eWaste in Latin America

Statistical analysis and policy recommendations

NOVEMBER 2015

UNITED NATIONS UNIVERSITY

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Institute for the Advanced Study of Sustainability

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The **GSMA** represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 250 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and Internet companies, as well as organizations in adjacent industry sectors.

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Executive Summary

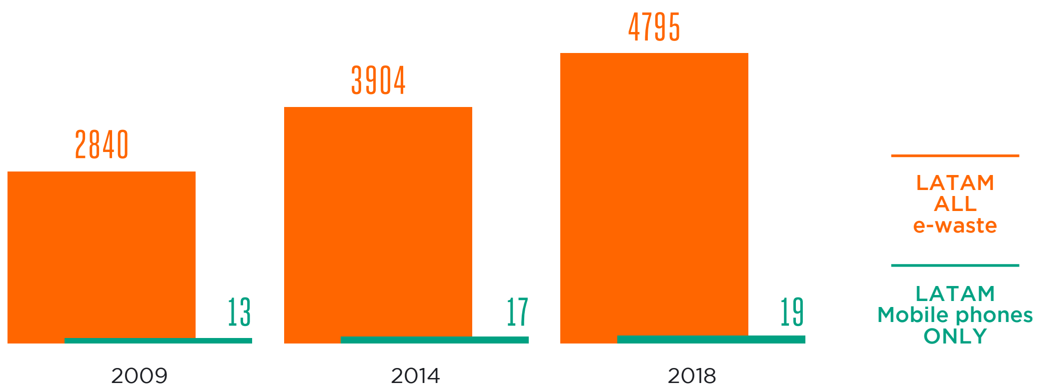
The modern lifestyle of a growing number of people living on the planet increasingly relies on electric and electronic equipment (EEE). The use of modern information and communication technology (ICT) can contribute to achieving some of the Sustainable Development Goals and enable a transition to more efficient resource use, which can engender key societal benefits.

In addition, increased demand for EEE is impacting consumption on a global level. In the case of some metals, such as cobalt and palladium, the mobile phone industry alone consumes more than 10 per cent of the annual global production.

As a result of increased EEE production and use, the amount of discarded electronics (e-waste[1]) is also growing worldwide, reaching more than 40,000 kilotonnes (kt) of electronic products discarded in 2014, nearly 4,000 kt of which occurred in Latin America (LATAM). For mobile phones in particular, nearly 189 kt have been discarded worldwide, of which nearly 17 kt occurred in LATAM. This means that worldwide, e-waste generated from mobile phones represents less than 0.5 per cent of the total weight of the world's e-waste, which is the same proportion for LATAM; ICT equipment, and mobile phones in particular, make up a relatively small segment of global e-waste.

Figure 1

Total e-waste arising and waste from mobile phones (kt) in LATAM



When looking at the expected growth rate, the average year-to-year growth of e-waste appears to be higher in LATAM compared to the global average. The amount of the region's e-waste is expected to increase to 4,800 kt in 2018. This is a growth of 70 per cent compared to 2009, whereas e-waste is projected to grow globally by only 55 per cent. Annual growth rate expected from now till 2018 will decline from 7 per cent in 2012 to 5 per cent in 2018 in Latin America.

Four main elements need to be considered when analysing the challenges of e-waste management: E-waste often contains materials that are considered toxic, which are potentially harmful to environmental and human health. This may also impacts lives of children in many countries, as they could be exposed to e-waste-derived chemicals in their

[1] IN THIS DOCUMENT, "E-WASTE" IS USED AS A GENERAL TERM TO INCLUDE ALL APPLIANCES DISCARDED: BOTH WASTE AND DISCARDED ELECTRONIC EQUIPMENT WITH POTENTIAL FOR REUSE. THE DISTINCTION BETWEEN EQUIPMENT DESTINED FOR DISPOSAL OR RECYCLING AND EQUIPMENT INTENDED FOR REUSE IS IMPORTANT, ESPECIALLY IN REGARD TO EXPORT, AND THIS IS A MATTER OF ON GOING DISCUSSION AMONG PARTIES TO THE BASEL CONVENTION.

daily life due to unsafe recycling activities that are often conducted in the home, either by family members or the children themselves. Furthermore, children may be exposed through dumpsites located close to their homes, schools and play areas.

In addition, evidence and studies are also showing the effects on fetuses that may already be exposed via their mothers. E-waste contains valuable and scarce materials, and recovery of these materials as secondary resources can alleviate some mining of virgin materials.

In some cases, the costs of proper collection and recycling of e-waste may exceed the revenues generated from the recovered materials. This is primarily due to the complexity of product design and the difficulty of separating highly commingled materials.

Extending equipment lifetime could be preferable from a life cycle perspective for some products. This could lower the ecological footprint through less production and also make products available for segments of the population that cannot afford brand new products.

Only a few LATAM countries have specific bills on e-waste management in place. In the majority of cases, e-waste management is regulated under general hazardous waste legislation, and specific policy bills or technical guidelines are currently being discussed, going through the legislative process or being implemented.

Basic waste management and recycling infrastructures exist, mainly linked to metal scrap processing, but individual and specific e-waste processing facility development is expected to grow in the coming years.

In many countries, pre-processing facilities are still relying mainly on manual dismantling. End-processing or disposal options for some of the critical fractions that result from e-waste processing are missing, and thus the majority of fractions are either exported or processed with rudimentary techniques that result in low yield, or they are disposed of.

From a strategic perspective, key principles should guide development of policies on e-waste and tackling mobile phone collection and treatment, in particular:
Adequate and targeted awareness campaigns need to be created by public authorities, with support from manufacturers, service providers, retailers and municipalities to inform consumers about their fundamental role in the recycling chain; appliances kept at home even when not used are holding back natural resources from potential recycling processes, and improper disposal of e-waste (especially mobile phones) with unsorted municipal waster or other metal scrap may prevent the opportunity to properly recover critical materials forever.

Securing reliable access to raw materials has become a critical challenge to ensure the production and supply of these products and functionalities for a growing number of people on the planet.

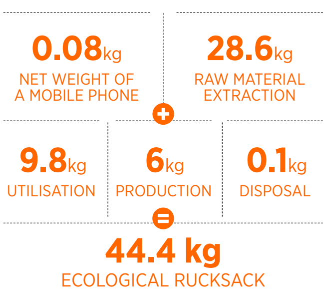
One of the primary elements to ensure future access to key metals is to enable effectiveness through the recycling chain; products must not only be collected, but also recycled, keeping in mind the effectiveness of various processes, particularly for key metals.
Separate collection of mobile phones is the first, fundamental step in the recycling chain. But societal benefits of e-waste (especially mobile phone) recycling can be achieved only if all e-waste collected is channelled to the best treatment options.

Efficiency in the recovery process is particularly important for metals that are extensively used in modern electronics. The intrinsic economic potential and the environmental benefits of recycling can be achieved only when efficiency is maximised across all steps of the recycling chain.
This report aims to identify the main challenges related to proper e-waste management, especiallly in the context of Latin America, with a particular focus on the opportunities linked to mobile phone collection and recycling.
The unique challenges of mobile phone collection and recycling, from a societal perspective, are discussed in the report.

Use of resources along lifecycle of a mobile phone

The total resource use of a product during all life cycle phases can be presented as the “ecological rucksack” of a product. This scientific concept summarises all the resources used for each life cycle phase of a product – from resource extraction to disposal – and quantifies the complete resource use of the respective product.

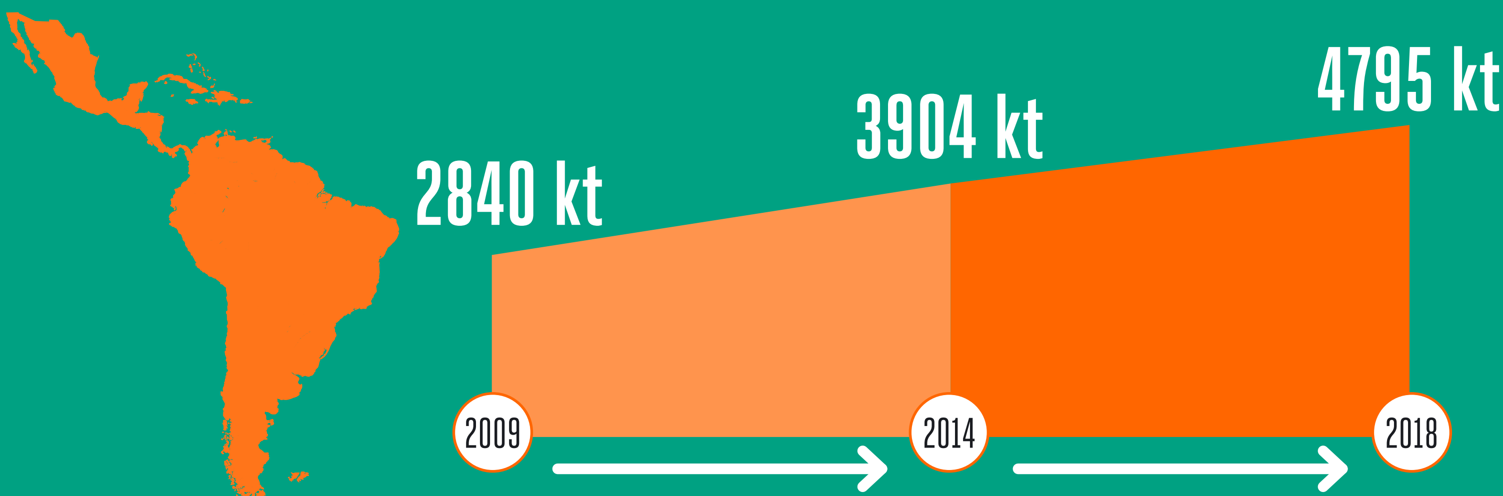
The ecological rucksack is, however, very heavy for most EEE. It usually far outweighs the actual weight of a product. The following breakdown from the Wuppertal Institute (2010) shows the ecological rucksack of a mobile phone, including only abiotic and biotic materials, based on existing data for a standard mobile phone:



Therefore, every attempt to lower the ecological rucksack is favourable from an ecological perspective. This can be done either by closing loops and securing close to 100% recycling rates or at least extending the lifetime of omponents or the entire product, e.g. through re-use.

eWASTE IN LATIN AMERICA

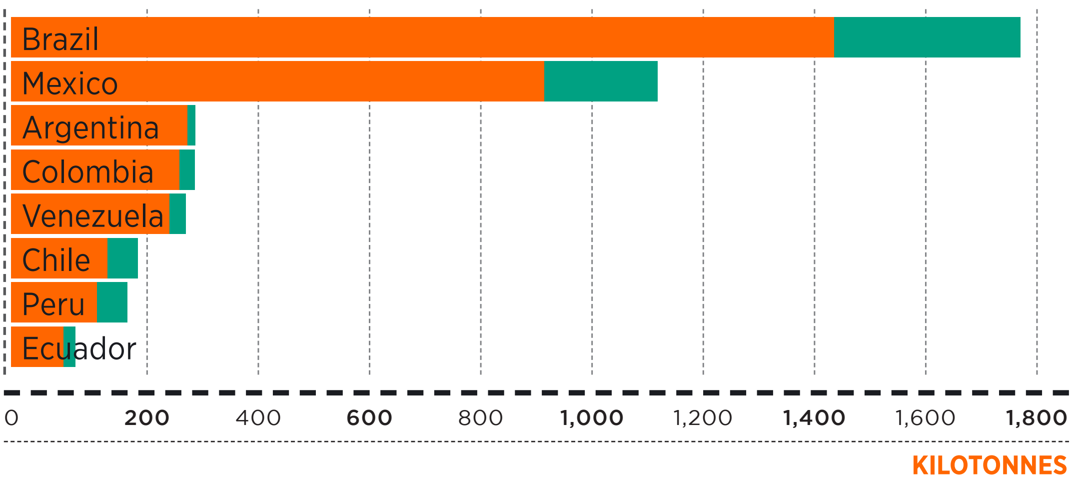
Total e-waste arising and waste from mobile phones (kt) in LATAM



KT = 1 KILOTONNE = 1,000 TONNES

eWaste in main Latam markets

2014 → 2018 →



2014 → 2018

eWaste in Latam will grow

5 to 7% annually

In 2014, Latin America produced **9%** of the world's eWaste

in 2014

29 g/person

OF MOBILE PHONE E-WASTE WAS GENERATED IN THE REGION

0.3 mobile phones discarded per person per year e-waste generated from mobile phones represents less than **0.5%** of the total weight of Latam' s e-waste

For mobile phones in particular, 17 kt were discarded in LATAM in 2014. This amount is expected to grow in coming years (2015-2018) with an average 6% per cent growth rate.

The ecological rucksack* of a standard mobile phone

0.08 KG NET WEIGHT OF A MOBILE PHONE

28.6 KG RAW MATERIAL EXTRACTION

9.8 KG UTILISATION

6 KG PRODUCTION

0.1 KG DISPOSAL

44.4 KG ECOLOGICAL RUCKSACK

SOURCE: WUPPERTAL INSTITUTE (2010)

*THE “ECOLOGICAL RUCKSACK” IS THE TOTAL RESOURCE USE OF A PRODUCT OVER ALL LIFE CYCLE PHASES

Key principles for eWaste policy development

- Adequate and targeted awareness campaigns
- Securing reliable access to raw materials
- Separate collection of mobile phones
- Efficiency in recovery process
- Foster the creation of eWaste management and recycling infrastructure
- Recognise the principle of extended producer responsibility (EPR)

1 Bringing sustainability to the cycle with green products

Over the past few decades, the electronics industry, and the Information and Communication Technology (ICT) industry in particular, have revolutionised the world; electrical and electronic equipment (EEE) products have become ubiquitous around the planet. Without these products, modern life would not be recognisable in developed and developing countries.

