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Decent work in the management of electrical and electronic waste (e-waste)

Sectoral Policies Department

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Issues paper for the Global Dialogue Forum on Decent Work in the Management of Electrical and Electronic Waste (E-waste)
(Geneva, 9–11 April 2019)

Geneva, 2019

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Contents

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Background

At its 329th Session (March 2017), the Governing Body of the International Labour Office decided that a Global Dialogue Forum on decent work in the management of electrical and electronic waste (e-waste) would be held in Geneva. During its 334th Session (October–November 2018), it decided that the date of the meeting would be 9–11 April 2019 and that all interested governments should be invited. Eight Employer and eight Worker participants would be appointed on the basis of nominations made by their respective groups in the Governing Body, and selected intergovernmental organizations and non-governmental organizations would be invited as observers.

The purpose of the Global Dialogue Forum is to discuss current and emerging issues and opportunities related to the promotion of decent work in the management of e-waste, with the aim of adopting points of consensus, including recommendations for future action by the International Labour Organization (ILO) and its Members. Taking place in the centennial year of the ILO, the Forum is also an opportunity to discuss more broadly the future of work in the circular economy.

1. An overview of e-waste

1. E-waste constitutes a small but growing part of the approximately 2.01 billion metric tonnes of solid waste that are generated globally each year. [1] However, it differs from the waste streams of glass, paper, wood and other materials, in that used electrical and electronic products contain hazardous substances as well as valuable materials, and hence require special treatment.

2. The growth in e-waste is amplified by growing demand for electronic and electrical equipment. It has been estimated that by 2020, approximately 50 billion devices will be connected to the internet. [2] That is more than six times the number of people on the planet today.

3. This demand is fuelling a competitive and dynamic global electronics industry, which in 2010 was estimated to employ 18 million women and men globally. Decent work challenges and opportunities in the industry – from the extraction of raw materials, to the manufacturing of electrical and electronic products, through to the management of e-waste – have been the subject of several ILO reports.

1.1. Defining e-waste

4. E-waste has been defined in many ways and is also referred to by other names, such as e-scrap or waste electrical and electronic equipment.

5. At its 12th meeting in 2015, the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal ("Basel Convention") adopted technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, which contain the following definition: "Electrical or electronic equipment that is waste, including all components, sub-assemblies and consumables that are part of the equipment at the time the equipment becomes waste". [3]

6. The Solving the E-Waste Problem programme hosted by the United Nations University defines e-waste as "all types of electrical and electronic equipment (EEE) and its parts that have been discarded by the owner as waste without the intention of re-use". Items qualify for inclusion if they have "circuitry or electrical components with power or battery supply". [4]

7. Directive 2012/19/EU of the European Parliament and of the Council defines e-waste as electrical and electronic equipment, "including all components, sub-assemblies and

[1] S. Kaza et al. (eds): *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050* (Washington, World Bank Group, 2018).

[2] S. Taylor: "10 Predictions for the Future of the Internet of Things", Cisco blog, 3 June 2015.

[3] *Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention,* Appendix I (United Nations Environment Programme, June 2015).

[4] United Nations University (UNU)/StEP Initiative: *One Global Definition of E-waste* (Bonn, 2014).

consumables which are part of the product at the time of discarding". The Directive covers the following six categories of electrical and electronic equipment:

(i) temperature exchange equipment;

(ii) screens and monitors;

(iii) lamps;

(iv) large equipment (any external dimension more than 50 cm), such as household appliances, information technology and telecommunications equipment, and electrical and electronic tools;

(v) small equipment (no external dimension more than 50 cm), such as household appliances, luminaires, musical equipment and toys; and

(vi) small information technology and telecommunications equipment (no external dimension more than 50 cm).

8. Materials considered as e-waste in one country, however, may not be considered e-waste in another country. Indeed, in some countries, e-waste is often narrowly defined simply as electronic waste, whereas in other countries, it comprises both electronic and electrical waste. [5] Furthermore, definitions of e-waste often exclude certain products which contain electronic or electrical components. Cars, for instance, are not covered, despite the fact that they contain many different kinds of electrical and electronic components.

9. The term "e-waste" itself can be misleading, since it overlooks the inherent value of the discarded products. In 2016, the total global value of all raw materials in e-waste – including gold, silver, palladium, copper, aluminium and iron – was estimated at €55 billion. [6]

1.2. Approaches to e-waste

10. Since the 1990s, the discussion of e-waste has focused on actual and potential environmental damage, on major risks to human health, workers and communities, and on the flows of e-waste from developed to developing countries. Past policy recommendations have overwhelmingly focused on the introduction of environmental legislation and regulation. However, there is growing recognition of the key role of labour market policies and of enterprises, cooperatives, employers, workers and ministries of labour or employment in advancing decent work in the management of e-waste.

11. There is also growing recognition that the prevailing linear model of "take, make, use and dispose" generates waste that could and should be reduced throughout the life cycle of electronic and electrical products. If such products are designed to last longer, and if more e-waste is recovered, reused and recycled throughout the life cycle, there will be less demand for virgin materials and less waste will be generated from the extraction of raw materials, packaging and transport (figure 1).

[5] ibid.; C.P. Baldé et al.: *E-waste statistics: Guidelines on classifications, reporting and indicators* (Bonn, UNU, 2015).

[6] C.P. Baldé et al.: *The Global E-waste Monitor 2017: Quantities, Flows, and Resources*, (UNU/ITU/International Solid Waste Association, 2017), p. 54.

Figure 1. A typical product life cycle

Source: A. Remmen et al.: *Life Cycle Management: A Business Guide to Sustainability* (Paris, UNEP, 2007), p. 12.

12. Moreover, if a circular economy approach is applied (see circle 1), e-waste can be seen as a resource that, if properly managed, can support livelihoods, generate employment, provide access to technology, enable technological upgrading, skills and knowledge transfer, and provide capital to produce second-hand commodities and to recover materials. [7]

Circle 1: The circular economy

The "circular economy" includes activities such as recycling, repair, rental and remanufacture. It replaces the traditional linear model of "extract, make, use and dispose". Embracing the circular economy reduces material extraction and waste generation. It can also be a source of job creation and re-creation and can result in net job gains: it has been estimated that embracing a circular economy would create 6 million new employment opportunities across the world.

Source: ILO: *World Employment and Social Outlook 2018: Greening with jobs* (Geneva, 2018)

[7] J. Lepawsky: "The changing geography of global trade in electronic discards: time to rethink the e-waste problem", in *The Geographical Journal* (Vol. 181, No. 2, June 2015); S. Laha: "(In) formality in E-waste Movement & Management in the Global Economy" (2015).

13. With the adoption of the 2030 Agenda for Sustainable Development, the issue of e-waste management has become part of the broader quest for sustainability, including through sustainable production and consumption and shaping a future that works for all at all stages in the circular economy. Advancing decent work in the management of e-waste is key to the achievement of several Sustainable Development Goals (see figure 2), particularly Goal 8, "promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all". [8]

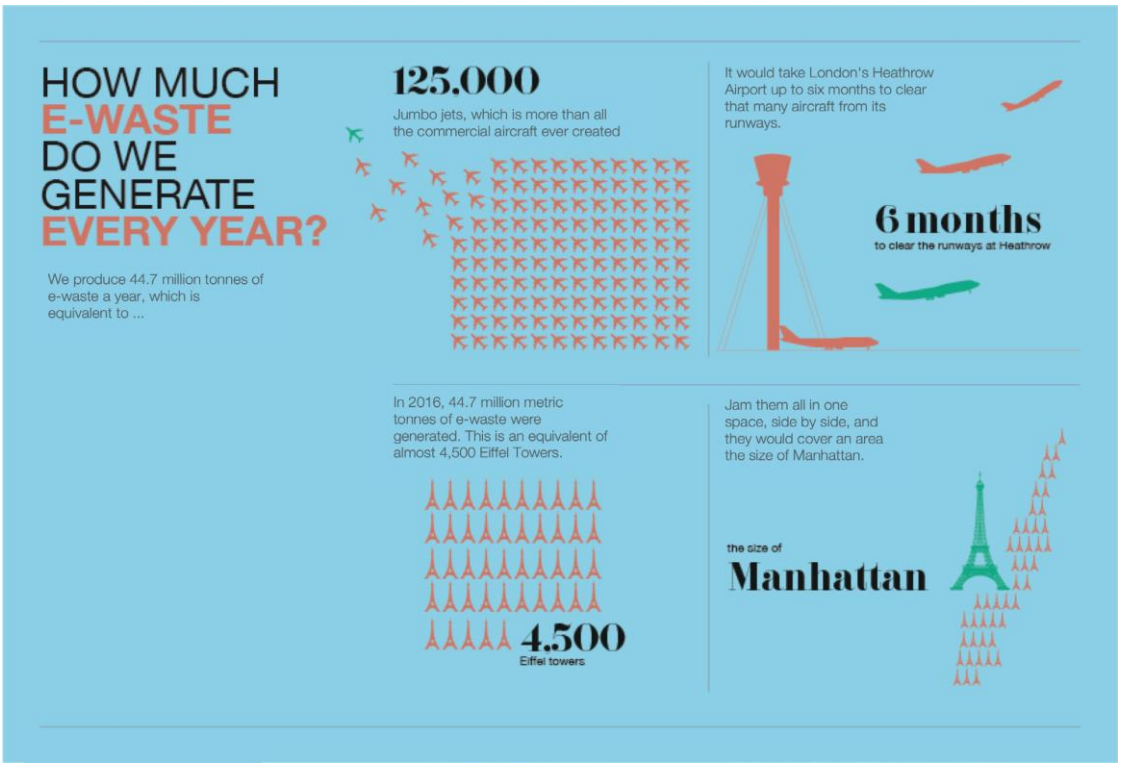
Figure 2. E-waste management key to the achievement of Sustainable Development Goals

[8] For more information about the contribution that e-waste management can make to the Sustainable Development Goals, see Baldé et al.: *The Global E-waste Monitor 2017*, op. cit.

1.3. Generation of e-waste

14. E-waste is generated by both the public and private sectors and by individual consumers. In 2016, a total of 44.7 million tonnes of e-waste was generated globally (see figure 3).

