

Additionally, **there is a great economic dilapidation of valuable resources. It is estimated that 55 billion euros of raw material** are contained in E-Waste and an appropriate system could generate profit from it. From these data it is easy to see the immense lost economic opportunity, an opportunity to create economic development and reduce a gigantic and ignored environmental damage.

E-Waste legislation

Today, 66% of the world population is covered by E-Waste legislation. Even though it is a good signal compared to 44% in 2014, there is a long way ahead. On one hand, there is still 34% of population with any national or regional legislation in regard to E-Waste, and on the other, legislation differs broadly in what to consider E-waste. In general, this causes a gap between data recollected in different countries.

At the same time, in many of these places where legislation has been approved, there exists a disparity amid legislation and its application, a situation that deserves the attention of all sectors around the world. On the other hand, what is less developed in general is the international law regarding E-Waste. Currently only the **Basel Convention ON THE CONTROL OF TRANSBOUNDARY MOVEMENTS OF HAZARDOUS WASTES AND THEIR DISPOSAL**[27] indirectly regulates some transboundary movements of E-Waste due to the composition materials of E-Waste.

Link to percentages of E-Waste Legislation Per Region: shorturl.at/GMU38

Transboundary movement of E-Waste

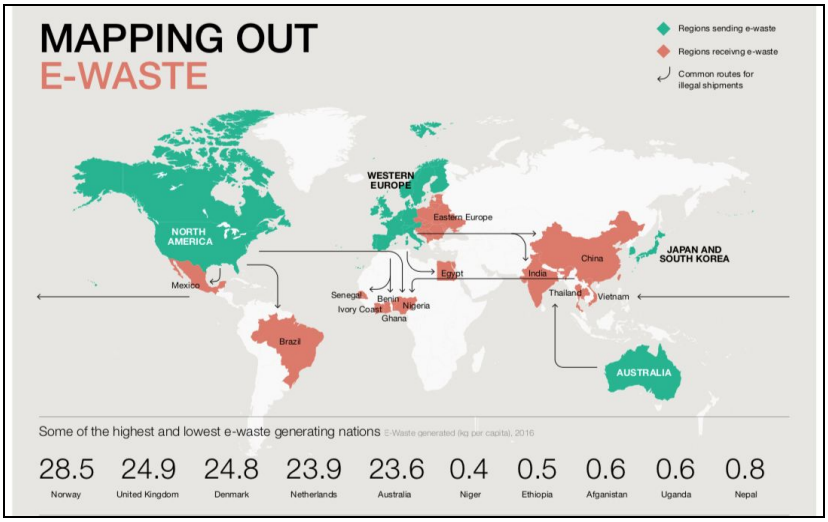
One problematic depicting the raw reality of E-Waste is undoubtedly the Transboundary movement of E-Waste. It also shows the practices of developed countries in regard to their

[26] Ibid., 32.
[27] *UNEP, Basel Convention,* 27/2014, 1-120 (2014), PDF, https://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf

problems and also a context dependency fordeveloping countries. Briefly, many developed countries pay others (mostly developing ones) to receive their E-Waste and treat it. Indeed, under the regulations set by the Basel Convention, t**hese practices are illegal**. But, how do developed countries get round these prohibitions? A two-year study into used EEE sent to Nigeria, **mostly from European ports**, has revealed a continuing severe problem of non-compliance with international and national rules governing such shipments. Limited functionality testing revealed that, of the Used EEE sent to Nigeria from other countries in 2015 and 2016 (assessed at around 60,000 metric tonnes in both years) at least 15,400 tonnes didn't work. The study also revealed that almost 70% (41,500 tonnes) of the UEEE reaching Lagos each year **arrived inside vehicles destined for Nigeria's second hand auto market**, an import route never before thoroughly assessed. Another 18,300 tonnes arrived in shipping containers.[28][29]

These practices should not be only taken as a shame, but also understood in terms of the scale of the problem they represent. As mentioned before, many developing countries do not have an official take-back system and therefore E-Waste is most likely to be treated under inferor conditions or finally disposed in a dump filled with the consequences to human health and environment. It is worth remembering that no matter where any one is or who they are, **problems cannot be exported**.

8. Graph. *Mapping Out E-Waste*



Recovered from: WEF, A New Circular Vision for Electronics

Linear Economy

The problem of E-Waste has one fundamental cause, the current system of production. In the current system (see definition III) the end point is waste. In that way, there is an infinite process of extraction of material and waste of products. Alongside this, life cycles of EEE are decreasing, meaning that waste amounts will increase faster. This system is definitely

[28] Ibid,. 45.

[29] "Thousands of tons of e-waste is shipped illegally to Nigeria inside used vehicles", *physics*, physics.org, last modified 2018, https://phys.org/news/2018-04-thousands-tons-e-waste-shipped-illegally.html

unsustainable, dangerous and expensive.