These products are used in areas such as medicine, transportation, education, health, communication, security, environmental protection and culture. ICT infrastructures are enablers of the Internet of things (IoT), a concept in which consumers and businesses enjoy rich new services, connected by intelligent and secure fixed and wireless networks.

In many cases, the functionalities enabled by modern technology (like food processing and conservation, telecommunication and e-learning, office productivity, medical and diagnostics, etc.), are entwined with sustainable development and with some of the Sustainable Development Goals (SDG); this is the case for SDG4 (Ensure inclusive and equitable quality education), SDG7 (Ensure access to affordable, reliable, sustainable and modern energy), SDG8 (Promote sustained, inclusive and sustainable economic growth), SDG12 (Ensure sustainable consumption and production patterns) or SDG 13 (Take urgent action to combat climate change and its impacts).

After use, these products are discarded, sometimes after re-use cycles in countries different from those where they were initially sold, becoming what is commonly called “e-waste”.

E-waste is usually regarded as a waste problem that can cause environmental damage and severe consequences to human health if improperly managed. In addition to the human health concerns related to workers' exposure, e-waste has various indirect effects on the larger population and more vulnerable segments, such as children.

E-waste often contains significant amounts of toxic and environmentally sensitive materials and thus could be extremely hazardous to humans and the environment if improperly disposed of or recycled.

On the other hand, e-waste is more often seen as a potential source of income for individuals and entrepreneurs who aim to recover the valuable materials (metals in particular) contained in discarded equipment.

E-waste treatment processes therefore aim to either remove the hazardous components or recover as many essential materials (e.g., metals, glass and plastics) as possible; achieving both objectives is most desired.

Recently, recycling and separation of e-waste has become a main source of income for a growing number of people. In most cases, though, this is done informally, with no or hardly any health and safety standards. This may expose workers and the surrounding neighbourhoods to health risks and lead to substantial environmental pollution.

e-Waste management and risks for human health

Informal e-waste management processes may lead to various environmental exposures to toxic compounds, such as lead, mercury, cadmium, chromium, Polychlorinated biphenyls (PCBs) and brominated flame retardants, persistent polycyclic aromatic hydrocarbons and unintentional contaminants such as dioxins and furans, among others. These compounds are not only a source of pollution but are also a risk to human health if improperly managed. Manufacturers are progressively phasing out many substances of concern as consequence of legislation (like the European Union's (EU) Restriction of Hazardous Substances Directive (RoHS) Directive) or on a voluntary basis, but these metals may still be found in waste arising from old products or, in lower quantities, they may still be used in applications where no substitute material has been found or where exemptions from the restrictions are granted.

Effects of exposure are direct and therefore they affect workers who process the material without suitable protective equipment or use inappropriate methods. There are also indirect effects where water and soil pollutants might enter through the food chain and affect the wider population, particularly in the case of informal recycling taking place in close proximity to urban settlements. Globally, several studies have demonstrated the exposure of high levels of the above-described compounds on working adults, pregnant women and children. Children are especially vulnerable to the health risks that may result from exposure to e-waste and therefore need more specific protection. As children are still growing, their intake of air, water and food in proportion to their weight is significantly higher than that of adults and consequently they are at greater risk of hazardous chemical absorption.

There are various routes of exposure for children:
· They may be exposed to e-waste-derived chemicals in their daily life due to unsafe recycling activities that are often conducted in the home - either by family members or the children themselves.
· They may be exposed through dumpsites located close to their homes, schools and play areas.

The number of studies related to these exposures has increased, indicating cytogenetic and cell function alterations and adverse health effects including impairment of the immune, cardiovascular, and gastrointestinal and endocrine systems, and perinatal complications such as pre-term delivery, restrictricted intrauterine growth, reduced neonatal lung function and neurobehavioural changes during childhood. Moreover, restrictions on the number and design of studies prevent accurate estimations of doses and effects of specific exposures.

In June 2013, the World Health Organization (WHO) convened a workshop of international scientists, policy experts and United Nations representatives to discuss the challenges of exposure for children and vulnerable populations to the toxic substances resulting from improper management of waste from EEE. The following points were raised and became an integral part of "The Geneva Declaration on E-waste and Children's Health[2]":

1 The global production of e-waste is steadily growing, as is the population exposed.

2 Evidence of associations between exposure to e-waste and adverse health effects are increasing. Associations have been reported between e-waste exposure and altered thyroid function, reduced lung function, negative birth outcomes, reduced childhood growth, mental health outcomes, cognitive development, cytotoxicity and genotoxicity.

3 There is convincing evidence of short- and long-term adverse health effects caused by exposure to individual substances contained in e-waste, as well as possible synergistic effects from mixtures of compounds. These include carcinogenic effects, endocrine disruption, neurodevelopmental anomalies, negative birth outcomes, abnormal reproductive development, intellectual impairment, attention deficits and cancer. However, more knowledge is required regarding the toxicity of the mixtures of chemicals that result from poor management processes.

4 The risk of adverse health effects extends beyond individuals exposed occupationally. Through environmental transport (including the transfer to homes via work clothes), bioaccumulation and the persistence of these compounds in the environment, humans at significant distances from e-waste recycling sites can also be exposed to dangerous substances.

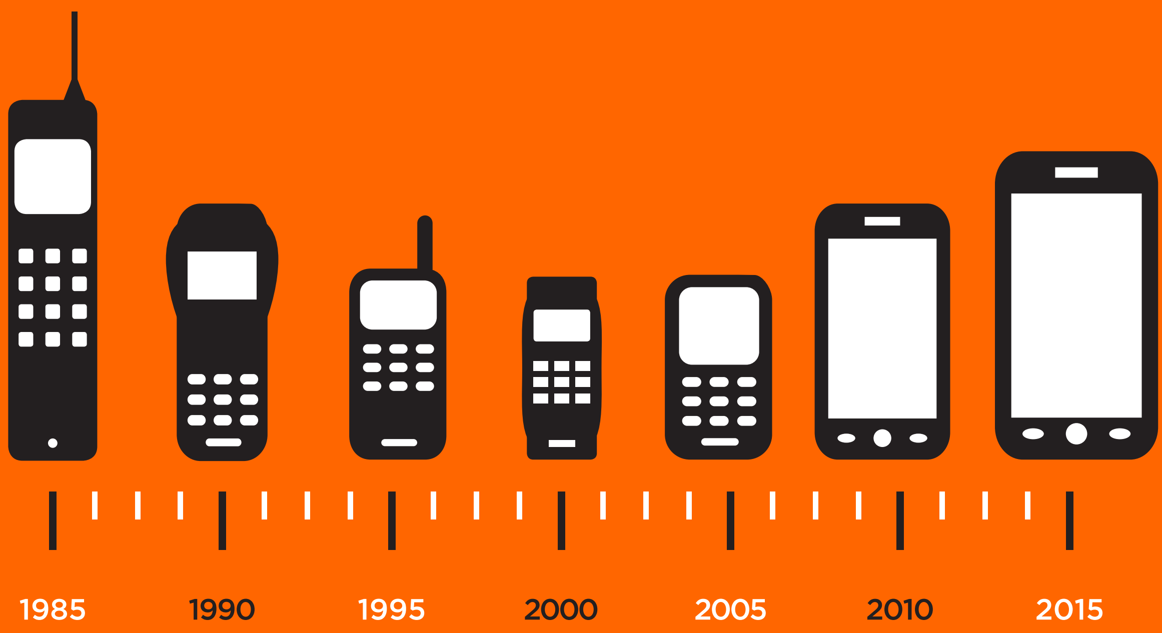
5 Vulnerable populations – in particular pregnant women, developing embryos/foetuses, and children – are at particular risk of developing adverse health effects due to their greater sensitivity, unique routes of exposure and sensitive windows of development.

6 In many countries, e-waste-related activities are not conducted under an acceptable standard that protects the health and safety of those exposed. We therefore urge the international community, UN agencies, national policymakers and regulatory authorities, industry and non-governmental organizations to cooperatively develop and introduce protective measures to limit adverse health effects from direct and indirect exposure to substances resulting from unsafe e-waste management practices.

[2] HTTPS://WWW.QCMRI.UQ.EDU.AU/CHEP/E-WASTE-NETWORK.ASPX

1.1 Closing the loop for sustainable societies

Evolution of the size and shape of an average mobile phone



Compared to traditional waste streams, e-waste handling poses unique and complex challenges, including:

- The heterogeneity and evolution of products, in terms of size, weight, function and material composition, and subsequently, in environmental impact at end-of-life (EoL);
- The continuous introduction of new products and features (tablets, for example) calls for continuous development of appropriate EoL treatment technologies;
- The presence or phasing out of certain constituent elements or potentially hazardous substances in appliances that require proper treatment;
- The relatively high use of certain precious metals and critical resources (e.g., gold, silver, ruthenium, indium, platinum group metals or rare earth elements) and the challenges in their recovery due to the "dissipated" nature of the low-concentration elements and the technological complexity involved in recovering them in recycling processes;
- The large and diverse group of actors involved in various used and EoL activities, such as collection, recycling and treatment, reuse, refurbishment, waste disposal and export of products and fractions.

One common element crosscutting modern technological improvements is the massive use of key metals. Some high-tech metals are indispensable for modern ICT and mobile phones in particular; antimony, cobalt, lithium, tantalum, tungsten and molybdenum are widely used in a range of electronic products.

Table 1

Simplified composition by weight of mobile phone[3]

Symbol	Percentage	Material
Al	2.35%	Aluminium
Cu	9.94%	Copper
Fe	9.74%	Steel
Ag	0.24%	Silver
Au	0.02%	Gold
Pd	0.008%	Palladium
Glass	3.80%	Glass
Plastics	45.03%	Plastics
Co	5%	Cobalt
Li	0.35%	Lithium
Ni	1.60%	Nickel
Pb	0.004%	Lead
Zn	0.40%	Zinc
In	0.0006%	Indium
Ta	0.018%	Tantalum
W	0.31%	Tungsten
Nd	0.04%	Neodymium
Pr	0.0079%	Praseodymium
Other	21.15%	Other
Total	100%	

It can be noted how, in addition to commonly known metals like aluminium, copper, steel and plastics, other metals – sometimes in very small percentages – can be found in mobile phones. They are particularly used for their chemical and physical properties, and sometimes enable functionalities, such as:

- Silver and gold, used for their malleable and ductile natures as well as their good electrical conductivity and solubility in tin-based solders, have become widely used in the electronics industry.
- Cobalt is used in magnetic recording media, but also in connection as an aid to the diffusion of gold into substrates. Cobalt is also used in rechargeable batteries.
- Tungsten, due to its high density, is used as a counterweight on the end of the shaft of the small motor that acts as the vibrator in cell phones.
- Tantalum is used in capacitors, and is used in LCDs.

In many cases, the electronics industry annually uses notable quantities of these elements in production. Even if quantities used in one single product may be quite small, the total number of products annually produced and the global availability of individual elements may pose future challenges.

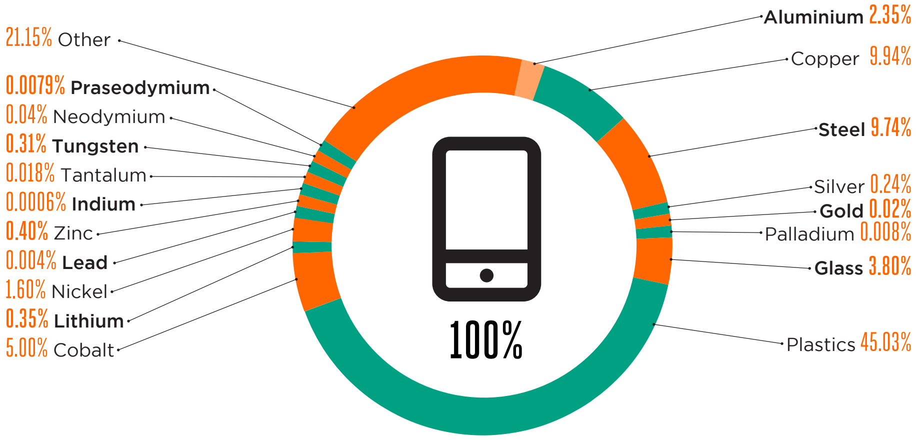
[3] MULTIPLE SOURCES: BEV C ET AL, ELEMENTAL COMPOSITION OF OVER TWO DOZEN CELL PHONES, RIM 2012. VALERO NAVAZO J.M. ET AL, MATERIAL FLOW ANALYSIS AND ENERGY REQUIREMENTS OF MOBILE PHONE MATERIAL RECOVERY PROCESSES, INTERNATIONAL JOURNAL LIFE CYCLE ASSESSMENT, 2013.