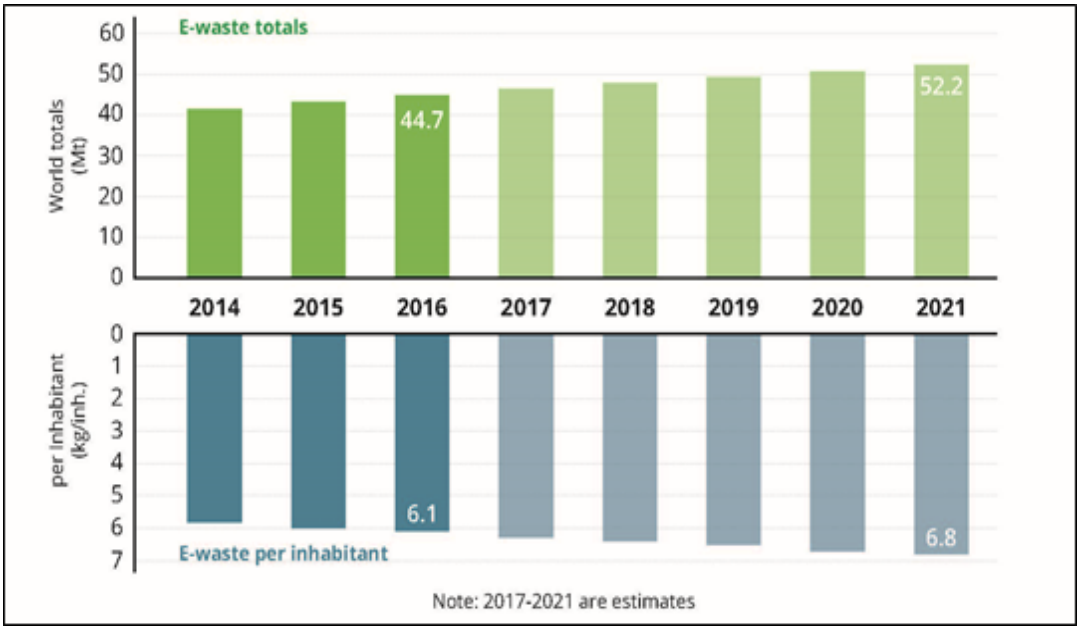
Figure 3. E-waste generated globally



Source: G. Bel et al.: *A New Circular Vision for Electronics: Time for a Global Reboot* (Geneva, World Economic Forum, forthcoming).

15. E-waste is the fastest-growing waste stream. It is expected to grow to 52.2 million tonnes by 2021, at an annual growth rate of between 3 and 4 per cent (see figure 4).

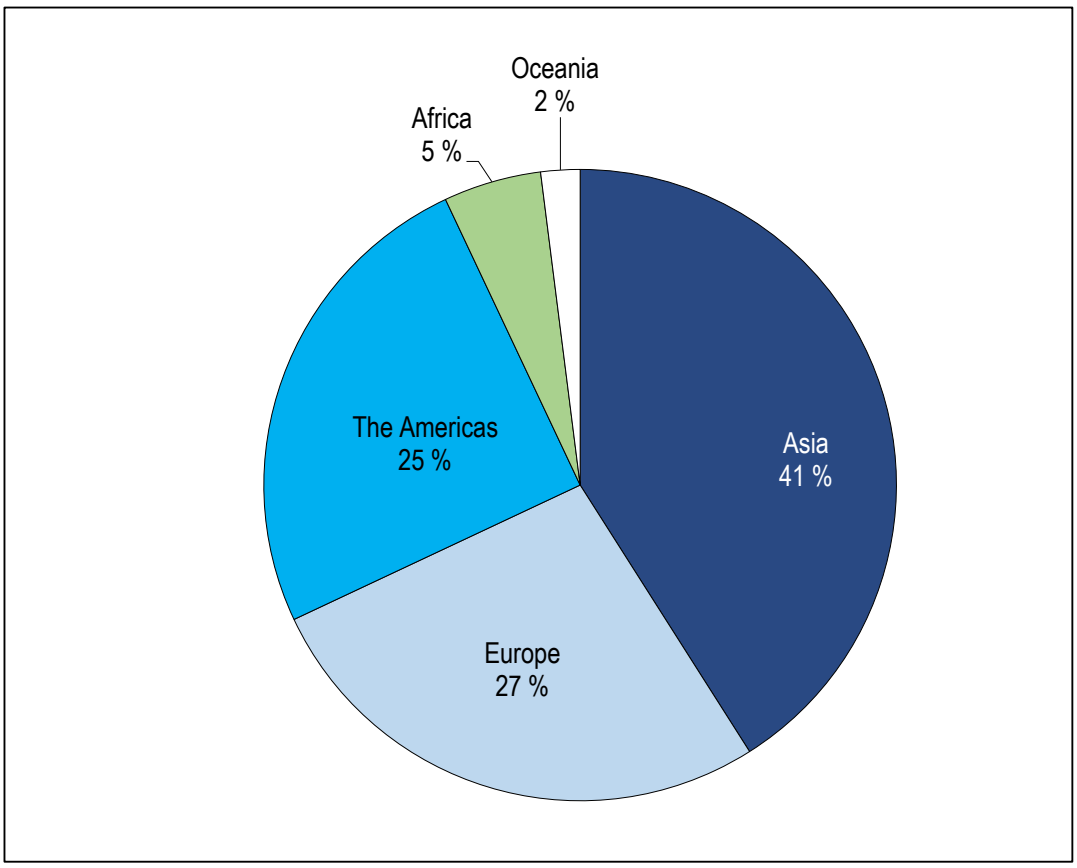
Figure 4. Actual and projected growth in global e-waste generation



Source: Baldé et al.: *The Global E-waste Monitor 2017*, op. cit., p. 5.

16. As shown in figure 5 below, most e-waste is generated in Asia (41 per cent), followed by Europe (27 per cent) and the Americas (25 per cent).

Figure 5. E-waste generated in 2016, by region

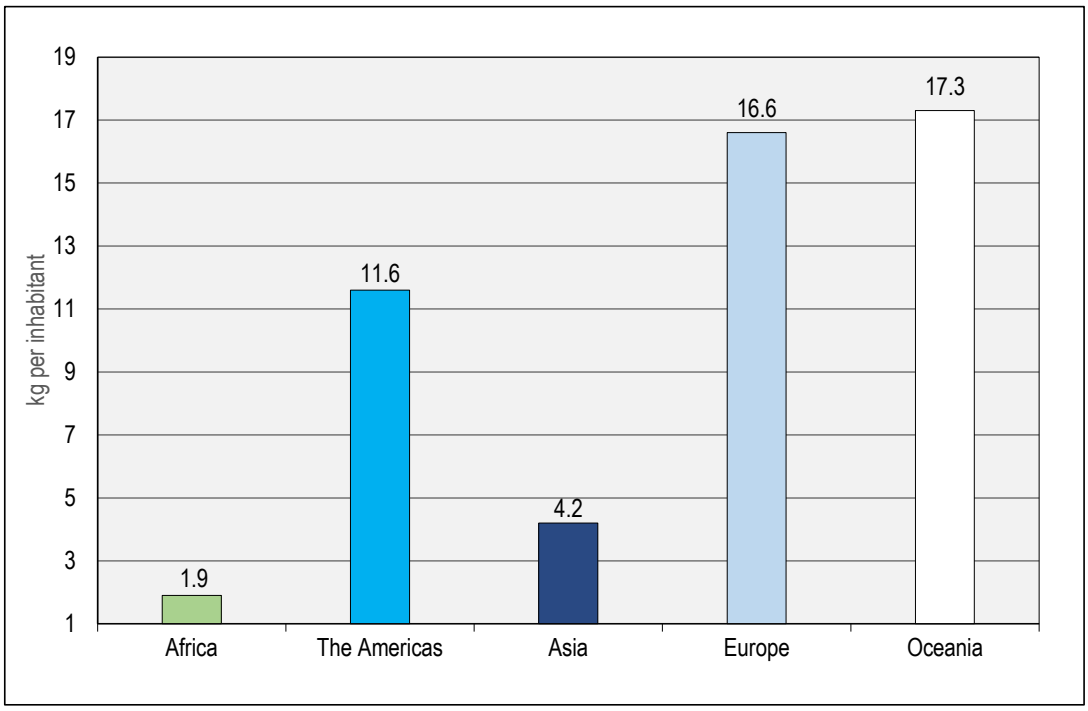


Source: ibid.

17. The picture changes when e-waste is measured per capita: inhabitants in Oceania [9] generated more e-waste per capita than in Europe, the Americas, Asia and Africa (see figure 6). This is a reflection of how individual consumers and also the public and private sectors in developed countries such as Australia and New Zealand generate more e-waste per inhabitant than developing countries.

[9] For the statistics discussed in this section, the Oceania region includes data from the following countries: Australia, Fiji, Kiribati, Federated States of Micronesia, New Zealand, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

Figure 6. E-waste generation per inhabitant by region (kg per inhabitant)



Source: ibid.

18. The aforementioned statistics about e-waste are limited by the fact that only 41 countries have collected data. Data is particularly lacking on the amount of e-waste generated, managed and traded. Furthermore, e-waste is commonly measured by weight, which does not indicate a given product's propensity for ecological harm. [10]

19. Finally, it should be noted that e-waste statistics do not generally account for the significant amount of waste and pollution that is generated when raw materials for the production of electronic and electrical products are extracted and transported, or when these products are manufactured, distributed and sold. The life cycle of a mobile phone is a case in point: extraction and production of raw materials generate 80 per cent of total greenhouse gas emissions, compared to 14 per cent from mobile phone use, and just 1 per cent from end-of-life treatment. [11]

1.4. Trade in e-waste

20. While earlier studies suggested that transboundary shipment from developed to developing countries was the major course of e-waste pollution, [12] recent studies have demonstrated that domestic generation of e-waste may be as significant, if not more so, than imports or exports.

[10] J. Lepawsky: *Reassembling Rubbish: Worlding Electronic Waste* (Cambridge (MA), MIT Press, 2018); M. Liboiron: "The Politics of Measurement: Per Capita Waste and Previous Sewage Contamination", Discard Studies, 2013.

[11] Lepawsky: *Reassembling Rubbish*, op. cit.; Liboiron, op. cit.