3. Possible solutions:

Circular Economy

As specified before in definition IV, a circular economy is one in which waste is designed out of the system. Transforming production processes to this model will not only solve entirely the problem, but also add billions of euros to the global economy. In fact, the World Economic Forum estimates that a circular model for EEE could reduce the costs for consumers by 7% by 2030 and 14% by 2040.[30] To do this, the following changes are necessary::

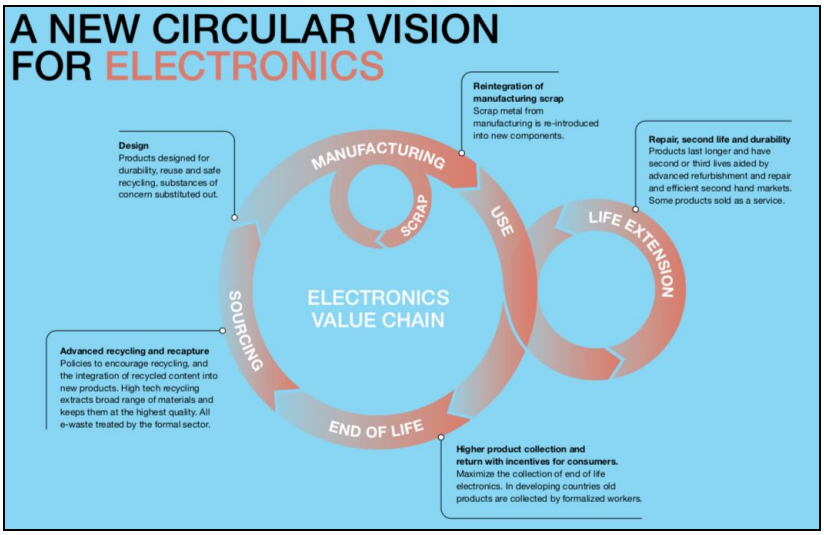
Design: products must be designed for reuse, durability and total recycling. At the same time, life cycles of products should be longer, through uploading instead of replacement until possible.

Official Take-back systems developing: developing a system by which people can return devices to be recycled, repaired or refurbished. To do this systems of Extended Producer Responsibility (EPR) could be developed through legislation. In this system, the producer will have the responsibility for their products throughout its life time, and therefore after.

Urban Mining: Companies and/or government should be incentivised to extract minerals from available E-Waste and reintroduce wasted material into the production cycle.

Reverse Logistics: companies should design systems to re integrate materials easily into their production cycles.[31]

9.Graph. *Circular vision for electronics.*



Recovered from: WEF, A New Vision for Electronics.

Standardize E-Waste definition and measurement in National and International legislation

[30] The World Economic Forum, PACE, *A New Circular Vision for Electronics: Time for a Global Reboot* (Geneva: WEF). 18, PDF

[31] Ibid,. 16-17.

Previously mentioned, legislation varies between the measure and definition of E-Waste. This leads to different treatment and collection of E-Waste worldwide and also to a lack of accurate information of the current situation. Standardizing parameters to collect and document E-Waste will increase the amount of E-Waste covered by legislation and foster the production of precise data available.

Strengthen the application of National and regional Legislation

Even when 66% of the world's population is covered with legislation, there are still places without it. Because of this, it is important to encourage its creation and approval. Likewise, in the countries with legislation it is essential to accelerate the processes of application of their legislation in order to be effective.

Develop International Legislation about E-Waste

In the same way, today the world is lacking international legislation directly addressing the situation of E- Waste. Developing it could be decisive in tackling problems like transboundary movement of E-Waste and in standardizing internationall behaviour in regard to E-Waste.

4. **Main international actors:**

Regions	**Organization**
Asia: biggest producer of E-Waste worldwide and destination for transboundary movement of E-Waste. **Europe:** Highest collection rate, main source of transboundary movement of E-Waste. **Africa:** Lowest collection rate, lowest national legislation rate and destination for transboundary movement of E-Waste. **Oceania:** highest per inhabitant rate of E-Waste generation. **Americas:** high production of E-Waste concentrated in the North of the continent, both in total as well as per inhabitant. Also, north of the continent is source of transboundary movement of E-Waste.	**ITU:** ITU has between its goals resolve the situation with E-Waste. It has done incredible efforts in collection and production of Data about the topic for countries to act. It has also impulsed the creation of the E-Waste coalition. **UNEP:** United Nations Environmental Program is the epicenter of debate and creation of international legislation regarding Environmental issues. The Basel Convention was created from it. **WEF:** World Economic Forum has incentivated research and pilot plans to test and foster models of circular economy around the world. **The E-waste Coalition:** it is a group of seven UN entities that have come together to increase cooperation and more efficiently provide support to Member States and Parties to address the e-waste challenge. The coalition brings together: the International Labour Organization (ILO); the International Telecommunication Union (ITU); the United Nations Environment Programme (UNEP); the United Nations Industrial Development Organization (UNIDO); the United Nations Institute for Training and Research (UNITAR); the United Nations University (UNU), and the Secretariat of the Basel and Stockholm Conventions. It is supported by the World Business Council for Sustainable Development (WBCSD), the World Health Organization (WHO) and the World Economic Forum and coordinated by the Secretariat of the Environment Management

	Group (EMG).

5. Guidelines for research:

The chairs recommend direct research in these areas:
- Trends of Global E-Waste. In this regard, see total report: ITU. (2017). The Global E-waste Monitor 2017: http://bit.do/e4dKQ
- Policy examples of E-Waste around the World. Concerning this, see chapter 5 of: ITU. (2018) Estrategias y políticas para la eliminación o reutilización adecuadas de residuos generados por las telecomunicaciones/TIC: http://bit.do/e4dLA (Available in French, Spanish and English)
- Circular Economy systems. Respecting this see: PACE,WEF, ITU. (2018). A New Circular Vision for Electronics Time for a Global Reboot: http://bit.do/e4dND and WhyMaps. (2018) Economía Circular: descubre lo que es antes de que reviente el Planeta: http://bit.do/e4dNN

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PACE,WEF, ITU. (2018). A New Circular Vision for Electronics Time for a Global Reboot: http://www3.weforum.org/docs/WEF_A_New_Circular_Vision_for_Electronics.pdf
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