Table 2

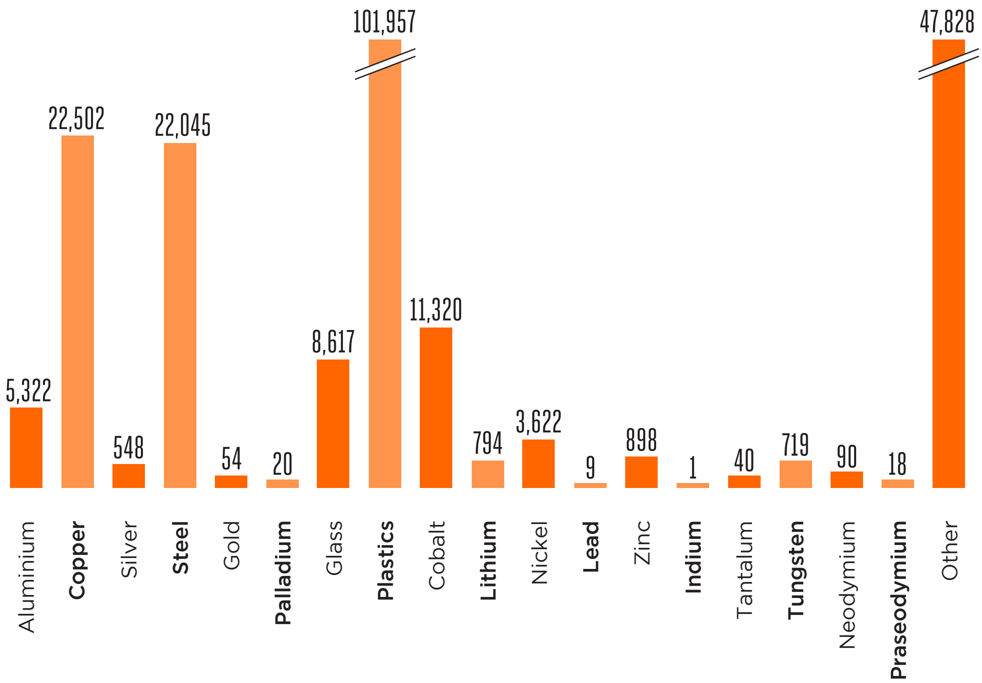
Consumption of key metals by the mobile phone industry

(2014 data)

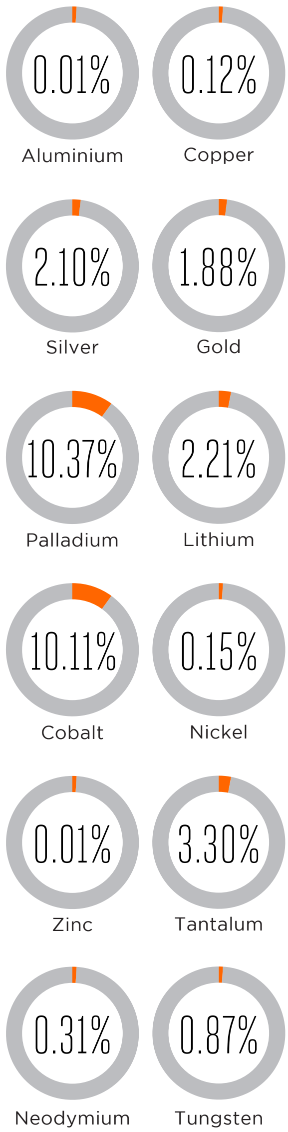
Simplified composition of mobile phone



Material consumption for global mobile phone production, 2014[4] (t)



Share of the global production



Securing reliable and undistorted access to these raw materials has become a critical challenge to ensure the production and supply of these products and functionalities. This is particularly the case for the future production of a growing number of devices to match global demand while avoiding price competition on raw materials that impacts final product price or generates supply restrictions. Some of the elements present in a mobile phone (tantalum, tungsten and gold) are also listed as "conflict minerals". Various initiatives[5] are attempting to support producers with guidance and to conduct due diligence throughout the supply chain to prevent the demand for these minerals serving as inputs to conflict and human rights violations along their supply chains in certain regions of the world.Effective recycling could further contribute to mitigate the need of primary production of these metals. One of the key elements that will ensure future access to key metals is recycling chain effectiveness:

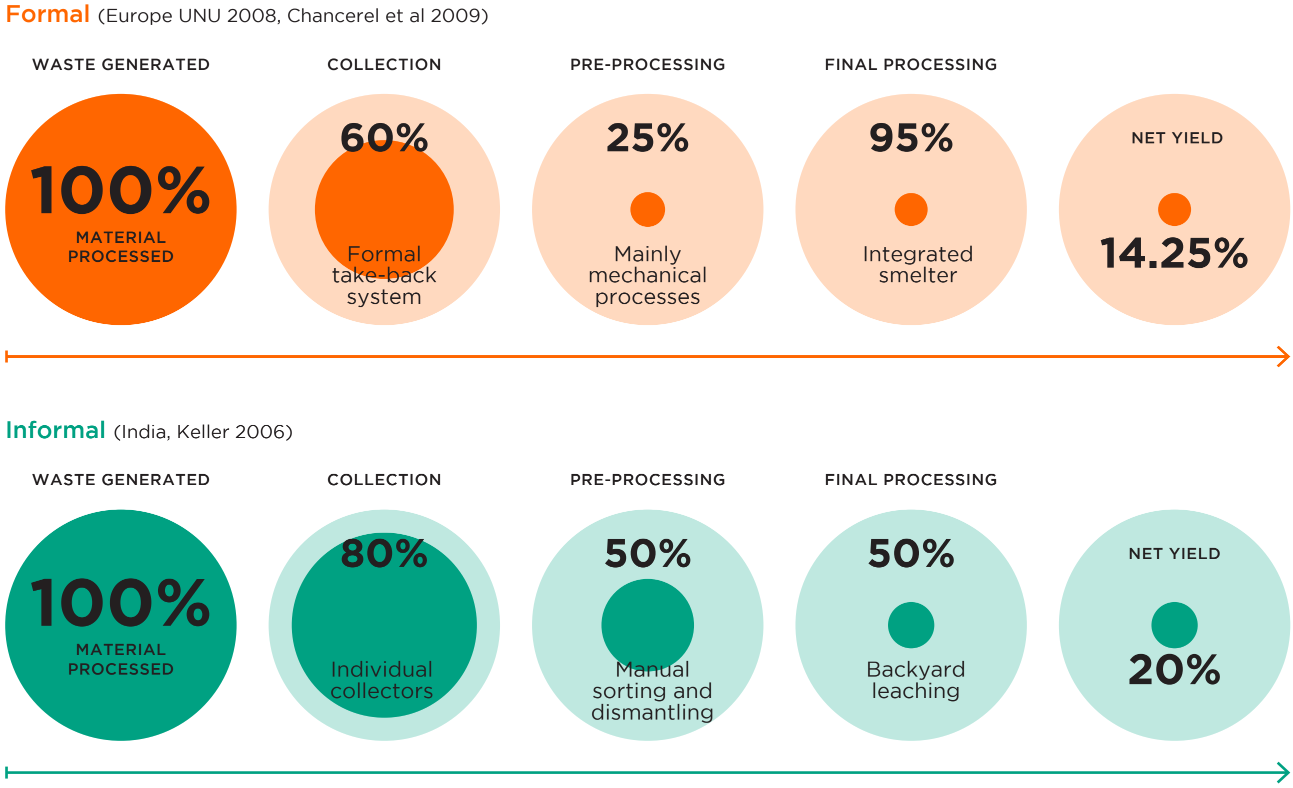
[4] BALDÉ, C.P., ET.AL, THE GLOBAL E-WASTE MONITOR – 2014, UNITED NATIONS UNIVERSITY, IAS – SCYCLE, BONN, GERMANY, 2015.
[5] ITU, GREENING ICT SUPPLY CHAINS – SURVEY ON CONFLICT MINERALS DUE DILIGENCE INITIATIVES, 2012.

keeping in mind the effectiveness of processes, particularly for these key metals. Collection, dismantling and pre-processing approaches can differ across different e-waste streams (i.e., Cathode Ray Tube (CRT) screens versus IT equipment or refrigerators versus lamps), depending on the material fraction's availability. However, end-processing technologies have been developed with a focus on material fractions, to a large extent regardless of the originating e-waste stream.

When looking at metrics to assess environmental performance of the recycling chain, it is important to remember that recovery effectiveness can only be determined by tracking the three steps of collection and sorting, pre-processing and end-processing.

Figure 3

Impact of recovery effectiveness in individual recycling chain steps and overall recovery performances[6]



Moreover, especially in regions where recycling operations are not properly developed, informal recycling[7] (pre-processing and end-processing) usually focuses on a few valuable elements like gold and copper (with often poor recycling yields), while most other metals are discarded and inevitably lost. In addition, small quantities of one or more key metals present in a single product do not necessarily incentivise effective recovery, especially when relevant quantities of individual fractions need to be concentrated.

Proper e-waste management is key to:

• Securing future access to elements needed to supply a growing global population with products and functionalities;
• Preserving the environment and human health of workers (direct exposure) and society at large (indirect exposure); and
• Calling for effectiveness across recycling operations, from collection through the final recovery or disposal of hazardous materials.
• Protect child's and workers' rights, from working conditions to preventing illegal child labour.
• Reduce the environmental rucksack associated with the production, usage and disposal of electrical and electronic equipment.

[6] EXAMPLE FROM: UNEP, METAL RECYCLING: OPPORTUNITIES, LIMITS, INFRASTRUCTURE, 2013.
[7] THE TERM "INFORMAL RECYCLING" USUALLY REFERS TO INDIVIDUALS, TYPICALLY MICRO-ENTREPRENEURS, WHO ARE, IN CONTRAST TO FORMAL ACTORS, NOT REGISTERED AS A BUSINESS, HAVE NO LICENCE AND/OR DO NOT REPORT IN ACCORDANCE WITH RELEVANT REGULATIONS. THEY GENERALLY OPERATE WITH LITTLE REGARD TO ENVIRONMENTAL HEALTH AND SAFETY CONDITIONS AND HAVE FEW OR NO MECHANISMS IN PLACE TO IMPROVE OPERATIONS.

2 E-waste statistics

The amount of e-waste generated worldwide in 2014 was 41.8 million metric tonnes. E-waste generated is defined[8] as the total weight of discarded EEE as a result of consumption within a country's territory in a given reporting year prior to any activity (such as collection, preparation for reuse, treatment, recovery – including recycling – or export) after discarding.

According to the methodology developed in 2014 for the European Commission by the UN's Think Tank, the United Nations University (UNU), the amount of waste generated in a specific year is calculated as a collective sum of discarded products that were placed on the market in all historical years multiplied by the appropriate lifespan distribution.

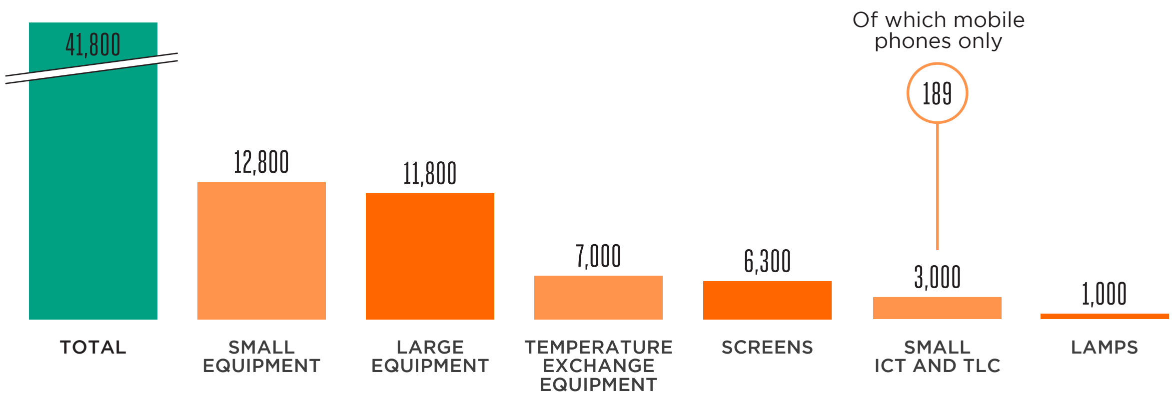
The lifespan distribution reflects the probability of a product batch being discarded over time, including both technical failures and disposal of functional products, and this is derived from consumer surveys and specific modelling.[9]

E-waste is comprised of a large variety of products, and in terms of weight, mostly by large equipment, small equipment and cooling and freezing equipment. Usually, discarded electronics are clustered in five or six waste streams[10]: Temperature exchange equipment, including refrigerators, freezers, air conditioners, heat pumps and other equipment for temperature exchange; Screens, monitors and equipment containing screens, which includes television screens but also laptops, notebooks and tablets; Lamps; Large equipment, including washing machines, cookers, electric hot plates, dishwashers and others; Small equipment, like vacuum cleaners, microwaves, appliances for hair and body care, video recorders, radio sets and other consumer electronics; and Small IT and telecommunication equipment, which includes mobile phones, GPS devices, PCs and other small IT products.

Out of the total 41.8 million tonnes of e-waste generated worldwide, the breakdown into the six waste streams is indicated in the table below.

Table 3

Total e-waste generated worldwide in 2014 in kt



[8] MAGALINI ET. AL, STUDY ON COLLECTION RATES OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE): POSSIBLE MEASURES TO BE INITIATED BY THE COMMISSION AS REQUIRED BY ARTICLE 7(4), 7(5), 7(6) AND 7(7) OF DIRECTIVE 2012/19/EU ON WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE), 2014.