[12] J. Puckett et al.: *Exporting Harm: The High-Tech Trashing of Asia* (Basel Action Network, Silicon Valley Toxics Coalition, 2002).

In Africa, for instance, an estimated 50 to 85 per cent of all e-waste was domestically generated in 2010. [13]

21. Furthermore, e-waste flows are more dynamic than earlier reports suggested. Available statistics on waste and scrap of primary batteries and electrical accumulators, for instance, suggest that e-waste is flowing not only from developed to developing countries, but also between developed countries and from developing to developed countries. [14]

22. Cheap labour and low environmental standards are often cited as the only reasons for the export of e-waste to developing countries. However, it is also the case that some developing countries have developed the infrastructure and competencies necessary for the reuse and refurbishment of appliances. [15] Companies in such countries often actively import e-waste. [16]

23. While trade in e-waste is thus more complex than earlier studies suggested, it remains the case that a proportion of all the used electronic and electrical equipment that is traded in the world is illegal, in breach of either the Basel Convention (see section 3.1.2. below) or national laws. While little data exists on illegal trade, the Countering WEEE Illegal Trade project estimated that 1.3 million tonnes of e-waste had been exported undocumented from the European Union (EU), and that even more is either mismanaged or illegally traded within Europe. [17]

1.5. The e-waste value chain

24. Formal e-waste recycling is an important industry in many countries. In the United States, for instance, 4.4 million tonnes of e-waste were recycled in formal electronic recycling facilities in 2011. [18] When e-waste is collected and treated formally, it normally includes the following steps:

- collection: products are collected from public recycling centres, non-profit or community organizations, workplaces, public institutions or private sector companies;
- sorting and disassembly: a product is separated into its components and hazardous components are removed manually;

[13] Secretariat of the Basel Convention: *Where are WEee in Africa? Findings from the Basel Convention E-waste Africa Programme* (2011).

[14] Lepawsky: *Reassembling Rubbish*, op. cit.; Lepawsky: "The changing geography of global trade in electronic discards", op. cit.; J. Lepawsky and C. McNabb: "Mapping international flows of electronic waste", in *The Canadian Geographer* (2010, Vol. 54, No. 2); Laha, op. cit.

[15] Lepawsky: *Reassembling Rubbish*, op. cit.; F. Wang et al.: "The Best-of-2-Worlds philosophy: Developing local dismantling and global infrastructure network for sustainable e-waste treatment in emerging economies", in *Waste Management* (2012, Vol. 32).

[16] R. N. Reddy: "Reimagining e-waste circuits: calculation, mobile policies, and the move to urban mining in Global South cities", in *Urban Geography* (2016, Vol. 37, No. 1).

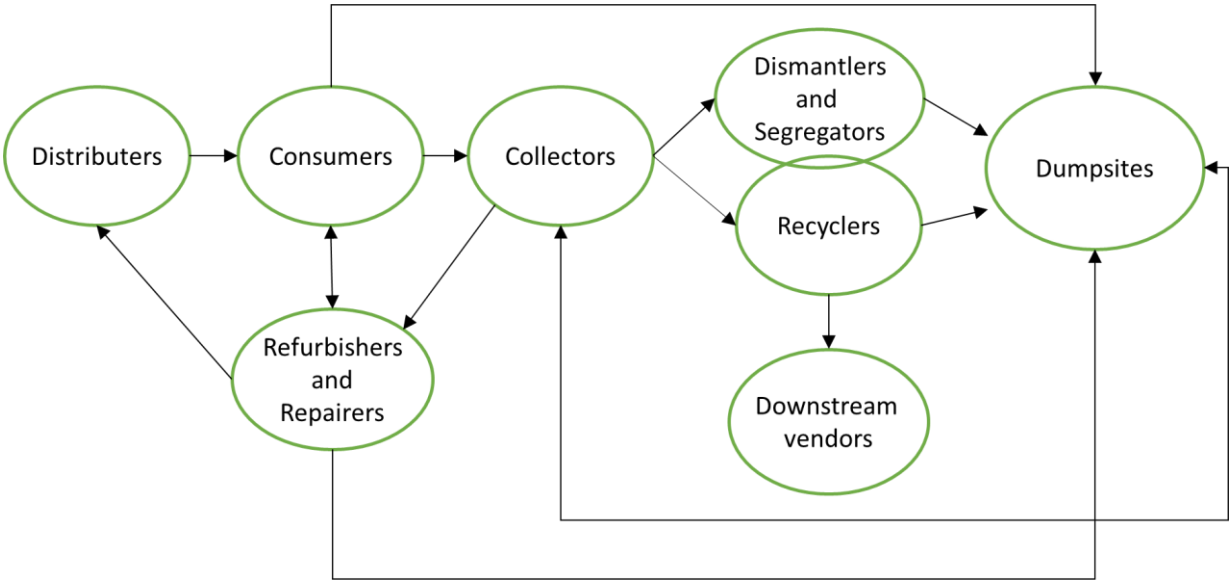
[17] J. Huisman et al.: *Countering WEEE Illegal Trade (CWIT) Summary Report, Market Assessment, Legal Analysis, Crime Analysis and Recommendations Roadmap* (Lyon, CWIT Consortium, 2015).

[18] Institute of Scrap Recycling Industries: *The Scrap Recycling Industry: Electronics* (2018).

- size reduction: products are broken down into relatively homogenous streams by mechanical and physical processes, and reusable and recyclable components are salvaged; and

- separation: the streams from the previous step are again separated and detoxified by thermal, chemical and metallurgical methods to recover materials.

Figure 7. A general structure of the informal value chain



Source: ILO analysis.

25. When e-waste is handled in the informal economy – as is the case in many developing countries, but also in developed countries – the value chain is complex, with multidirectional flows and many different actors (see figure 7 above). While informal e-waste value chains differ from one country to another, the detailed mapping that the ILO has carried out in Argentina, India and Nigeria suggests that there are some similarities in how the work is structured and organized:

- Distributers are entities that buy new and used electrical and electronic equipment from various sources domestically or overseas and sell the equipment to consumers directly.

- Consumers of new and used electrical and electronic equipment can be divided into three categories: individual, public and corporate consumers.

- Collectors go from door to door to buy or collect used electrical and electronic equipment, or they scavenge dumps for e-waste. Also referred to as waste pickers or scavengers, the majority operate in unsafe conditions in the informal economy, and many belong to disadvantaged groups or minorities.

- Repairers and refurbishers extend the lifetime of both new and used electrical and electronic equipment, which they sell for reuse, but they also generate e-waste from the equipment that cannot be repaired. They are among the better organized actors in the value chain, often specializing in the refurbishment of specific types of equipment.

- Dismantlers or segregators manually break down the used equipment that cannot be repaired to usable and marketable components and materials.

- Recyclers burn, leach and melt e-waste to convert it into secondary raw materials, which are sold to suppliers of manufacturing industries.

- Downstream vendors purchase the e-waste components that have been separated, dismantled and recovered by recyclers.

- All waste is co-disposed at dumpsites. Collectors scavenge dumpsites for e-waste and components finally discarded by the aforementioned actors are disposed on dumpsites.

26. The informal nature of activities and relationships in e-waste value chains necessitates trust and reciprocity between stakeholders. Social connections and allegiances play an important role in informal e-waste networks. [19] In Bangladesh, for instance, the work of traders is based on close personal networks, which extend to the Bangladeshi diaspora. [20]

27. While there are informal e-waste workers and employers in almost all countries, the work in e-waste value chains is generally more formalized in developed countries than in developing countries. The treatment of used electrical and electronic equipment in developed countries is capital-intensive and generally considered safer. However, because labour costs in these countries are high, and because the costs of manually dismantling and sorting often exceed the value of the materials, it has been observed that fewer products and components are recovered, repaired, refurbished and reused before they are destroyed and recycled than in developing countries. Conversely, in developing countries, where the labour costs associated with repair, refurbishment and dismantling are lower, there is a large second-hand market for used products and components, which means that they are generally used for a longer time before they are scrapped and recycled, albeit frequently in an unsafe way and with a negative impact on the environment. [21]

28. Recognizing the co-existence and characteristics of formal and informal e-waste value chains, the Solving the E-Waste Problem programme has developed a "best of two worlds" philosophy. The idea is to create a global network for more efficient and environmentally friendly management of e-waste, whereby it is manually dismantled in developing countries and then exported to state-of-the-art recycling facilities in developed countries. Proponents argue that workers in developing countries will acquire improved occupational health and safety and higher wages from manual dismantling, while refining facilities in developed countries will have access to high-quality and low-cost feedstock. Critics have countered that the approach still favours a collect-and-destroy approach over repair, refurbishment, repurposing and reuse, and in some instances may destroy the livelihoods of informal recyclers in developing countries. The "best of two worlds" debate highlights the complexity but also the necessity of applying a global perspective and systems approach to e-waste management and to shaping a future that works for all in the circular economy.

[19] Laha, op. cit.

[20] J. Lepawsky and M. Billah: "Making chains that (un)make things: waste–value relations and the Bangladeshi rubbish electronics industry", in *Geografiska Annaler Series B, Human Geography*, (2011, Vol. 93, No. 2).

[21] R. Kuehr and F. Magalini: *UNU & WHO Survey on E-waste and its Health Impact on Children* (UNU – Institute for Sustainability & Peace, 2013); K. Lundgren: *The global impact of e-waste: Addressing the challenge* (Geneva, ILO, 2012); Laha, op. cit.; A. Herod et al.: "Global destruction networks, labour and waste", in *Journal of Economic Geography*, (2014, Vol. 14, No. 2).

2. Decent work in e-waste: Opportunities and challenges

29. In 2013, the International Labour Conference identified waste management and recycling as one of three economic sectors (alongside agriculture and construction) in which there is significant opportunity and a necessity to improve the quality of work. This chapter examines how e-waste generates new opportunities and challenges in relation to each of the four strategic objectives of the Decent Work Agenda as set out in the ILO Declaration on Social Justice for a Fair Globalization of 2008.

2.1. Employment

30. It has been estimated that solid waste management and recycling provide employment for 19 to 24 million women and men worldwide, of which four million work in the formal waste and recycling sector. [22] However, the above-mentioned lack of data and issues of defining used electrical and electronic equipment have rendered it impossible to provide a global figure for employment in the e-waste subsector.

31. Although it is not clear in all cases how they have been produced, the following national estimates provide an insight into employment in e-waste:

- In China, 690,000 women and men were estimated to be working as collectors or recyclers in 2007. [23]
- In Serbia, 5,000 to 8,000 workers have been estimated to collect e-waste. [24]
- In Argentina, 34,000 people were estimated to be working in the e-waste value chain in 2016. [25]
- In Nigeria, up to 100,000 people work in the e-waste economy. [26]
- In South Africa, the 62 member companies of the e-Waste Association of South Africa employ 5,324 workers. [27]
- In Dhaka, Bangladesh, an estimated 60,000 people work in e-waste. [28]
- In New Delhi, India, there are between 10,000 and 25,000 informal e-waste workers. [29]

[22] ILO: *Sustainable development, decent work and green jobs*, Report V, International Labour Conference, 102nd Session, Geneva, 2013

[23] F. Wang et al.: *E-waste in China: A Country Report* (Bonn, UNU/StEP Initiative, 2013).

[24] ILO: *Tackling informality in e-waste management: The potential of cooperative enterprises* (Geneva, 2014).

[25] ILO: *Estimating green employment in Argentina: Green jobs in the Argentinian e-waste value chain* (Geneva, forthcoming).

[26] O. Ogungbuyi et al.: *E-waste country assessment Nigeria* (Secretariat of the Basel Convention, 2012).

[27] E-waste Association of South Africa (eWASA): *Assessment of the job creation potential in e-waste through sustainable enterprise development, with a special focus on e-waste in the automotive industry* (2014, unpublished).

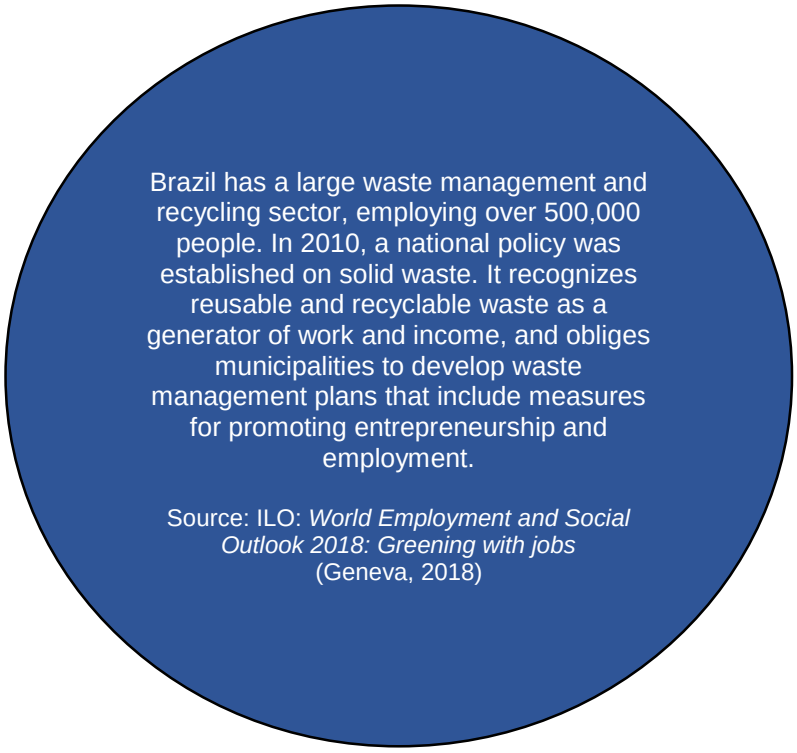
[28] Lepawsky and Billah, op. cit.

[29] Laha, op. cit.; A. Chaturvedi, R. Arora and U. Killguss: "E-waste recycling: Bridging the formal-informal divide", in S. Mukherjee and D. Chakraborty (eds): *Environmental Scenario in India: Successes and Predicaments* (New York, Routledge, 2012).

2.1.1. Job creation

32. While there are concerns that the transition to a green economy may result in reduced employment in the extraction of resources and manufacturing, it is expected that new employment opportunities will arise in reprocessing, services and waste management (see circle 2). By 2030, global employment in the broader waste sector is projected to increase by 70 per cent. [30] Jobs in the reprocessing of lead and secondary precious metals, for instance, are predicted to grow by 15 per cent and 11.2 per cent, respectively. [31]

Circle 2: Municipalities and waste management in Brazil



33. With regard to e-waste, manual sorting and dismantling is usually more effective in extracting and creating value from e-waste than automated processes. Furthermore, these tasks are labour-intensive and the entry level for these jobs is relatively low. Several studies have confirmed that better management of this fast-growing waste stream can be an engine of job creation:

- One study estimated that every 1,000 tonnes of e-waste processed in the United Kingdom creates 40 additional jobs in collection and sorting. [32]

[30] G. Montt, F. Fraga and M. Harsdorff: *The future of work in a changing natural environment: Climate change, degradation and sustainability* (Geneva, ILO, 2018).

[31] ILO: *World Employment and Social Outlook 2018: Greening with jobs* (Geneva, 2018).

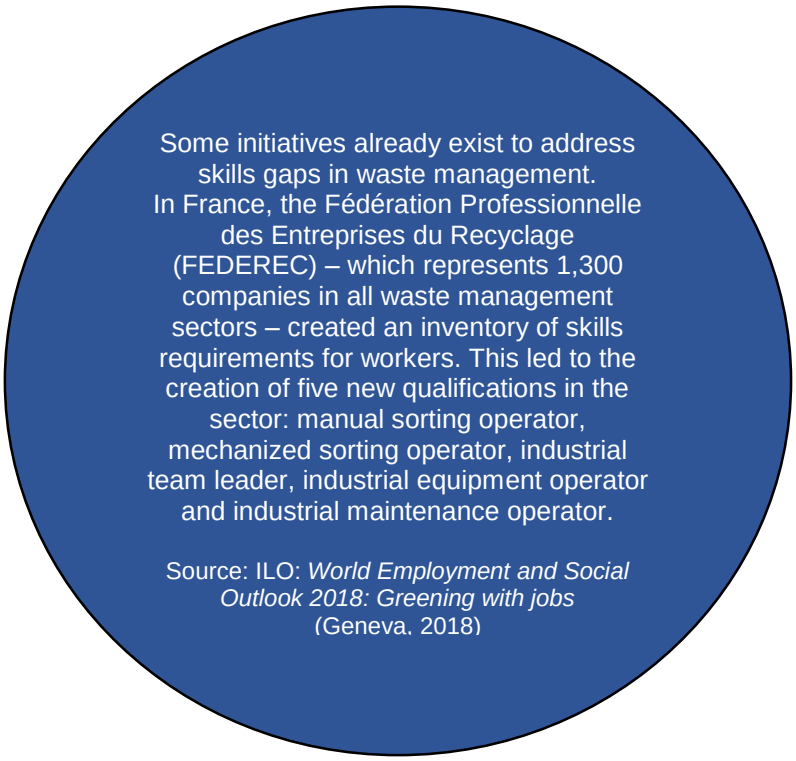
[32] Friends of the Earth: *More jobs, less waste*: *Potential for job creation through higher rates of recycling in the UK and EU* (London, 2010).

- Another study estimated that for every 1,000 tonnes of e-waste processed, 30 jobs are created in landfills, 15 jobs are created in sorting and recycling, and 200 jobs are generated in repairing. [33]
- East Africa Computer Recycling estimated that each tonne of e-waste could create one job, potentially generating thousands of new jobs in Kenya. [34]
- An older study from Massachusetts, United States, calculated that electronics recycling supported ten times more jobs than land filling, and grading for parts and resale generated over 100 times more jobs than recycling. [35]

34. The management of e-waste can provide particular employment opportunities for persons with disabilities. In South Africa, for example, a social enterprise, Oasis Recycling, runs three recycling workshops that provide sheltered employment for persons with mental disabilities. [36]

35. Over time, the circular economy will require new skills, including in sorting, identifying the value and recognizing the hazards of different types of waste. It is important to invest in the skills for a circular economy now to avoid skills shortages in the future (see circle 3).

Circle 3: Skills for a circular economy



[33] K. Sampson: "How Ewaste Recycling Is Creating A Lot Of Jobs" (2015).

[34] H. Guilcher and K. Hieronymi: "Proposal – Each ton of e-waste/month creates 1 green job" (2013).

[35] Massachusetts Department of Environmental Protection: *Electronics Re-Use and Recycling Infrastructure Development in Massachusetts* (United States Environmental Protection Agency, 2000).

[36] eWASA, op. cit.

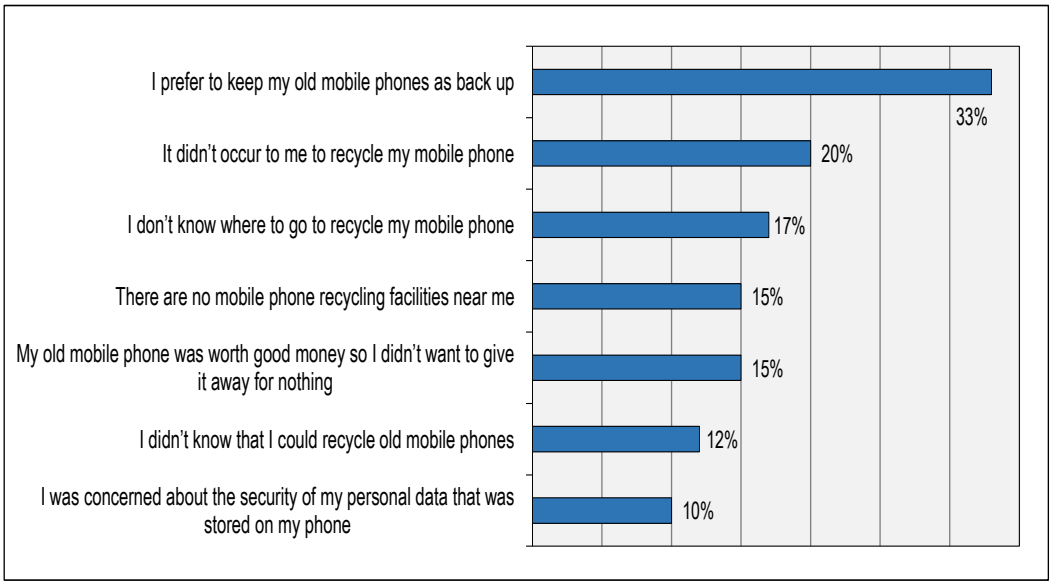
2.1.2. Multinational enterprises

36. In most countries, the responsibility for waste management resides with municipalities, which in turn have adopted different institutional models with various degrees of outsourcing. While the involvement of private sector companies in waste management differs from country to country, in many regions there has been an increase in the operations of large multinational waste management enterprises such as Veolia (France) and Waste Management (United States), many of whom also handle e-waste. Other large multinational enterprises such as Umicore are highly specialized in refining and recycling precious metals found in batteries, portable electronics and cars.