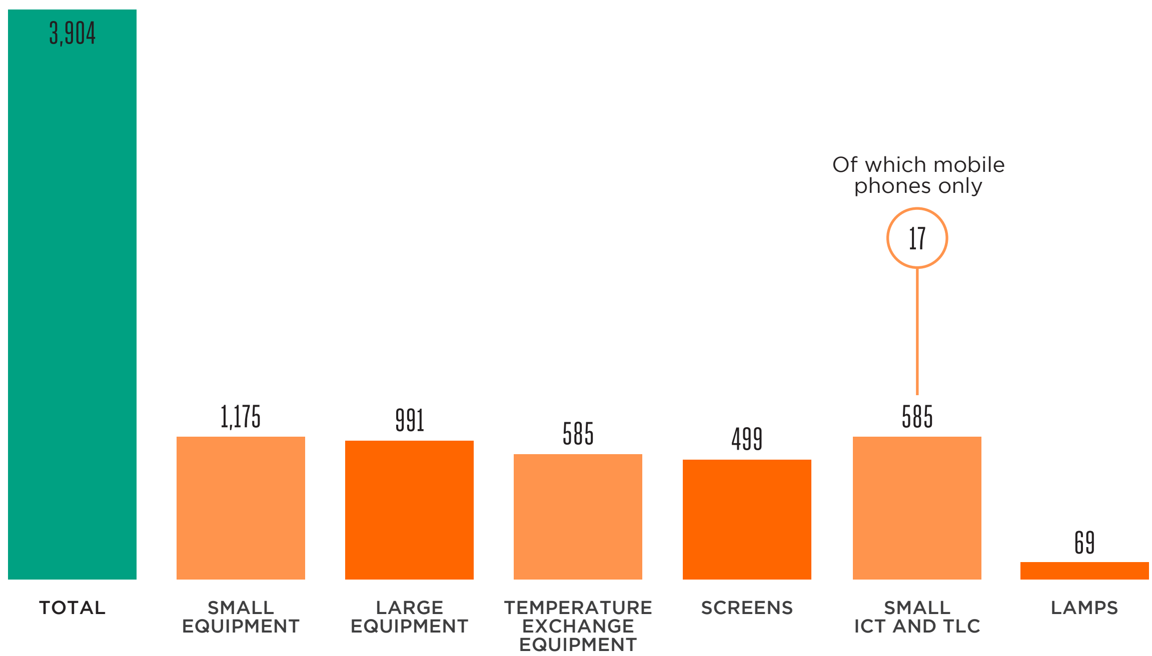
[9] WANG, F., ET AL., ENHANCING E-WASTE ESTIMATES: IMPROVING DATA QUALITY BY MULTIVARIATE INPUT–OUTPUT ANALYSIS. WASTE MANAGEMENT 33(11): 2397–2407, 2013.

[10] EU WEEE DIRECTIVE (2012/18/EU), WHICH CLUSTERS PRODUCTS ACCORDING TO TREATMENT TECHNOLOGY REQUIREMENTS AND OPERATIONS PRACTICES.

The e-waste in LATAM was 3.9 million tonnes in 2014, and the waste stream breakdown is reported below.

Table 4

Total e-waste generated in LATAM in 2014 in kt

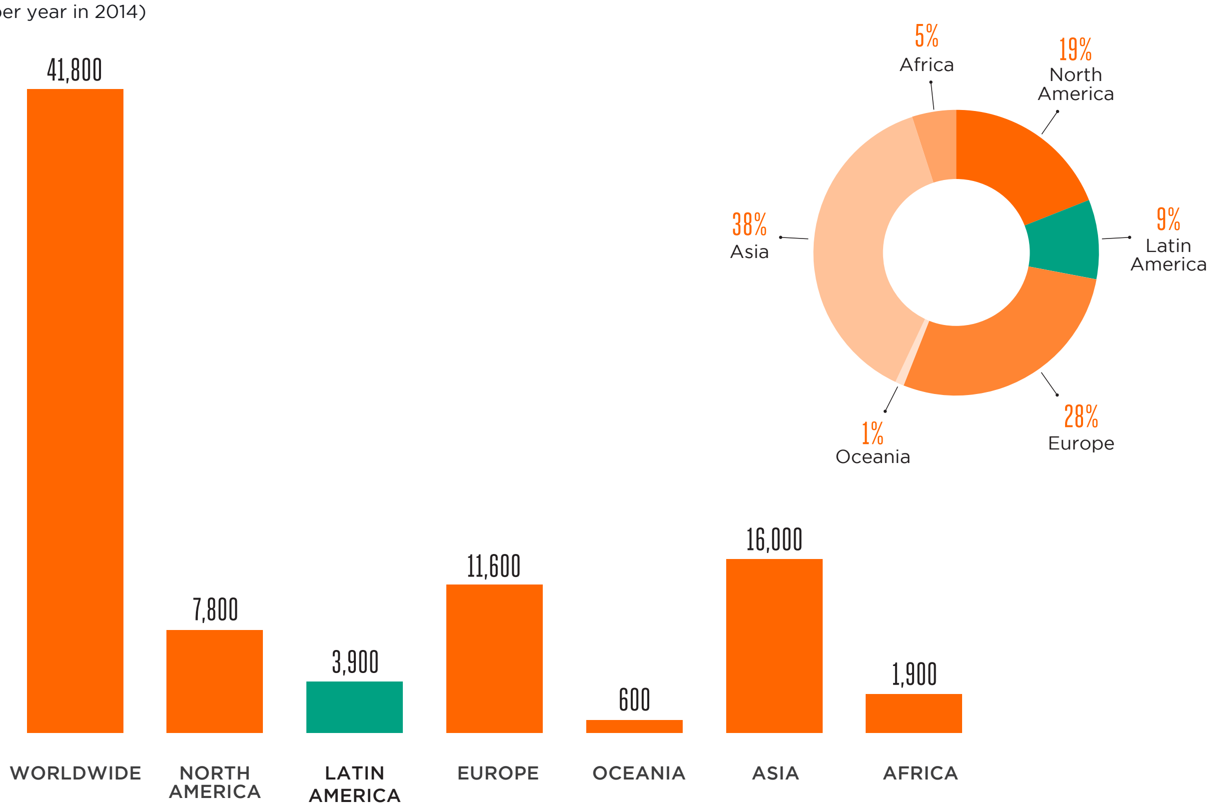


Out of all the regions in the world, most e-waste is generated in the Americas, Europe and Asia.

Table 5

Total e-waste generated by all world regions

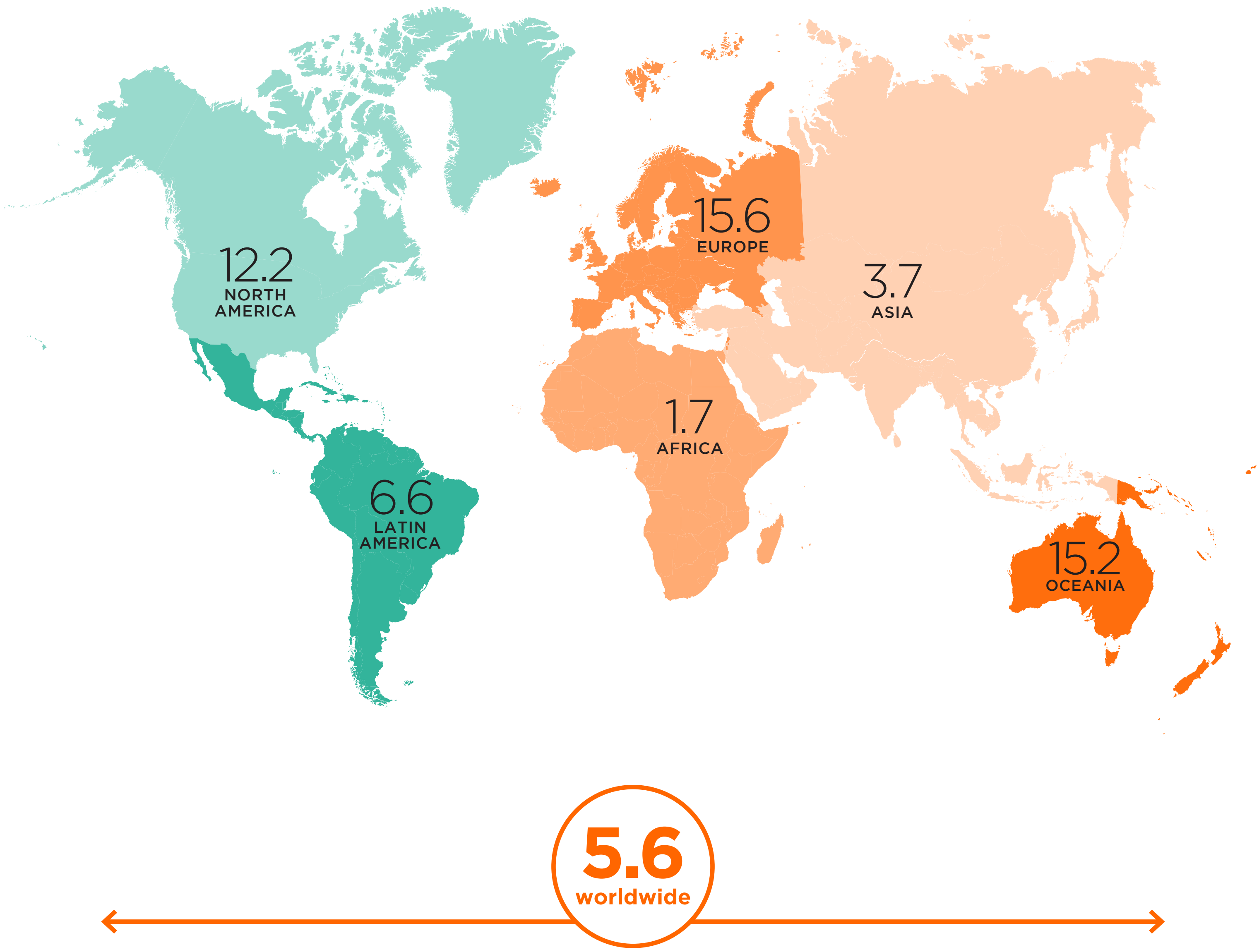
(kt per year in 2014)



But the reasons behind e-waste generation in distinct regions are different; per capita, most e-waste is generated in Europe, North America and Oceania, equating to about 15 kg/person on average. Despite lower e-waste generation per capita, Asia (China and India in particular) shows a high total generation due to the region's large population.

Table 6

E-waste generated per capita by all world regions

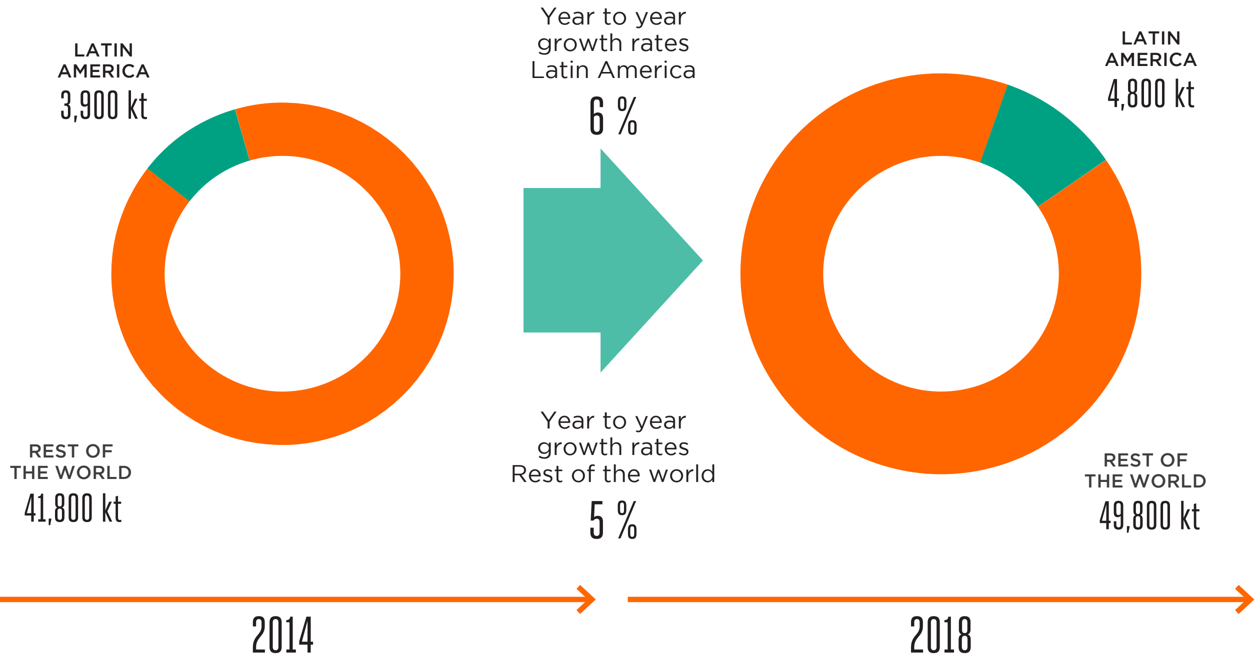


Total e-waste generated in 2014 in kg/person

In LATAM, the amount of e-waste generated in 2014 was equal to 6.6 kg/person, which is slightly higher than the global average.
When looking at the expected growth rate, the average year-to-year growth of e-waste appears to be higher in LATAM compared to the global average. The amount of the region's e-waste is expected to increase to 4.8 million tonnes in 2018.
This is a growth of 70 per cent compared to 2009, whereas e-waste is projected to grow globally by only 55 per cent.

Table 7

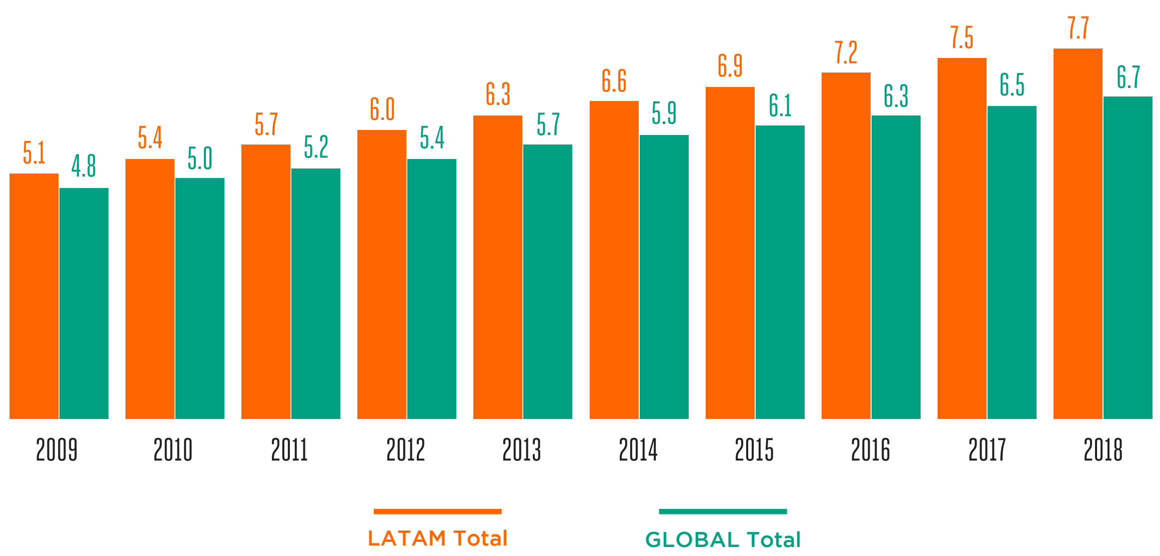
Amounts of total e-waste and growth rates for LATAM and the world



When observing e-waste generated per person, LATAM's results are higher than the global average. The region's growth rate is higher than the global rate even when compared to the absolute growth rate of total e-waste generated.