37. Leading brands such as Apple, Canon, Google, Huawei, Microsoft and Samsung have established ambitious targets for the use of recycled or renewable materials in new products and for the recovery of their used products. As part of its take-back scheme, and with a view to reusing more components and materials, Apple has developed a recycling robot that is capable of dismantling nine different versions of the iPhone at a rate of 200 devices per hour.

38. However, the performance of such take-back schemes is undermined by a lack of consumer awareness. Other issues include inconvenient methods of collection, consumer concerns about data privacy, and the fact that many used products fetch a higher price in the second-hand market than brands are offering (see figure 8).

Figure 8. Reasons for not recycling last mobile phone



Source: P. Tanskanen: "Electronics Waste: Recycling of Mobile Phones", in E. Damanhuri (ed.): *Post-consumer waste recycling and optimal production* (IntechOpen, 2012), p. 148.

39. Some multinational enterprises have begun experimenting with devices or products to provide a service which has the potential to facilitate longer product lifetimes and greater reuse of electronic and electrical products. Noting the significant opportunities inherent in such service business models, better product tracking and closed-loop systems, the World Economic Forum and the UN E-waste Coalition conclude in a recent report that: "it is time to reconsider e-waste, re-evaluate the electronics industry and reboot the system for the benefit of industry, consumer, worker, health of humankind and the environment". [37]

[37] Bel et al., op. cit.

2.1.3. Small and medium-sized enterprises

40. Three recent ILO background studies on e-waste management in Argentina, India and Nigeria provide examples of how micro, small and medium-sized enterprises in the sector, such as Attero in India and Green Compass Recycling in Nigeria (see circle 4), can contribute to job creation and sustainable development.

Circle 4: Green Compass Recycling in Nigeria

41. Such micro, small and medium-sized enterprises introduce new technologies and bring innovative business models to the market, and are also responsive to emerging issues and needs. For instance, the ever-increasing use of electronic data has offered new opportunities for companies that guarantee safe data destruction. Two highly automated recycling plants in Canada generate most of their profit from certifying that data in recycled equipment is securely destroyed. [38]

2.1.4. Cooperatives

42. An ILO study from 2014 explored the potential of cooperative enterprises to tackle informality in e-waste management. It concluded that cooperatives and other social and solidarity economy organizations, supported by effective regulation and capacity-building, could create jobs, improve working conditions, lift e-waste workers higher in the value chain, and improve environmental impacts. [39]

[38] J. Lepawsky and C. Mather: 2011 "From beginnings and endings to boundaries and edges: rethinking circulation and exchange through electronic waste", in Royal Geographical Society: *Area* (2011, Vol. 43, No. 3, Sept.).

[39] ILO: *Tackling informality in e-waste*, op. cit.

43. Many waste pickers organize into cooperatives and other cooperative-like social and solidarity economy enterprises in Africa, Latin America and Asia in order to:

- create economies of scale and share risks when collecting, segregating and recycling waste or selling recycled items;
- obtain the necessary permits and licenses to operate;
- identify and establish partnerships, including with municipal corporations;
- strengthen their collective voice and negotiation power with local governments, middlemen, and other market actors, particularly for integration into formal waste management systems, fair remuneration, social protection and improved occupational safety and health;
- facilitate their access to services such as finance, insurance, housing, child care and education;
- provide opportunities for skills training; and
- raise awareness about the significance of appropriate waste management, as well as about waste pickers to reduce social stigma.

2.2. Social protection and conditions of work

2.2.1. Work organization and informality of work

44. The vast majority of work with e-waste in developing countries takes place in the informal economy and is often carried out by migrants, children and other vulnerable groups. Similar to home-based workers, who are also reported to be involved in dismantling electronic products, such workers are often not covered by social security schemes.

45. While informal economic activities are predominantly carried out by low-skilled workers, e-waste workers are often highly skilled in making appliances usable again and they make major contributions to local economies. [40] Working conditions are often poor, unsafe and unhealthy, and rudimentary management of e-waste often causes environmental degradation and a low recovery rate of valuable materials. Rights at work are usually not respected for informal e-waste workers.

46. Some have argued that informal work in e-waste management should be banned outright, but there is also growing recognition that this could cause a large number of workers to lose their livelihoods. The ILO Transition from the Informal to the Formal Economy Recommendation, 2015 (No. 204), provides guidance to governments, employers and workers on how to promote employment and income opportunities as well as rights and social protection for the millions involved in the transition to the formal economy, including in the management of e-waste. A key challenge in formalizing e-waste management will be transforming existing networks of e-waste management to improve the safety and health, working conditions and rights of workers while ensuring that existing livelihoods are preserved and improved.

[40] Lepawsky: *Reassembling Rubbish*, op. cit.

2.2.2. Occupational safety and health

47. The risks that e-waste poses to human health and the environment are outlined in the 2012 ILO report *The global impact of e-waste: Addressing the challenge.* Electrical and electronic equipment contains heavy metals, chemicals and other hazardous substances (see table 1). They are particularly harmful for pregnant women and children. Workers in e-waste are also exposed to physical and ergonomic hazards that can lead to work-related injuries, ill health and diseases.

Table 1. E-waste recycling and associated risks for human health

Metals and some of their compounds	Human health risk
Antimony	Irritation of the eyes, skin and lungs
Bismuth	Skin problems and depression
Cadmium	Lung damage, bone fracture, damage to central nervous system, cancer, possibly DNA damage
Chromium	Lung cancer, kidney and liver damage
Cobalt	Vomiting, loss of vision, heart issues, thyroid damage, cause of asthma
Gallium	Throat irritation, breathing problems, chest pains
Germanium	Negative impact on skin, eyes and blood
Molybdenum	Joint pains in knees, hands and feet
Nickel	Lung cancer, nose cancer, heart disorders
Selenium	Abdominal pain, fever, heart and muscle problems, bronchial asthma, diarrhoea, enlarged liver, burning, bronchitis, sore throat
Silver	Brain damage, kidney, eye, lung, and liver associated problems
Lead	Reduced fertility of men, rise in blood pressure, kidney damage, miscarriages, brain damage, diminished learning abilities of children
Tin	Eye and skin irritations, sickness and dizziness, breathlessness, urination problems, headaches
Iron	High risk of lung cancer
Yttrium	Negative impact on liver
Zinc	Vomiting, skin irritations, decreased sense of taste and smell, birth defects, stomach cramps

Source: A.K. Awasthi and J. Li: "Management of electrical and electronic waste: A comparative evaluation of China and India", in *Renewable and Sustainable Energy Reviews* (Vol. 76, Feb. 2017).

48. Workers handling e-waste are directly affected by hazardous substances to which they are exposed during the recycling process: not only the hazardous substances in the e-waste itself but also those used to extract valuable minerals from it. In India, workers in waste recycling sites are exposed to higher levels of silver, copper and rare earth metals compared to other workers. [41] In the Philippines, it was found that workers were inhaling dust from smelting activities and were exposed to toxic vapours and corrosive liquids. [42]

[41] V. Joon, R. Shahrawat and M. Kapahi: "The Emerging Environmental and Public Health Problem of Electronic Waste in India", in *Journal of Health & Pollution* (2017, Vol. 7, No. 15).

[42] A. Terazono et al.: "Material Recovery and Environmental Impact by Informal E-Waste Recycling Site in the Philippines", in M. Matsumoto et al. (eds): *Sustainability Through Innovation in Product Life Cycle Design* (Springer Japan, 2017).

49. In addition, there are many secondary safety and health risks for family members of e-waste workers, particularly when e-waste is dismantled and processed in homes or when families live with workers on e-waste sites, and also when workers bring contaminates home on their bodies and clothes. Furthermore, hazardous substances and emissions pose a risk for surrounding communities and environments.

50. E-waste workers are often unaware of the hazards of their work, which can exacerbate safety and health hazards. A study in Nigeria showed that 88 per cent of informal e-waste workers were unable to mention even one harmful chemical in e-waste, and only 12 per cent had good knowledge of occupational safety and health issues, compared to 76 per cent in a control group. [43]

51. To address the risks faced by waste collectors, in 2010 the ILO developed the Work Adjustment for Recycling and Managing Waste (WARM) training methodology. Using simple, low-cost improvement measures, it aims to improve the safety, health and efficiency of waste collection work, and is currently being adapted for use in the informal e-waste economy in India. [44]

2.3. Rights at work

52. To ensure that the fundamental principles and rights at work and the protections set out in ratified ILO Conventions are enjoyed by workers in the e-waste value chain, member States have the duty to adopt, implement and enforce those protections in national laws and regulations.

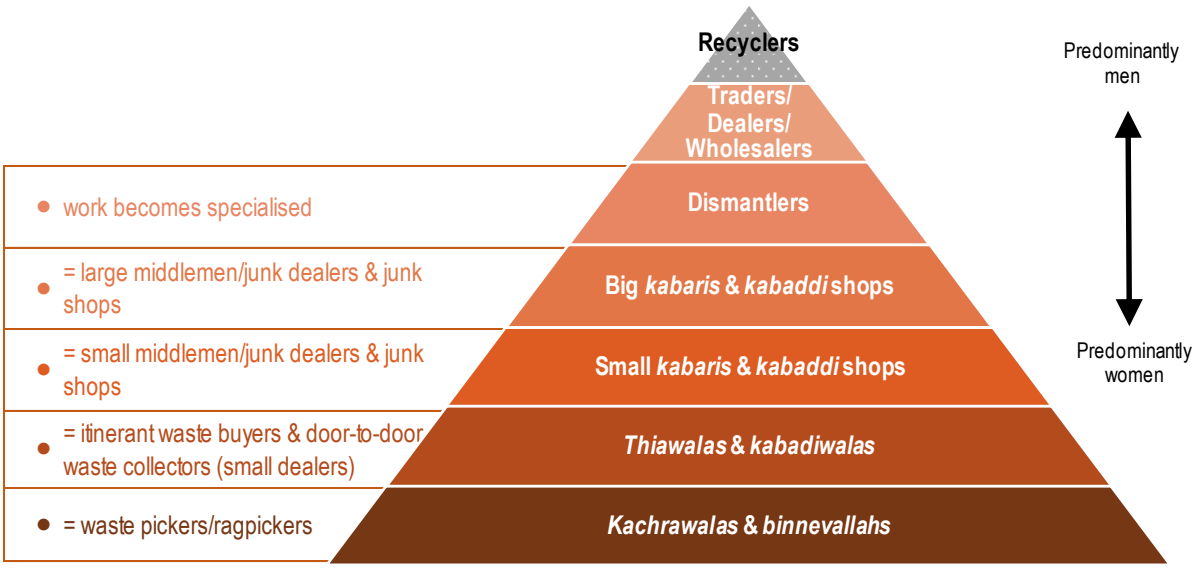
53. In this regard, it is widely recognized that a high incidence of the informal economy in all its aspects is a major challenge for realizing workers' rights, including the fundamental principles and rights at work. Furthermore, the realization of freedom of association and collective bargaining in e-waste value chains is hampered by the absence of strong and representative organizations of workers and employers.

54. In many countries, the e-waste value chain is characterized by a lack of gender equality and widespread discrimination. In India, for example, the Scheduled Castes and Scheduled Tribes, and particularly women, are disproportionally represented in the lower part of the value chain, as illustrated in figure 9.

[43] C.M. Ohajinwa et al. "Health Risks Awareness of Electronic Waste Workers in the Informal Sector in Nigeria", in *International Journal of Environmental Research and Public Health* (2017, Vol. 14, Issue 8,).

[44] T. Kawakami and T.T. Khai: *WARM: Work Adjustment for Recycling and Managing Waste: Action manual for waste collectors and communities to promote their joint actions in improving safety, health and efficiency in waste collection and management* (ILO, 2010).

Figure 9. Informal e-waste sector hierarchy in India



Source: ILO: *E-waste in India* (Geneva, forthcoming).

55. Child labour has been observed in e-waste management, and at some e-waste sites may comprise a significant proportion of the workforce. A representative of the Associated Chambers of Commerce and Industry estimated that as many as 400,000–500,000 children aged 10–15 were working with e-waste in India. [45] In Agbogbloshie, Ghana, children have mainly been identified as working in manual dismantling and burning activities. [46]

2.4. Social dialogue

56. Social dialogue with representative organizations of employers and workers is critical in the development of inclusive policies and integrated sectoral strategies to ensure a just transition towards environmental sustainability, greening of enterprises, social inclusion and the promotion of green jobs in e-waste. The ILO's *Guidelines for a just transition towards environmentally sustainable economies and societies for all* of 2015 call on governments to "provide opportunities for the participation of social partners at all possible levels and stages of the policy process through social dialogue and foster consultations with relevant stakeholders". Consultations with e-waste workers and employers and their respective organizations is particularly important for the recognition of workers, the formalization of their activities and the promotion of decent work. The respect, promotion and realization of the fundamental principles and rights at work through the Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87), and the Right to Organise and Collective Bargaining Convention, 1949 (No. 98), is crucial in this regard.

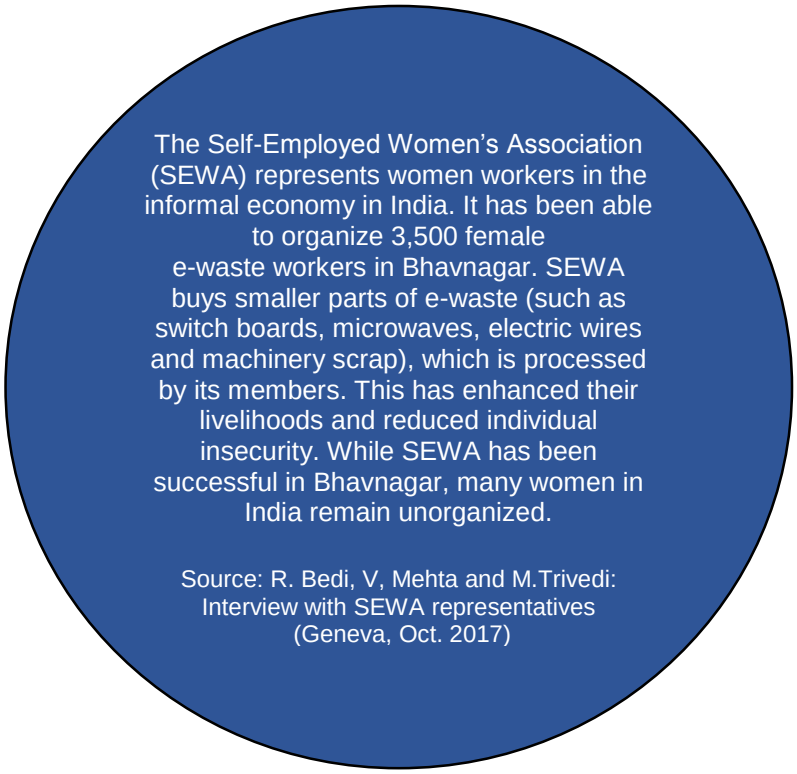
57. However, due to the informal nature of most work in e-waste and an absence of trade unions and employers' associations in the sector in many countries, the vast majority of e-waste workers and employers face considerable challenges in practice. They are prevented from gaining sufficient knowledge of sectoral dynamics and safety and health risks, from forming organizations, from contributing to national policies and strategies related to e-waste, and

[45] Joon et al., op. cit.

[46] Lundgren, op. cit.

from establishing relations – including in terms of membership – with representative workers' and employers' organizations, which would have secured their representation in sectoral dialogue with other stakeholders in the e-waste value chain. [47]

Circle 5: Self-Employed Women's Association in India

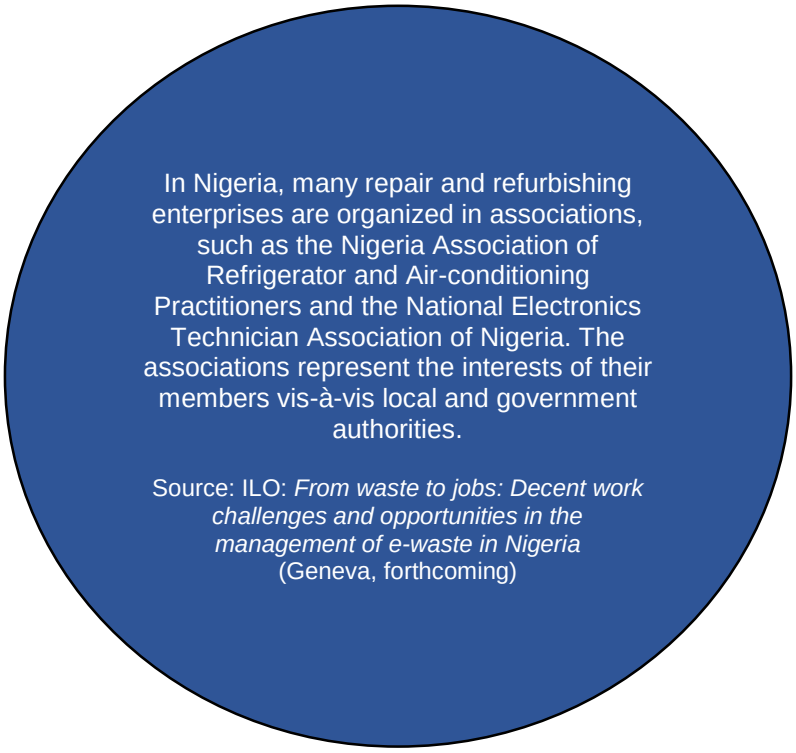


58. Notable exceptions include SEWA's work to organize informal home-based e-waste workers in India (see circle 5) and the repair and refurbishing organizations in Nigeria (see circle 6). In Mexico, one of the country's largest employers' organizations, COPARMEX, is implementing a successful recycling centre and programme to inform the general public about the importance of recycling e-waste, how to do it and where to bring it. [48]

[47] ILO: *Tackling informality in e-waste*, op. cit.

[48] See COPARMEX: "Recicla tus electrónicos".

Circle 6: Refurbishment and repair associations in Nigeria



59. At the global level, IndustriALL Global Union is actively promoting safe and decent work for informal e-waste workers as part of its efforts to organize workers and develop sustainable industrial policies in the information and communications technology, electrical and electronics sectors. Since 2010, the European Federation of Public Service Unions, which organizes workers in the energy, water, waste, health and social services sectors and in local and national administrations in all European countries, has made efforts to develop and formalize social dialogue and promote environmental sustainability, including through European works councils with large European waste management companies and through the introduction of environmental clauses in international framework agreements.

3. Governance of e-waste

3.1. International instruments concerning e-waste

3.1.1. International labour standards

60. In addition to the eight fundamental Conventions, which are applicable to all workers and employers, the following ILO Conventions and Recommendations are particularly relevant to advancing decent work in e-waste management:

- the Transition from the Informal to the Formal Economy Recommendation, 2015 (No. 204);
- the Labour Inspection Convention, 1947 (No. 81); the Occupational Safety and Health Convention (No. 155) and Recommendation (No. 164), 1981; and the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187);
- the Chemicals Convention (No. 170) and Recommendation (No. 177), 1990;
- the Job Creation in Small and Medium-Sized Enterprises Recommendation, 1998 (No. 189);
- the Promotion of Cooperatives Recommendation, 2002 (No. 193);
- the Employment Relationship Recommendation, 2006 (No. 198);

Also of relevance are:

- the *Guidelines for a just transition towards environmentally sustainable economies and societies for all* (2015), including Annex 1, which lists international labour standards and resolutions that may be relevant to a just transition framework; and
- the Conclusions concerning the promotion of sustainable enterprises, adopted by the International Labour Conference at its 96th Session (2007).