Table 8

Amounts of e-waste generated per person and growth rates for LATAM and the world (kg/person)

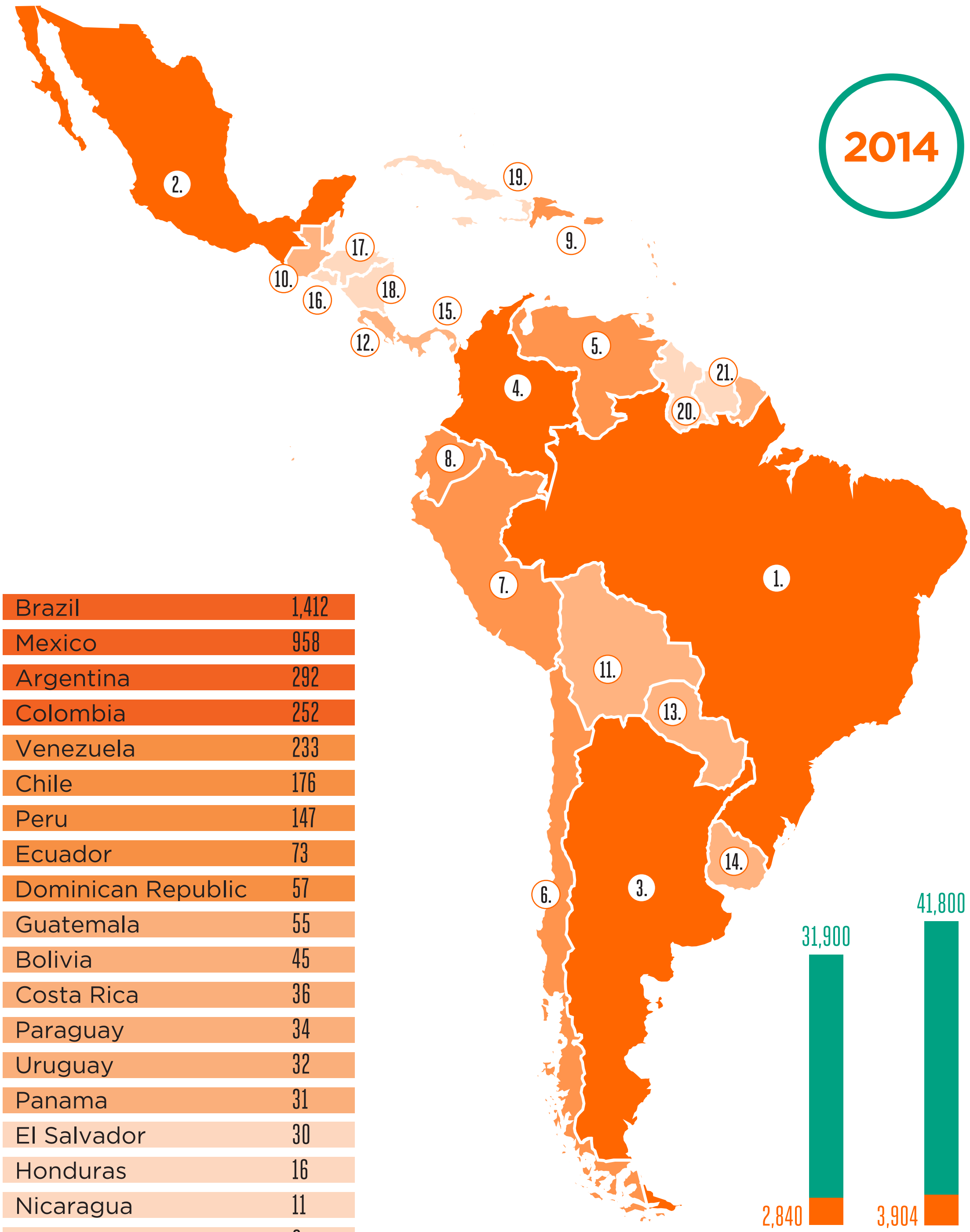


Within LATAM, most e-waste is generated in Brazil and Mexico, which respectively produced 1,400 kt and 1,000 kt of e-waste. This is due to the countries' large populations.

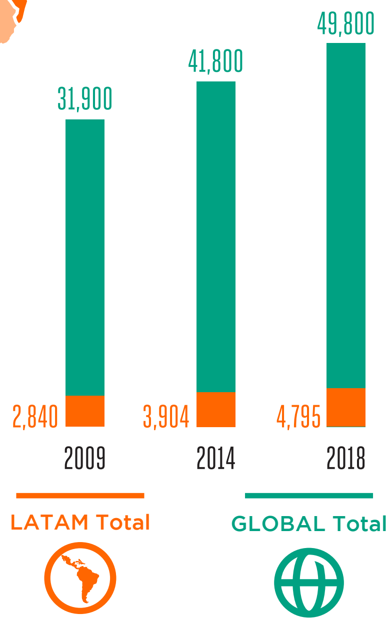
Table 9

e-Waste generated in individual countries of LATAM

(kt)



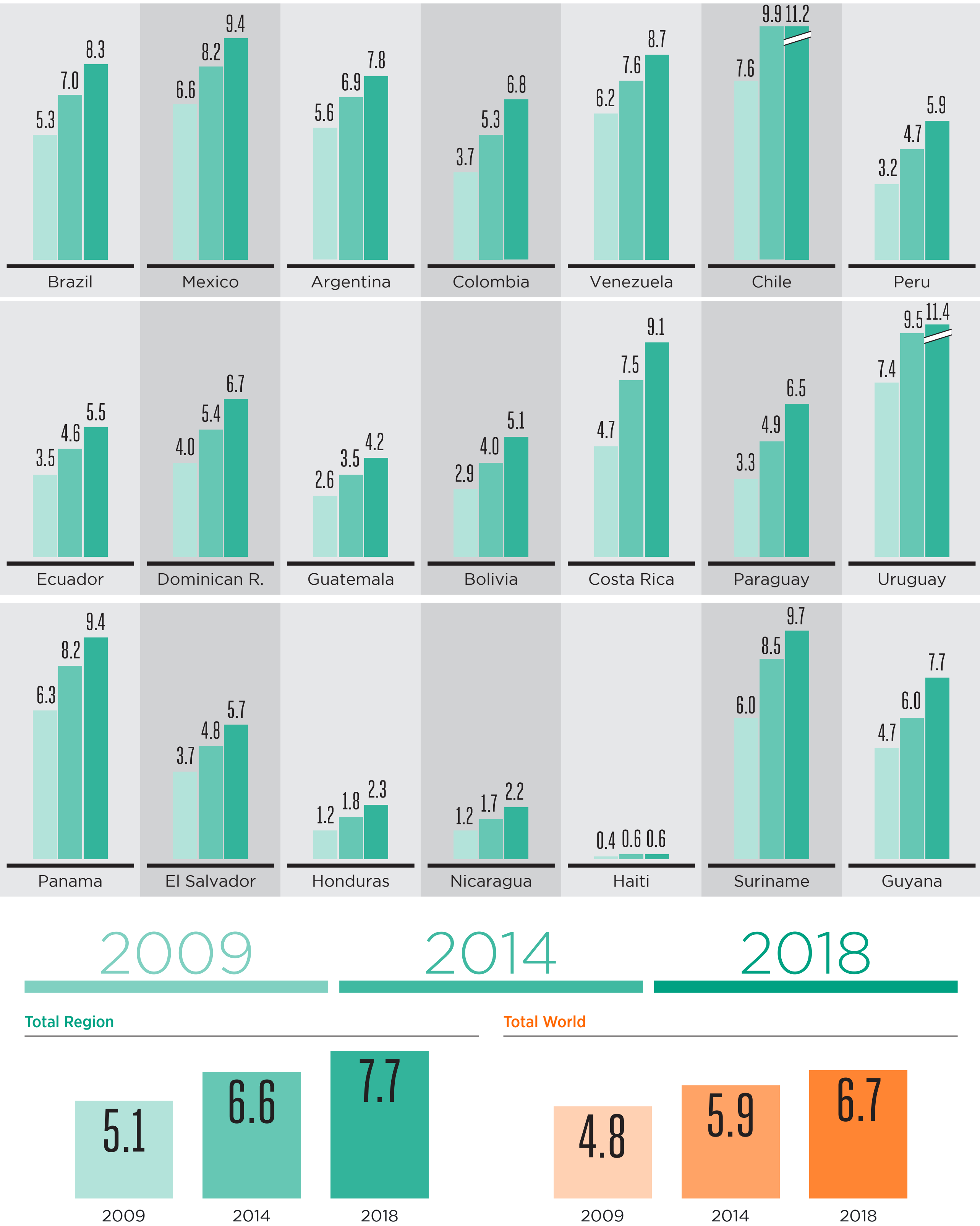
1.	Brazil	1,412
2.	Mexico	958
3.	Argentina	292
4.	Colombia	252
5.	Venezuela	233
6.	Chile	176
7.	Peru	147
8.	Ecuador	73
9.	Dominican Republic	57
10.	Guatemala	55
11.	Bolivia	45
12.	Costa Rica	36
13.	Paraguay	34
14.	Uruguay	32
15.	Panama	31
16.	El Salvador	30
17.	Honduras	16
18.	Nicaragua	11
19.	Haiti	6
20.	Suriname	5
21.	Guyana	5



Per person, Chile and Uruguay produced the most e-waste, respectively generating 9.9 and 9.5 kg/person. By 2018, Uruguay is expected to overtake Chile for per capita e-waste generation.

Table 10

E-waste generated (kg) per capita in individual countries of LATAM



In the figures below, the main countries contributing to e-waste generation are displayed.

Figure 4

Total e-waste arising (kt) in main countries of LATAM

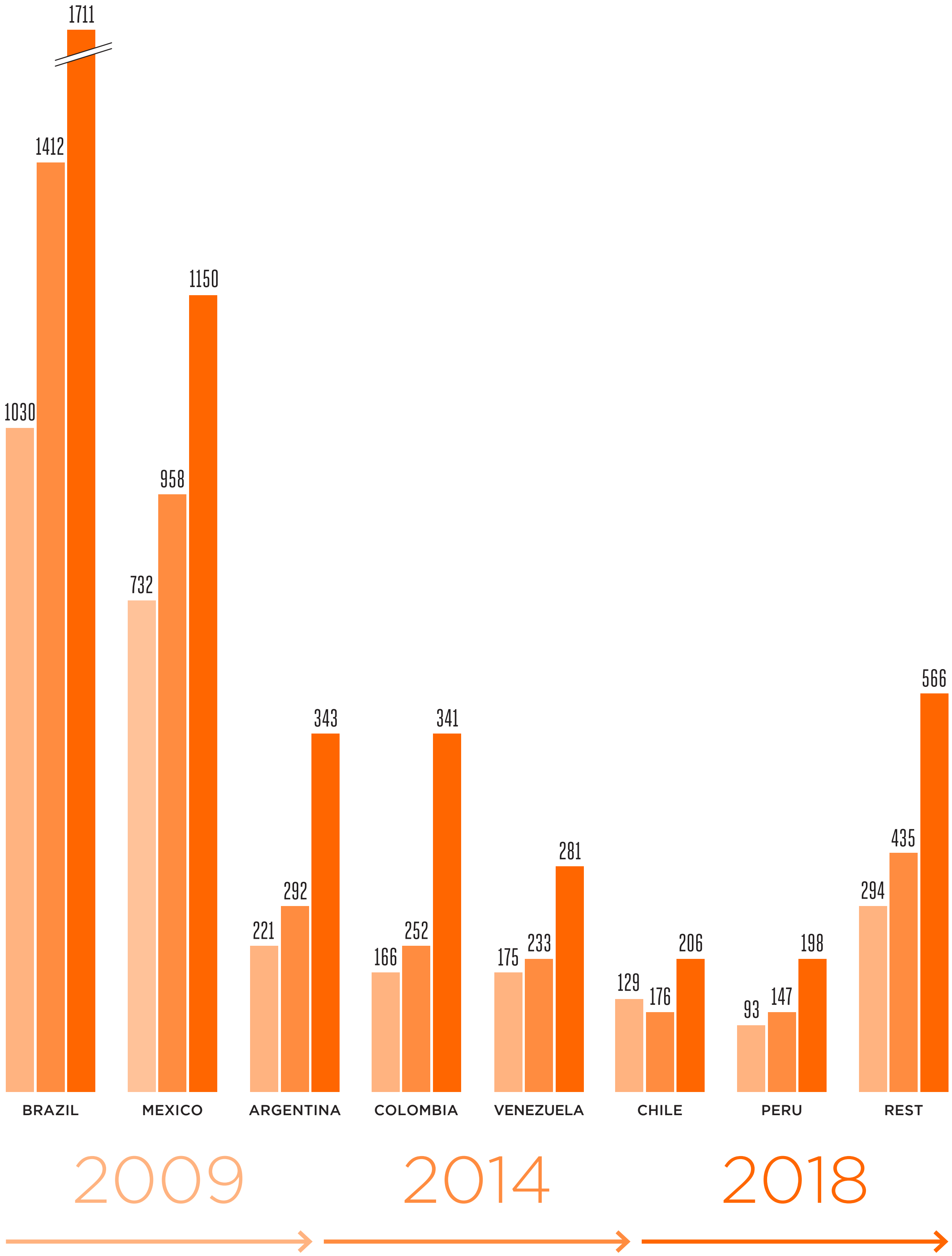
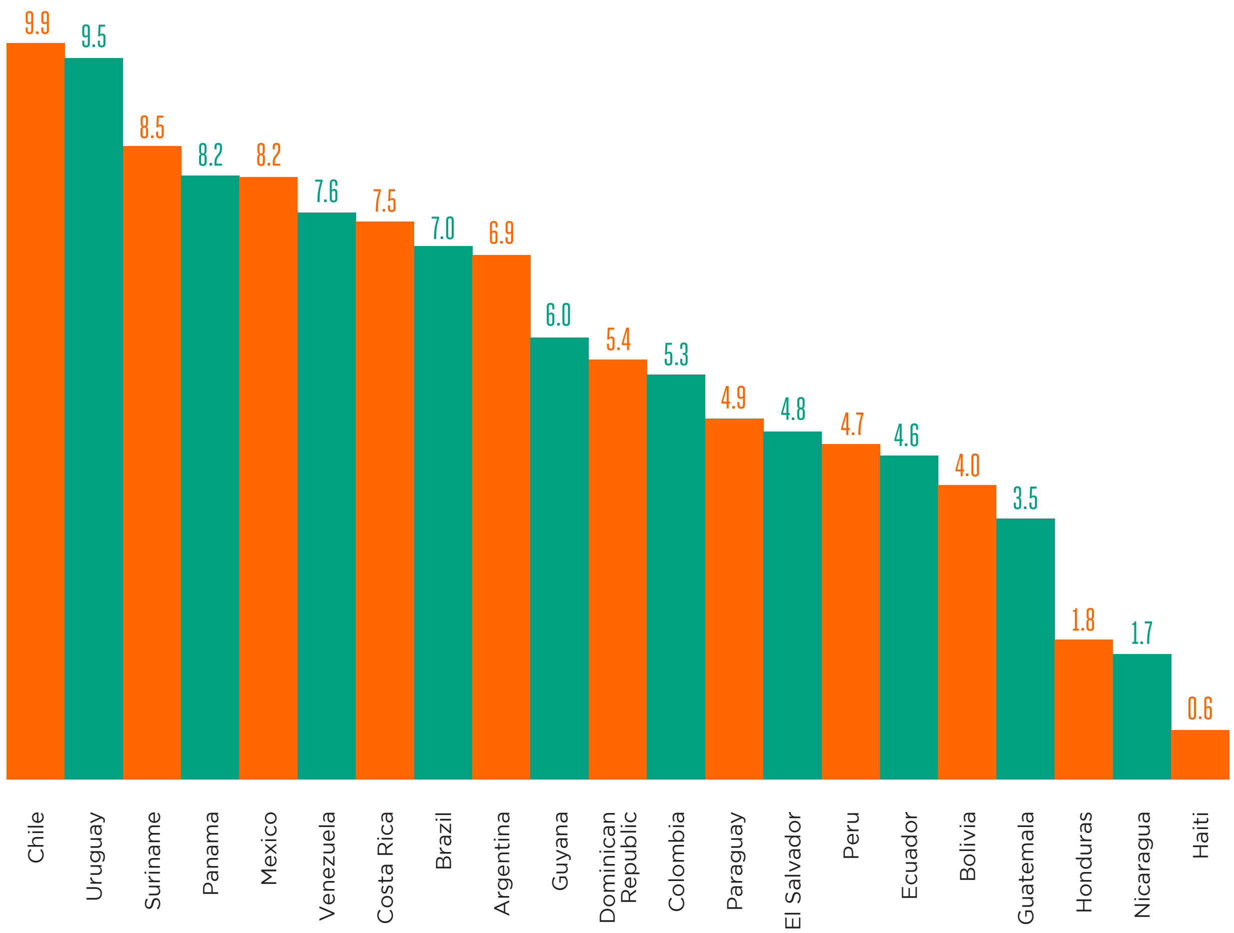


Figure 5

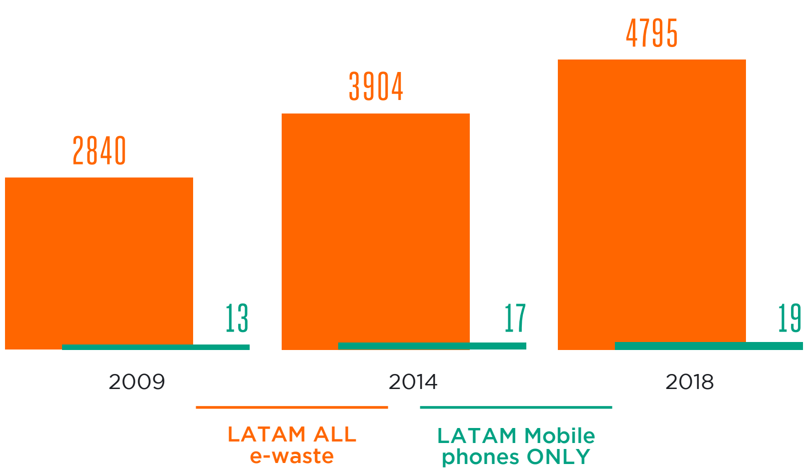
Total e-waste arising (kg/person) in LATAM countries in 2014



Discarded ICT equipment, and mobile phones in particular, represent a relatively small segment of e-waste. In terms of weight, phones and mobile phones represent a very small part of the e-waste stream, as can be seen in the figure below that compares the total amount of e-waste arising in LATAM versus the amount of mobile phones discarded.

Figure 6

Total e-waste arising and waste from mobile phones (kt) in LATAM



In 2014, LATAM generated 17 kt of mobile phone e-waste and 20 kt of fixed phone e-waste, which respectively represented 0.4 per cent and 0.5 per cent of the region's total e-waste.

In 2014, 29 g/person of mobile phone e-waste was generated in the region, which represents approximately 0.3 mobile phones discarded per person per year.

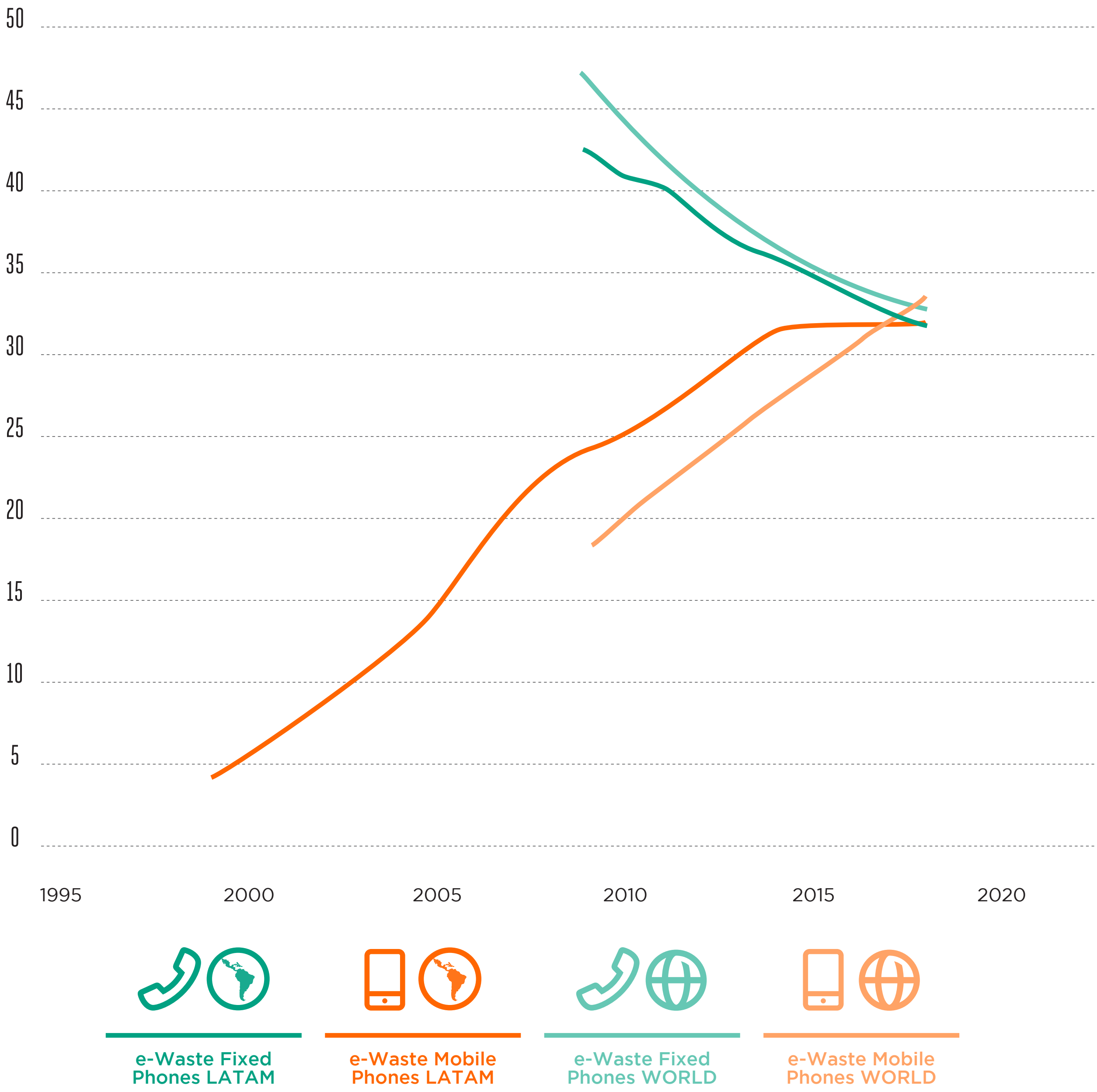
The amount of waste from mobile phones in LATAM increased dramatically from 1995 to 2010, but the growth seems to have levelled off afterwards. Globally, no data was available before 2009, but the amount of e-waste from mobile phones grew at a constant pace after 2009, in contrast to LATAM.

For fixed phones, the amount of e-waste is 34 g/person in LATAM, and this amount declines after 2009. This trend and the amount of waste generated per capita are comparable to the rest of the world.

Expressed in units, the amount of e-waste was around 0.06 fixed phones per capita per year. This is in line with the popularity of mobile phones over fixed phones in the region where there are greater than one mobile phone subscriptions per capita, but only 0.18 per capita for fixed phones.

Figure 7

E-waste generated from fixed and mobile phones: Latin America and worldwide data in g per person

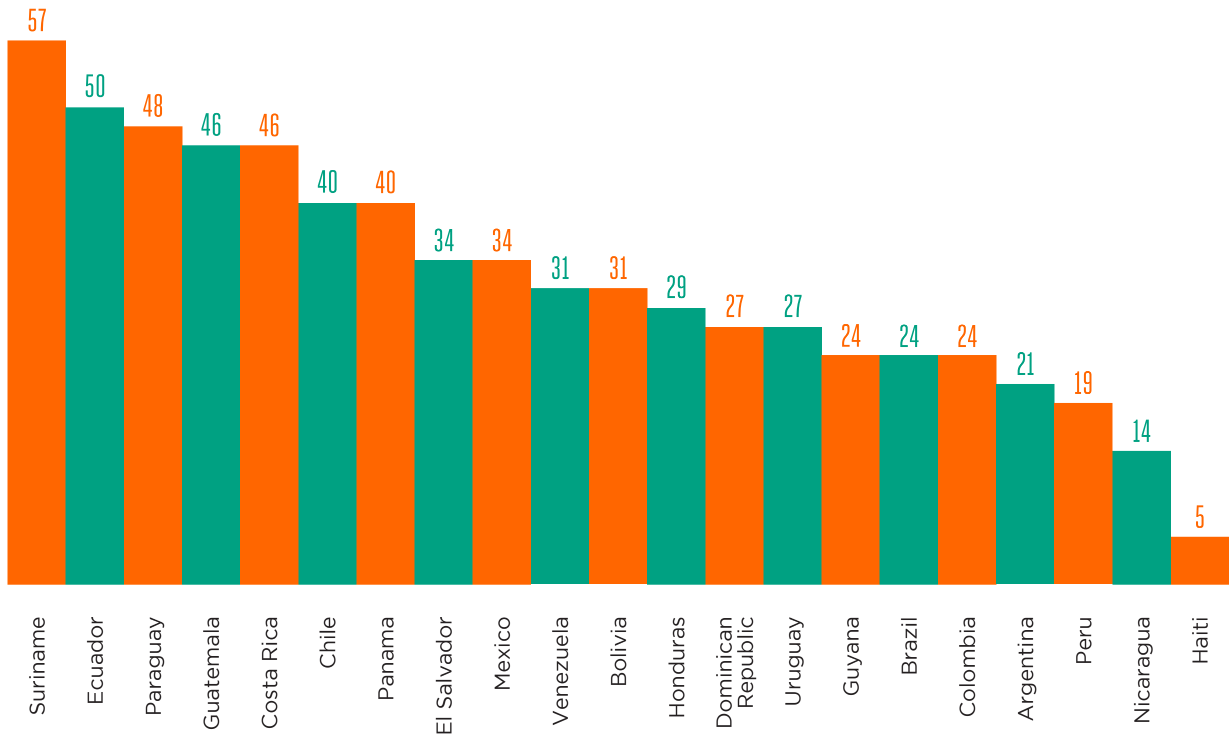


In 2014, the countries with the greatest amount of e-waste from mobile phones per capita appear to be Suriname and Ecuador, as displayed in Figure 8.