3.1.2. United Nations environmental conventions

61. E-waste management is governed by a framework of UN conventions, including but not limited to the following instruments.

Basel Convention

62. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, adopted in 1989, aims to protect human health and the environment against the adverse effects of transboundary movements and disposal of hazardous waste, including by applying the prior informed consent procedure (shipments made without consent are illegal). Parties are expected to minimize the quantities that are moved across borders, to treat and dispose of wastes as close as possible to their place of generation, and to prevent or minimize the generation of wastes at source. An amendment to the Convention, the Basel Ban, was adopted in 1995 but has not yet entered into force. The aim of the Basel Ban is to prohibit all transboundary movements of hazardous wastes from member countries of the Organisation for Economic Co-operation and Development (OECD) which are destined for final disposal operations in non-OECD member countries.

Minamata Convention

63. The Minamata Convention on Mercury was adopted in 2009 and entered into force in 2017. The Convention strives to protect human health and the environment from mercury emissions and releases. It controls mercury supply sources, regulates the informal economy in artisanal gold mining and trade, phases out and phases down the use of mercury, and controls storage, waste and contaminated sites.

Other relevant conventions

64. Also relevant to the management of e-waste are the 1998 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, revised in 2017, which promotes shared responsibility between exporting and importing countries of hazardous chemicals, and the 2001 Stockholm Convention on Persistent Organic Pollutants, as last amended in 2015, which requires countries to take measures to eliminate or reduce the release of persistent organic pollutants into the environment.

3.2. Regional instruments concerning e-waste

3.2.1. EU directives

Directive 2012/19/EU on waste electrical and electronic equipment

65. Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment recasts Directive 2002/96/EC, which aimed to prevent e-waste generation and promote reuse, recycling and other forms of recovery in order to reduce disposal. The new Directive sets ambitious targets for e-waste collection. From 2016 to 2018, the minimum collection rate targets were set at 45 per cent of the average weight of electrical and electronics products entering the market. From 2019 onwards, the target is 65 per cent of the average weight of electrical and electronic equipment placed on the market, or alternatively 85 per cent of all e-waste generated in the territory of an EU Member State. [49]

Directive 2011/65/EU on restricting the use of hazardous substances in electrical and electronic equipment

66. Directive 2011/65/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment recasts Directive 2002/95/EC. The purpose of the new Directive is to restrict the use of hazardous substances in electrical and electronic equipment, protect human health and promote the environmentally sound recovery and disposal of e-waste. The Directive restricts the use of ten hazardous materials in manufacturing electrical and electronic equipment. [50]

[49] Lundgren, op. cit.; Laha, op. cit.; United Nations Environment Management Group: *United Nations System-wide Response to Tackling E-waste* (2017).

[50] ibid.

3.2.2. Other regional instruments

Bamako Convention

67. The Bamako Convention on the Ban of the Import to Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa entered into force in 1998. The Convention uses language similar to that of the Basel Convention, but is in some respects stronger in that it prohibits all import of hazardous waste from non-Parties and includes radioactive wastes, which has been cited as a limitation of the Basel Convention. The Bamako Convention also promotes clean production. [51]

3.3. E-waste management and regulation in selected countries

68. It is estimated that 67 countries have legislation in place concerning various aspects of e-waste management and that the legislation covers some 66 per cent of the world population. [52] These laws are primarily focused on protecting the environment through legislative and regulatory measures, and in many cases do not consider e-waste as a resource that, if better managed, could provide decent work opportunities for small and medium-sized enterprises, cooperatives and workers.

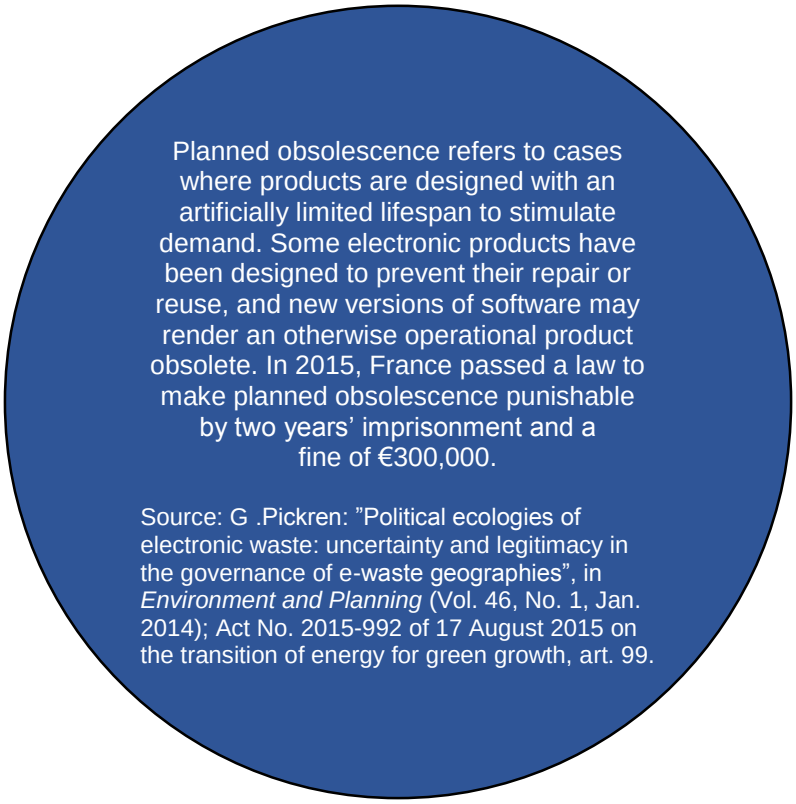
69. As set out in the ILO's *Guidelines for a just transition towards environmentally sustainable economies and societies for all*, coherent policies across the economic, environmental, social, education and training, and labour portfolios are needed to provide an enabling environment for enterprises, workers, investors and consumers to embrace and drive the transition towards environmentally sustainable and inclusive economies and societies. Considering the key role that labour market institutions can play in addressing the challenges and opportunities of e-waste management, it is imperative that the expertise, resources and perspectives of ministries of labour and employment and employers and workers are taken into account when legislation and regulations related to e-waste are formulated or revised.

70. Because e-waste is a relatively recent issue, it has also been observed that legislation, regulations and policies are introduced or changed frequently. These range from measures to address planned obsolescence in France (see circle 7) to the introduction of an electrical and electronic levy in Ghana. As is the case in other sectors, it is of critical importance to ensure that e-waste enterprises and workers operate in a predictable environment.

[51] Lepawsky: *Reassembling Rubbish*, op. cit.; Laha, op. cit.; United Nations Environment Management Group, op. cit.

[52] Baldé et al.: *The Global E-waste Monitor 2017*, op. cit.

Circle 7: Policies to address planned obsolescence



71. National e-waste laws and regulations are often based on the principle of extended producer responsibility (EPR). The OECD defines EPR as "a policy approach under which producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products". [53] Assigning such responsibility to producers could in principle provide incentives to prevent waste at the source, promote product design for the environment, and support the achievement of public recycling and materials management goals. However, in many countries, it has proven challenging to implement EPR in practice. Moreover, there are concerns that EPR initiatives by individual brands or companies may do more harm than good if they are not well coordinated with overall national waste management policies. Some have argued that in certain situations, EPR may discourage the repair and refurbishment of products. [54]

72. The enforcement of national environmental and labour laws and regulations concerning e-waste remains a key challenge in many countries, particularly where the resources and capacities of environmental and labour administrations are weak. Efforts to strengthen the capacity of labour inspectors and of employers' and workers' organizations should be seen as an integral part of any future investment in waste and e-waste infrastructure and systems.

73. The following country case studies provide examples of how both developed and developing countries in the Americas, Asia and Africa have taken steps to govern the management of e-waste.

[53] OECD: "Extended producer responsibility" (undated).

[54] B. Callén and T. Sánchez Criado: "Vulnerability Tests: Matters of 'Care for Matter' in E-waste Practices", in *TECNOSCIENZA Italian Journal of Science and Technology Studies* (2015, Vol. 6, No. 2).

3.3.1. Argentina

74. There is currently no legislation in force in Argentina that specifically regulates e-waste management. Local legislatures are responsible for promulgating environmental laws and regulations, and the city of Buenos Aires has introduced a zero-waste policy that has facilitated the development of activities related to e-waste recycling. However, a weak institutional environment has so far hindered the development of profitable, environmentally sustainable, country-wide e-waste value chains. Formal value chain segments are found only in Buenos Aires and the four provinces in which most economic activity takes place, and they involve only the most profitable activities, namely the recovery of computer and telephony equipment used in the public sector and medium-sized and large companies. It is estimated that those activities have created some 600 formal jobs. Less-profitable segments of the value chain are characterized by widespread informal or semiformal economic activity.

3.3.2. China

75. From 2000 onwards, China implemented a series of e-waste policies, including an import ban, a policy to restrict the use of hazardous substances in manufacturing, and the establishment of a licensing scheme for recycling companies. These form part of a deliberate shift towards circularity, officially starting with the State Council's Circular Economy Promotion Law (2009). [55] From 2009 to 2011, the government ran an "old for new" rebate programme to encourage formal collection by authorized collectors. This increased the annual collection rate to 64 per cent and resulted in the collection of almost 50 million appliances. [56] In 2011, a new regulation was implemented and an extensive formal recycling system was established. By the end of 2014, a total of 49 urban mining centres, which yield copper and gold at prices that are below world market prices, had been constructed. [57] These policies have succeeded in diverting large amounts of e-waste from informal to formal recycling, and it is estimated that some 5,000 new jobs have been created. [58] However, they have also been criticized for predominantly focusing support for large scrap processing companies at the expense of smaller actors, who are often better at reusing and repairing devices and salvaging components. [59]

[55] World Economic Forum: *Recovery of Key Metals in the Electronics Industry in the People's Republic of China: An Opportunity in Circularity* (Geneva, 2018).