Figure 8

E-waste from mobile phones generated per person in LATAM by country

(2014 data - g/person)



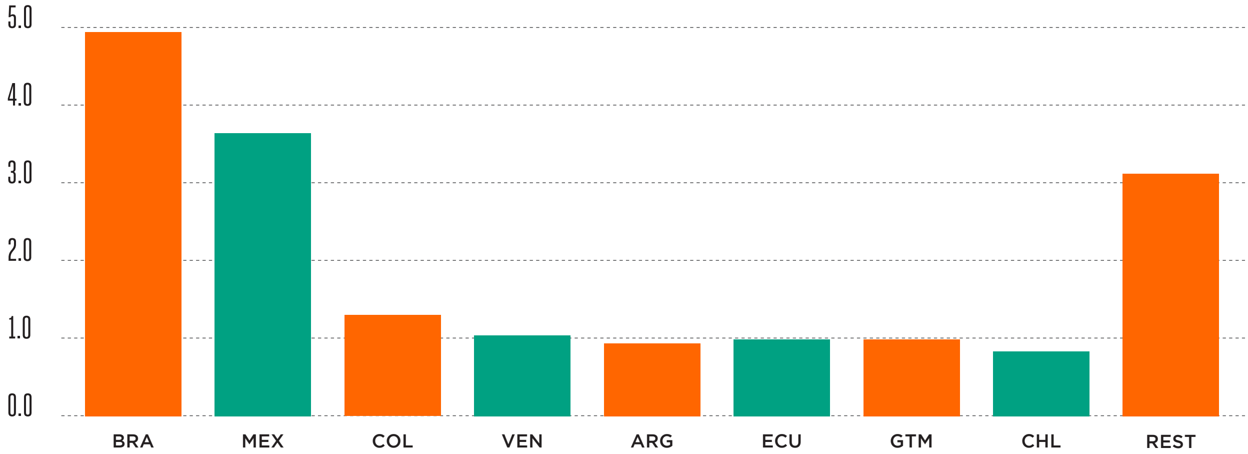
Although the analysis on kg per person of discarded mobile phones is relevant, it might be more interesting to look at the total amount of waste generated at country level, which is displayed in Figure 9. From a general waste management perspective, particularly to assess and develop recycling infrastructure or allocate financial resources for take back and recycling, the total amount of e-waste generated is the driving element.

As for the total e-waste, Brazil and Mexico show the highest amount of discarded mobile phones and fixed phones, mainly due to the size of their populations rather than per capita disposal rate (kg/person).

Figure 9

2014 mobile phone e-waste for a selection of LATAM countries

(in kt)



In the past, estimates of e-waste generated were mainly derived from simple correlation with GDP. For this report, e-waste arising for mobile phones and fixed phones was derived using the sales lifespan approach, which is consistent with internationally accepted definitions of e-waste statistics[11]. In this method, the sales were derived from trade statistics (COMTRADE database from the UN) and subjected to automated statistical routines as described in the UNU's first e-waste monitor[12].

This report mostly relied on European-derived lifespans, which included the dormant time of the device prior to discarding it. In other countries, the lifespan of mobile phones could deviate significantly and lead to error. Also, the time series of the sales could contain errors. In order to estimate the error range for mobile phones, three scenarios are calculated for e-waste generated. In the first scenario, the e-waste generated is calculated with the European lifespans. In the second scenario, the lifespans are adjusted within ±30 per cent range of European lifespans, such that the stock levels match more closely with the penetration rate of mobile phones published by ITU. Most stock levels could be fitted within the 30 per cent range, indicating that the sales and lifespans are comparable with each other. In the third scenario, the lifespans can be adjusted to any value, such that it best fits the stock.

[11] BALDÉ, C.P ET AL., E-WASTE STATISTICS: GUIDELINES ON CLASSIFICATIONS, REPORTING AND INDICATORS, UNITED NATIONS UNIVERSITY, IAS – SCYCLE, BONN, GERMANY, 2015
[12] BALDÉ, C.P., ET.AL, THE GLOBAL E-WASTE MONITOR – 2014, UNITED NATIONS UNIVERSITY, IAS – SCYCLE, BONN, GERMANY, 2015

3 Policy recommendations for e-waste regulations in LATAM

Four main elements need to be considered in the context of policy development when it comes to e-waste:

E-waste often contains materials that are considered toxic, which are potentially harmful to environmental and human health.

In some cases, the costs of proper collection and recycling of e-waste may exceed the revenues generated from the recovered materials. This is primarily due to the complexity of product design and the difficulty of separating highly commingled materials.

The extension of equipment's life-time might be affordable in the case of some products to lower the enormous ecological footprint through production and make it also available for some, which cannot afford brand-new products.

E-waste contains valuable and scarce materials, and recovery of these materials as secondary resources can alleviate some mining of virgin materials.

IN SOME CASES, THE COSTS OF PROPER COLLECTION AND RECYCLING OF E-WASTE MAY EXCEED THE REVENUES GENERATED FROM THE RECOVERED MATERIALS

This is why a proper financing mechanism, tailored to the national context, needs to be defined first and enforced afterwards. Activities carried out along the recycling chain are sometimes remunerated by the revenues generated, but in the majority of cases, they are not.

All these elements cannot be de-coupled from a national or regional assessment of recycling infrastructures available for proper collection, pre-processing and end-processing of e-waste and resulting fractions.

A proper financing scheme should be developed to ensure a nation's e-waste is properly treated and the societal benefits are maximised. Revenues generated by proper recovery of material may not suffice.

3.1 Approaches around the world

Financing e-waste management activities and allocation of economic responsibilities along the downstream chain has proven to be challenging in countries with existing e-waste management schemes and in countries discussing potential take-back system architectures. The way stakeholders financially contribute to different activities varies, and many models exist. From a broader perspective, there are three main stakeholders who could bear financial responsibility for EoL management of any kind of e-waste:

- **ENTIRE SOCIETY:** As e-waste is a societal problem that not only impacts consumers but also on the entire population (both in terms of environmental and societal impacts), e-waste management systems could be financed by the entire society (i.e., by taxpayers). This is usually the case for municipal solid waste, especially when governmental (central or local) organizations control waste management operations.

- **E-WASTE HOLDERS:** This could be seen as an implementation of the "polluter pays principle" (PPP), where the "polluter" is the person responsible for discarding the waste. This is usually the case for non-household waste, where companies are held responsible for handling their waste produced or where citizens are charged directly on the basis of the actual waste generated and disposed of.

- **PRODUCERS:** This is the implementation of the EPR principle. Introduced in 1990 by T. Lindquist, nowadays the OECD[13] defines EPR as "an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle".

Apart from a few examples, like the systems in Japan and California, most e-waste policy around the world is implemented based on the EPR principle.

EPR theory

The fundamental idea behind EPR as a policy principle is to provide an economic incentive to producers in order to take into account environmental considerations when designing and manufacturing their products, so that waste management can be improved.

The logical reasoning and the economic incentive behind the concept is the idea that producers, through eco-design, could create products that last longer and are more easily recycled after use, thus reducing the waste management cost for the producer.

EPR practice

From a practical and operational perspective, the EPR principle aims to shift part of the waste management responsibilities (administrative, financial and/or physical) from governments or municipalities (and thus taxpayers) to the entities that produce and sell the products that are destined to become waste.

From a theoretical perspective, the EPR principle also represents a fundamental shift in the paradigm of the PPP, where the consumer disposing of the waste is no longer seen as the actor triggering waste management needs; instead, the economic agent making profit on the production and sale of the product (i.e., the producer) is encouraged to take a broader role.

For EPR-based e-waste management systems, a proper definition of the "producer" is imperative. The definition should not only refer to the manufacturer or the brand of the individual product, but should include all the entities locally producing, assembling or importing new or used EEE that is sold on the national market.

[13] OECD, EXTENDED PRODUCER RESPONSIBILITY: A GUIDANCE MANUAL FOR GOVERNMENTS, OECD, MARCH 2011.

3.2 Legislative framework for e-waste management in LATAM

In 2015, a joint report[14] from various UN organisations (ITU, 2015) provided a comprehensive overview of the regulatory and operational context for e-waste management in LATAM.

The analysis, conducted in collaboration with the governmental representatives of the countries of the region, shed light on the existence of specific regulations for e-waste management, the current recycling infrastructure and the presence of organised systems for e-waste management.

In addition to various initiatives in place nationally and occasionally internationally (such as RELAC - Plataforma Regional de Residuos Electrónicos en Latinoamérica y el Caribe), LATAM is expected to start a project coordinated by UNIDO involving most countries in the region (Argentina, Bolivia, Chile, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Peru, Uruguay and Venezuela).

The project is expected to be funded by the Global Environment Facility (GEF), national agencies and the private sector, and will aim to provide technical advice on policies, operations, law, technology and awareness of e-waste.

This will help to strengthen policies and the training of technicians and officials, and develop information and awareness on the subject at national level.

From a general perspective, a few elements are important to highlight:

• The majority of LATAM countries already ratified the Basel convention in 1990 and have general waste management legislation in place. Waste management is sometimes referred to in national constitutions as well.

• Only a few LATAM countries currently have specific bills on e-waste management in place. In the majority of cases, e-waste management is regulated under general hazardous waste legislation, and specific policy bills or technical guidelines are currently being discussed, going through the legislative process or being implemented.
It should be observed that waste holders are usually financially responsible for waste management under general hazardous waste bills, and the EPR principle is not generally implemented. A fundamental shift is thus expected, and an adequate legislative framework should support the development of sufficient systems for e-waste management, taking into account the individual challenges of different waste streams.

• Basic e-waste management and recycling infrastructure exists in the region, where it is mainly linked to metal scrap processing, but development of individual and specific e-waste processing facilities is expected to grow in the coming years. In many countries, pre-processing facilities are still mainly performing manual dismantling. EoL-processing or disposal options for some of e-waste's critical fractions are lacking, and thus most of these fractions are exported, processed using rudimentary processes and low yields, or disposed of.

BASIC E-WASTE MANAGEMENT AND RECYCLING INFRASTRUCTURE EXISTS IN THE REGION, WHERE IT IS MAINLY LINKED TO METAL SCRAP PROCESSING, BUT DEVELOPMENT OF INDIVIDUAL AND SPECIFIC E-WASTE PROCESSING FACILITIES IS EXPECTED TO GROW IN THE COMING YEARS.

[14] GESTION SOSTENIBLE DE RESIDUOS DE APARATOS ELÉCTRICOS Y ELECTRÓNICOS EN AMÉRICA LATINA, ITU ET. AL, 2015. APPLIES FOR ALL THE COUNTRIES.

National e-waste legislation and e-waste generated

Table 12

Status of ratification of the Basel convention by countries of LATAM and the amount of e-waste in the country in 2014.

Country	Basel Convention ratification*	Total e-waste generated (kt)	Specific national e-waste legislation
Argentina	1991	292	In development
Bolivia	1996	45	In development
Brazil	1993	1412	Yes
Chile	1992	176	In development
Colombia	1996	252	Yes
Costa Rica	1995	36	Yes
Dominican Republic	2000	58	In development
Ecuador	1993	73	Yes
El Salvador	1991	30	In development
Guatemala	1995	55	In development
Guyana	2001	5	No
Haiti	N.A.	6	—
Honduras	1995	16	In development
Mexico	1991	958	Yes
Nicaragua	1997	11	In development
Panama	1991	31	In development
Paraguay	1995	34	No
Peru	1993	148	Yes
Suriname	2011	5	No
Uruguay	1991	32	In development
Venezuela	1998	233	In development

YES / IN DEVELOPMENT / NO: Specific national e-waste legislation

Total e-waste generated(kt)

*Basel Convention ratification

3.2.1 Argentina

In Argentina, some provinces have specific legislation on e-waste (e.g., the Buenos Aires area since 2011). A national legislative framework for e-waste has been discussed in parliament for a few years.

The country's general waste management principles are in line with the Basel Conventions principles, and the Constitution itself defines for all citizens the right to a healthy and balanced environment suitable for human development, calling on authorities to provide for the enforcement of this provision and increase awareness and education.

Recently, various initiatives have been launched, and they will contribute to move forward. These include:

- The incentive programme "Renovate", which encourages retailers to ensure no-cost take back from consumers and transfers waste EEE to operators for decontamination, dismantling and recovery;

- Research from the National Institute of Industrial Technology (INTI) and joint projects with municipalities and civil society are setting up e-waste processing plants, which could eventually be managed by work cooperatives; and

- Campaigns and seminars from the national government and programmes led by the Ministry of Education are spreading awareness of computer refurbishment to be used in public schools. In addition some foundations offer training programmes to urban recyclers.

3.2.2 Bolivia

Bolivia does not have specific regulations on e-waste, but a specific working group with representatives from the public and private sectors and various ministries has been created. The aim of the task force is to develop national technical standards for e-waste management.

Currently, the country has no formal recycling initiatives, although it has carried out several recycling campaigns to raise awareness about e-waste management. There are several associations and private companies engaged in the disposal of waste EEE, mainly through manual dismantling.

3.2.3 Brazil

In Brazil, a national law has been published that sets a national framework for e-waste management, which in some provinces is complemented by specific policies enacted by local governments. In addition, legal framework guidelines for separate collection of e-waste exist.

Some dedicated companies for e-waste treatment are present in the country. Some are operating with manual dismantling, but some extensively use mechanical semi-automated processes. Many of the fractions that result from pre-processing are also sent to end-processing options on the local market, including lead-containing glass, batteries and mercury-containing lamps.