[56] Wang et al.: *E-waste in China*, op. cit.; S. Honda, D.S. Khetriwal and R. Kuehr: *Regional E-waste Monitor: East and Southeast Asia* (Bonn, UNU, 2016); H. Duan et al.: "Systematic characterization of generation and management of e-waste in China", in *Environmental Science and Pollution Research* (2016, Issue 23).

[57] Duan et al., op. cit.; Y. Gu et al.: "To realize better extended producer responsibility: Redesign of WEEE fund mode in China", in *Journal of Cleaner Production* (2017, Vol. 164); X. Zeng, J.A. Matthews and J. Li: "Urban Mining of E-Waste is Becoming More Cost-Effective Than Virgin Mining", in *Environmental Science & Technology* (Vol. 52, No. 8, 2018).

[58] Gu et al., op. cit.; Zeng et al., op. cit.

[59] Y. Schulz: "Towards a New Waste Regime? Critical Reflections on China's Shifting Market for High-Tech Discards", in *China Perspectives* (2015, No. 3).

3.3.3. India

76. India's first specific e-waste legislation came into force in May 2012 and was implemented at the state level by State Pollution Control Boards. The legislation mandated all collection centres, dismantlers and recyclers involved in e-waste management to register with the State Pollution Control Boards in the states in which they operate and made EPR an integral part of e-waste management. In 2016, the legislation was revised and EPR became a federal responsibility. Producers are now required to set up a deposit-refund system to incentivize consumers to return electronic and electrical equipment. Producer responsibility organizations were introduced to assist manufacturers in complying with the EPR legislation. Research has shown, however, that a general lack of awareness of the e-waste legislation and a lack of capacity to implement it has undermined its effectiveness in practice. It is estimated that between 60 and 85 per cent of the country's e-waste continues to be handled by workers in the informal economy. [60]

3.3.4. Japan

77. The Government of Japan first introduced laws on e-waste in 1998. The Japanese e-waste management system is considered to be one of the best in the world in terms of compliance and the amount of e-waste collected. In 2012, the collection rates for larger items ranged from 91 per cent (air conditioners) to 80 per cent (refrigerators). The average material recycling rate of all e-waste is 72 per cent. However, the law places the bulk of the financial burden on consumers. This has led to some illegal dumping. There are also reports of retailers who have re-sold collected equipment to dealers, despite having already received payments for recycling fees for the same equipment. [61]

3.3.5. Nigeria

78. In 2011, national environmental regulations for the electrical and electronics sector were introduced in Nigeria as the first environmental regulations specifically targeting e-waste with the aim of minimizing pollution. The government also developed guidelines for importers of e-waste and made EPR an integral part of the legislation. In addition, states have their own regulatory bodies for environmental protection, physical planning and solid waste management. However, the effectiveness of these governance measures remains limited due to the insufficient capacity and resources of the responsible agencies.

[60] K. Bhaskar: "Managing India's electronic waste", in *Live Mint* (18 May 2017).

[61] M.I. Rasnan et al.: "Sustainable E-Waste Management in Asia: Analysis of Practices in Japan, Taiwan and Malaysia" in *Journal of Environmental Assessment Policy and Management* (2016, Vol. 18, No. 4); J. Li et al.: "'Control-Alt-Delete': Rebooting Solutions for the E-Waste Problem" in *Environmental Science and Technology*, (2015, Vol. 49, No. 12,).

3.3.6. United States

79. The United States does not have federal legislation on e-waste, however, 25 states have electronics recycling laws in place. [62] California, for example, passed a law on e-waste in 2003, requiring consumers to pay for the treatment of their discarded electronics. In 2014, Maine adopted a law, which includes a modified approach to EPR: the costs are shared between the municipality, the producer and the households or other consumers. [63]

3.4. International collaboration and partnerships

80. Starting with its engagement in the Partnership for Action on Computing Equipment, which was the leading network on e-waste from 2010 until it ended in 2017, the ILO has actively sought to enhance policy coherence and to advocate for decent work in the management of e-waste through partnerships with other UN agencies, international organizations and non-governmental organizations. In the collaboration and partnerships listed below, the ILO actively promotes the Decent Work Agenda and seeks to create opportunities for its constituents to become engaged in global policy debates and programmes to improve the management of e-waste in specific countries.

Issue Management Group on Tackling E-waste

81. The ILO has been a member of the United Nations Environment Management Group's Issue Management Group on Tackling E-waste since its inception. In 2017, the Group prepared a report which identified 154 initiatives that the UN and related entities were or had been implementing. Survey findings contained in the report highlighted the need to engage more with the private sector in order to address business responsibility in the production of electronic and electrical equipment. The report stressed the importance of adopting a life-cycle approach whereby more attention should be paid to upstream activities, such as design and production, and repair and refurbishment activities should be supported by reducing taxes on reuse and repair operations. [64]

Towards a UN e-waste coalition

82. The ILO and six other UN entities that are active in addressing the global challenge of e-waste signed a letter of intent in March 2018 with a view to strengthening their cooperation and leveraging their respective strengths and capacities. [65] With the support of the World Economic Forum and the World Business Council for Sustainable Development, these UN entities have since worked together to detail plans for the establishment of a United Nations E-waste Coalition. An online portal for information and statistics on e-waste is being

[62] See National Center for Electronics Recycling, undated [accessed 21 Jan. 2018].

[63] A. Borthakura and M. Govind: "Emerging trends in consumers' E-waste disposal behaviour and awareness: A worldwide overview with special focus on India", in *Resources, Conservation and Recycling* (2017, Vol. 117).

[64] United Nations Environment Management Group, op. cit.

[65] The International Telecommunication Union (ITU), United Nations Environment Programme (UNEP), United Nations University (UNU), United Nations Industrial Development Organization (UNIDO), Secretariat of the Basel and Stockholm Conventions, and United Nations Institute for Training and Research (UNITAR).

developed, and the coalition is exploring ways of providing integrated and better coordinated advice and assistance in selected countries.

Collaboration with the United Nations Industrial Development Organization on e-waste in Latin America

83. With the financial support of the Global Environment Facility, the United Nations Industrial Development Organization (UNIDO) is implementing a large-scale regional programme to strengthen national initiatives and enhance regional cooperation for the environmentally sound management of persistent organic pollutants in e-waste. The programme aims to achieve environmentally sound management and disposal of e-waste in 13 countries in Latin America. UNIDO has asked the ILO to implement country projects in Argentina and Peru to develop supportive labour market policies, strengthen the capacities of employers, workers and governments, analyse the employment situation in e-waste and improve working conditions in the e-waste value chain. The project, which was funded, commenced in December 2018 and will end in the first half of 2020. [66]

Partnership with the International Finance Corporation in India

84. The International Finance Corporation is implementing an India E-Waste Program, which is financed by the Governments of Japan and the Republic of Korea, and which aims to develop a responsible and sustainable e-waste management ecosystem in India, to mobilize investment, and to develop a toolkit to assist the private sector in the implementation India's e-waste rules. The International Finance Corporation has asked the ILO to provide advice on matters related to decent work challenges and opportunities, particularly in relation to safety and health.

Strategic Approach to International Chemicals Management

85. The Strategic Approach to International Chemicals Management is a policy framework to foster the sound management of chemicals, including those used in the production of electronic and electrical equipment. It has produced a compilation of best practices on hazardous substances within the life cycle of electrical and electronic products, and continues to address hazardous substances in electronics through advocacy and knowledge-sharing. [67]

Platform for Accelerating the Circular Economy

86. The Director-General of the ILO has recently joined the Global Leadership Group of the Platform for Accelerating the Circular Economy (PACE), which is hosted by the World Economic Forum, and which includes over 50 chief executive officers, ministers and heads of international organizations committed to leading innovative initiatives and projects in areas such as plastics, electronics and food. PACE hopes to contribute to new business models, well-designed policies, technological innovation and investment opportunities that can address current and future environmental and social challenges while also providing economic benefits. According to PACE, the transition towards a circular economy represents a global growth opportunity of US$4.5 trillion by 2030 and is critical to restoring natural systems.

[66] ILO: *From e-waste to jobs: Mobilizing the world of work to manage e-waste better in Latin America* (Geneva, forthcoming).

[67] United Nations Environment Management Group, op. cit.

4. Key considerations

87. Given the ILO's normative approach and unique tripartite structure, the Organization and its constituents can make an important contribution to advancing decent work in the management of e-waste, protecting the environment and supporting a just transition to a circular economy in the electronics industry. In its deliberations on how to address challenges and opportunities in e-waste management, the Global Dialogue Forum may wish to consider the need to:

(a) produce more reliable data and information about the generation and flows of e-waste, the e-waste value chain and key actors, and opportunities and challenges for advancing decent work;

(b) raise awareness of governments, employers, workers and consumers about the e-waste issue;

(c) invest in waste management systems and infrastructure to handle the increasing flows of solid waste as well as the rapidly growing streams of e-waste;

(d) revise or adopt e-waste laws, regulations and policies with the full involvement of the ILO's constituents;

(e) strengthen the capacity of environmental and labour administrations to enhance enforcement of e-waste laws and regulations;

(f) enhance the capacity of employers' associations and trade unions to advance decent work in e-waste management, including through social dialogue;

(g) provide incentives for enterprises to explore the design of more sustainable products and business models in the electronics industry and to foster green innovation and sustainable models of production;

(h) support the transition to a formal e-waste economy on the basis of the principles and guidance in the ILO Transition from the Informal to the Formal Economy Recommendation, 2015 (No. 204), and the 2015 ILO *Guidelines for a just transition towards environmentally sustainable economies and societies for all*;

(i) foster an enabling environment for sustainable enterprises and cooperatives in the management of e-waste, including by identifying and removing constraints faced by micro, small and medium-sized enterprises, such as limited access to finance to adopt new clean technologies;

(j) invest in the skills for a circular economy now to avoid skills shortages in the future;

(k) develop and provide education and training programmes and materials especially for e-waste workers in developing countries;

(l) provide support for all workers to have full access to fundamental principles and rights at work, and to exercise their rights to organize and bargain collectively;

(m) protect the safety and health of e-waste workers, improve working conditions and enhance access to universal health care and social security; and

(n) foster greater policy coherence for advancing decent work and a circular economy approach in e-waste management at the global, regional and national levels, including through partnerships and increased collaboration with other international and regional organizations.

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