3.2.4 Chile

Chile has not yet published a bill on e-waste. E-waste is being treated in the context of hazardous waste legislation, but a specific bill on e-waste based on EPR is in development.

Though the country lacks specific e-waste legislation, a few recycling companies are certified to recycle e-waste, mainly through manual disassembly and critical fraction export.

In recent years, given the active work of RELAC, the country has carried out various initiatives, awareness raising campaigns and pilot schemes, including voluntary participation from some producers of EEE.

3.2.5 Colombia

Colombia published a specific regulation on e-waste based on EPR in 2013, but the full legislative process is ongoing and is expected to be finalised soon. The bill is complemented by existing regulations on lamps and batteries.

Compliance schemes for management of certain e-waste streams (mainly PC and peripherals, lamps and batteries) are being set up to ensure nationwide e-waste management. Recycling infrastructure mainly uses manual disassembly in the pre-processing phase and subsequent export for end-processing of critical fractions.

3.2.6 Ecuador

Ecuador has national regulations for hazardous waste based on waste holder responsibility, which formerly provided the legal framework for e-waste management. In 2013, specific e-waste regulation was introduced under the umbrella of the EPR principle, including specific management guidelines inspired by the applicable broader environmental legislation.

In addition, specific bills for handling discarded mobile phones were introduced in 2012. Importers and producers are requested to submit their discarded mobile phone management plans and report on the results achieved. This gives them an extra allowance on import permits according to the defined quota. Currently, the quota is 2.5:1, meaning that for every five discarded phones handled, the importer is allowed to introduce two additional new phones onto the market, on top of the original allowance.

3.2.7 Paraguay

Despite having a general waste management legislative framework in place, Paraguay does not have a specific bill on e-waste. There is a general lack of awareness about e-waste management, and this leads the majority of e-waste generated to landfill.

Recent studies have highlighted that e-waste is probably assimilated to solid waste in Paraguay, in general.

3.2.8 Peru

Peru has a specific bill for e-waste management that addresses the responsibilities of various actors involved along the entire value chain and is complemented by the nation's general waste management regulations.

Since 2010, public campaigns have been developed to increase public awareness and stimulate e-waste collection in some cities (Lima, Callao, Huancayo, Trujillo and Arequipa).

It should be highlighted that various initiatives involving international stakeholders are currently developing e-waste management under the EPR umbrella in order to meet the challenging target set by the Ministry of Environment. The challenge sets a goal of ensuring that by 2021,[15] 100 per cent of solid waste generated will be recycled and disposed of properly.

In addition, a new bill[16] was published in August 2015, setting specific targets for e-waste arising from consumer electronics and ICT. The target is calculated on the basis of appliances placed on the market, and increases from 4 to 16 per cent over five years.

3.2.9 Uruguay

Despite its general regulations on environmental protection and waste management, Uruguay does not have a specific bill on e-waste management, though there have been some on-going activities promoted by the government and public institutions. A working group at the ministerial level is currently developing e-waste policy bills under the umbrella of EPR principle with support from an international expert.

As in its neighbouring countries, local processing of e-waste is mainly conducted through manual disassembly and recovery of basic metals, and the majority of fractions are exported. Few voluntary programmes for management of certain e-waste products exist (mainly mobile phones and PC).

3.2.10 Venezuela

Despite the presence of general regulations on environmental protection and waste management, Venezuela does not have a specific bill on e-waste management, though the general regulations do refer to the topic. An e-waste-specific bill is expected to be developed soon under the EPR umbrella in the context of wider review of international standards and national legislation.

Few e-waste processing operators, who mainly conduct manual pre-processing, exist in the country. Capacity building and training for e-waste management is being implemented via online courses and awareness-raising campaigns, which will soon be launched by the central government.

[15] PERU MINISTRY ENVIRONMENT: NATIONAL ENVIRONMENTAL ACTION PLAN 2011-2021(PLANAA).
[16] RESOLUCIÓN MINISTERIAL N° 200-2015-MINAM

Adequate and targeted awareness campaigns need to be created by public authorities, with support from manufacturers, service providers, retailers and municipalities to teach consumers about their fundamental role in the recycling chain.

3.3 Overall recommendations on policy design, particularly for mobile phones

The previous chapters identified the key societal challenges for e-waste management and the current legislative framework in LATAM, but there are other elements that need to be considered, particularly regarding mobile phone characteristics and the e-waste recycling chain, including: When informal treatment occurs on different e-waste streams, the goal is usually to target to target metals metals carrying economic value (mainly copper, sometimes gold). This is done through rudimentary manual disassembly and in the worst cases, some end-processing (targeting copper and gold from printed circuit boards) occurs via rudimentary hydro-metallurgical (acid bath) or pyro-metallurgical (burning/heating) approaches with poor yield and severe environmental and human health consequences. In the case of mobile phones, given the size and the design of the product itself, it is more difficult to access the elements/fractions that carry economic value, which is mainly represented by the printed circuit board. Alternative sources of revenue are linked to component harvesting for refurbishment, especially where the refurbishment and reuse markets are particularly developed.

The real challenge for properly processing mobile phones is collecting them when they reach EoL. Due to their small size, they might be easily discarded with unsorted waste or, because of the perceived value or for personal reasons, people tend not to recycle them, but keep them at home. Alternatively, especially when trying to receive compensation for the discarded products, consumers prefer to resell them or dispose of these items through refurbishment channels. This all means that it is quite difficult, even across the EU where the WEEE Directive has been in place for more than 10 years, to find mobile phones at e-waste collection points or recycling plants, even though the potential number of products discarded is substantial[17]. This is one element that may hamper policies like Ecuador's, which relate to quotas. EoL mobile phone collection proves to be quite challenging around the world, and consumer engagement is the key.

Compared to all other e-waste streams, mobile phones are much richer in intrinsic material content. Particularly for mobile phones, the maximisation of material recovery, both from an economic and a critical metals perspective, can only be achieved when proper treatment and end-processing takes place. Maximising precious metal recovery can mitigate the need for e-waste management financing in the EPR context only when flows follow routes that lead to higher recovery rates of valuable materials. From a strategic perspective, end-processing options for key components and fractions that contain critical metals should again be prioritised over the recovery of only a few metals. Integrated copper melters[18] that recover a higher number of critical materials, normally using pyro-metallurgical approaches, are nowadays located only in Europe and North America. When fractions or products are sent as waste to these plants for proper recovery, transboundary shipments should take place according to Basel Convention rules.

It is crucial, particularly for mobile phones, to develop policies that aim to integrate several stakeholders in the e-waste management process. Particularly important is the development of proper campaigns by public authorities to ensure that consumers are handing over EoL mobile phones in dedicated collection points or systems. The disposal phase of any product is ultimately a consumer action, and despite EPR principles, the main leverage here is consumer awareness of their role in the recycling chain. In addition, for all the flows entering the material recovery option (thus not considering eventual reuse and refurbishment loops), it is crucial to ensure components rich in key and precious metals, including batteries, are being treated with the aim of maximising the recovery of key metals. Maximisation of processing yields and an increase in the znumber of metals recovered should guide the development and enforcement of recycling standards, both in terms of treatment operations and downstream channelling of fractions through national and international markets.

[17] DEFRA, TRIAL TO ESTABLISH WEEE PROTOCOLS, 2007. DURING THE SAMPLING CAMPAIGN OF WASTE COLLECTED IN CIVIC AMENITY SITES, OUT OF APPROXIMATELY 125T OF MATERIAL SAMPLED AND WEIGHED (MORE THAN 16,000 ITEMS) ZERO MOBILE PHONES WERE FOUND. MAGALINI ET. AL, HOUSEHOLD WEEE GENERATED IN ITALY: ANALYSIS ON VOLUMES & CONSUMER DISPOSAL BEHAVIOUR FOR WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT, 2012. IN SAMPLING CAMPAIGN FROM WASTE COLLECTED FROM MUNICIPALITIES AND DELIVERED TO RECYCLING PLANT LESS THAN 0,08% IN WEIGHT WAS REPRESENTED BY MOBILE PHONES.

[18] UNEP, METAL RECYCLING: OPPORTUNITIES, LIMITS, INFRASTRUCTURES,2013.

4 Conclusions

Modern society and the lifestyle of a growing part of Earth's population are relying more and more on electric and electronic products. This is happening not only in developed countries, but also increasingly in developing countries and growing economies. The use of modern ICT can contribute to achieving some of the Sustainable Development Goals and enable transition to more efficient use of resources, generating key societal benefits.

The increase in demand for EEE is also impacting resource consumption on a global level, both for production and usage. This is especially so for some of the metals used in modern electronics, ICT, and mobile phones in particular. In many instances, the metal uses are intimately connected with modern functionalities delivered. In the case of some metals, such as cobalt and palladium, the mobile phone industry alone is responsible for more than 10 per cent of annual global production consumption. As a result of the increase of EEE production and use, the amount of discarded electronics is also growing worldwide, reaching more than 40 million tonnes of electronic products discarded in 2014, nearly 4 million tonnes of which were discarded in LATAM.
This amount is expected to grow in coming years (2015-2018), with an annual average rate of 4.5 per cent growth worldwide, and 5.3 per cent growth projected for Latin America. For mobile phones in particular, 189 kt were discarded worldwide and 17 kt were discarded in LATAM in 2014. This amount is expected to grow in coming years (2015-2018) with an average rate of 6.6 per cent global growth rate, and a 3 per cent growth rate for LATAM.

For these reasons, e-waste collection and proper treatment have become a societal imperative in every nation on Earth, because these initiatives:

- Can contribute to a reduction of environmental impact of improper disposal of e-waste, reducing the potential consequences for the environment and human health. These impacts not only affect workers who are potentially exposed to harmful recycling operations, but also society at large.
- Can create new entrepreneurial opportunities in the waste management sector and enable new job opportunities, especially in growing economies. Informal sectors can also be integrated into the collection phase.
- Can re-introduce critical resources needed for new EEE manufacturing into production cycles according to the paradigms of circular economy, if a proper recycling chain is designed.
- Can further close the digital divide by providing access to re-usable equipment for those who cannot afford brand new equipment.

The third element is critical for

ESTABLISHMENT OF PLATFORMS FOR COORDINATED DISCUSSION WITH ALL STAKEHOLDERS IN THE ENTIRE CHAIN SHOULD BE PROMOTED AND ENCOURAGED

mobile phones and modern ICT, taking into account the extensive use of critical metals and the technological complexity of recovery. But there are key aspects that need to be considered, such as:

- Adequate and targeted awareness campaigns need to be created by public authorities, with support from manufacturers, service providers, retailers and municipalities to teach consumers about their fundamental role in the recycling chain. Small ICT devices kept at home, even when no longer used, are holding back natural resources from potential recycling processes. An even worse scenario is represented by the improper disposal of these items with unsorted municipal waste or with other metal scrap, as this might permanently preclude the opportunity of proper recovery of critical materials.
- The separate collection of mobile phones is the first, fundamental step in the recycling chain, but societal benefits of e-waste, and mobile phone recycling in particular, can only be achieved if collected e-waste is channelled into the best treatment options. Efficiency in the recovery process is particularly important for metals that are extensively used in modern electronics, such as gold, silver, palladium and cobalt. The intrinsic economic potential and the environmental benefits of recycling can be exploited only when efficiency is achieved across all steps of the recycling chain.

The role of policy and government in these scenarios is critical; legislative framework should enable effective operations for take back and recycling. This should support long-term cost-effectiveness of an EPR-based system through fair competition between logistics providers and recyclers.

However, a sound legislative framework that clearly addresses the roles and responsibilities of all stakeholders involved in the e-waste recycling chain, including consumers and civil society, can only work when the responsible authorities ensure active enforcement.

Based on the figures presented in this report and the experience of GSMA members in the region, the following activities are proposed:

- Collaborate with competent authorities and key stakeholders in the region to promote, design and implement policies, standards, regulations and programmes for effective e-waste management based on the EPR principle.
- Foster the establishment of platforms for coordinated discussion with all stakeholders involved in the entire chain should be promoted and encouraged, involving manufacturers, importers, distributors, and e-waste collection and recycling companies.
- Engage consumers and promote e-waste management programmes and campaigns that highlight the societal opportunities related to reuse and recycling of products, particularly from a resource management perspective. Campaigns must also include transparent and effective information on best practices and success cases in the region.
- Develop and adopt standards and procedures for effective e-waste management from an environmental and health and safety perspective, reducing possible risks.

Other relevant publications

eWaste in Colombia 2015
February 2015,
GSMA Latin America

eWaste in Latin America 2014: The contribution of mobile operators in reducing electronic waste
May 2014,
GSMA Latin America

Mobile Economy Latin America
November 2014,
GSMA Intelligence

Digital Inclusion and Mobile Sector Taxation in Mexico
August 2015,
Deloitte

Key Considerations in Mobile Spectrum Licensing Latin America
March 2015,
Ovum

Licence Renewal in Latin America
February 2014,
GSMA Latin America

WE CARE

Working together to provide a safer and more reliable mobile experience

The ‘We Care’ campaign is a regional programme in which mobile operators in each country carry out initiatives to provide users with a safer and more reliable environment. Through a variety of actions, operators collaborate with government and regulatory authorities and non-profit civil associations to address social problems, taking advantage of the ubiquity of mobile technology.

Protecting the environment is one of the key elements of the ‘We Care’ campaign. GSMA is working hand in hand with the mobile industry to launch and support initiatives for appropriate collection and management of electronic waste (e-waste) in Latin America. The GSMA is also working on awareness campaigns to help mobile device users understand their essential role in e-waste recycling programmes.

For more information visit www.gsmala.com/wecare

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