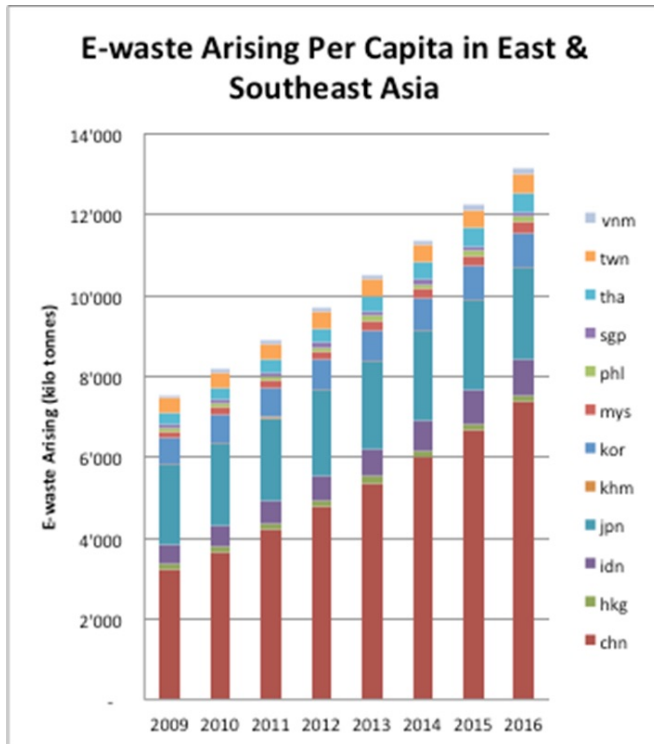


E-waste in East and Southeast Asia jumps 63 percent in five years

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Growth of e-waste in East and Southeast Asia. Credit: United Nations University

The volume of discarded electronics in East and Southeast Asia jumped almost two-thirds between 2010 and 2015, and e-waste generation is growing fast in both total volume and per capita measures, new UN research shows.

Driven by rising incomes and high demand for new gadgets and appliances, the average increase in [e-waste](#) across all 12 countries and areas analyzed—Cambodia, China, Hong Kong, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand and Vietnam—was 63% in the five years ending in 2015 and totalled 12.3 million tonnes, a weight 2.4 times that of the Great Pyramid of Giza.

China alone more than doubled its generation of e-waste between 2010 and 2015 to 6.7 million tonnes, up 107%.

The first Regional E-waste Monitor: East and Southeast Asia, [was compiled](#) by the UN's think tank, the United Nations University, through its Sustainable Cycles (SCYCLE) Programme and funded by the Japanese Ministry of Environment.

Using UN University's estimation methodology, the research shows rising e-waste quantities outpacing population growth.

The average e-waste generation per capita in the region was approximately 10 kg in 2015, with the highest generation found in Hong Kong (21.7 kg), followed by Singapore (19.95 kg) and Taiwan, Province of China (19.13 kg).

There were large differences between nations on the per capita scales, with Cambodia (1.10 kg), Vietnam (1.34 kg) and the Philippines (1.35 kg) the lowest e-waste generators per capita in 2015.

The report uniquely presents a summary of the regional e-waste statuses, and it is arranged to allow direct comparisons where possible that can help further the development of e-waste management systems and policies based on other countries' experiences.

"For many countries that already lack infrastructure for environmentally sound e-waste management, the increasing volumes are a cause for concern," says co-author Ruediger Kuehr of UN University. "Increasing the burden on existing waste collection and treatment systems results in flows towards environmentally unsound recycling and disposal."

The report cites four main trends responsible for increasing volumes:

- More gadgets: Innovation in technology is

driving the introduction of new products, particularly in the portable electronics category, such as tablets and wearables like smart watches.

- **More consumers:** In the East & Southeast Asian region, there are industrializing countries with growing populations, but also rapidly expanding middle classes able to afford more gadgets.
- **Decreasing usage time:** The usage time of gadgets has decreased; this is not only due to rapidly advancing technology that make older products obsolete due to hardware incompatibility (e.g., flash drives replacing floppy disks) and software requirements (e.g., minimum requirements for PCs to run operating software and various other applications) but also soft factors such as product fashion. As more devices are replaced more rapidly, e-waste arising grows.
- **Imports:** Import of EEE provides greater availability of products, both new and second-hand, which also increases e-waste arising as they reach their end of life.

The report warns of improper and illegal e-waste dumping prevalent in most countries in the study, irrespective of national e-waste legislation.

Consumers, dismantlers and recyclers are often guilty of illegal dumping, particularly of "open dumping", where non-functional parts and residues from dismantling and treatment operations are released into the environment.

Studies in the region show that the main reasons are:

- **Lack of awareness:** End users do not know that they should dispose of their obsolete EEE separately or how or where to dispose of their e-waste. Additionally, informal e-waste recyclers often lack the knowledge about the hazards of unsound practices;
- **Lack of incentives:** Users choose to ignore collection and/or recycling systems if they need to pay for them;
- **Lack of convenience:** Even if disposal

through existing systems does not incur a fee, users may choose not to dispose of their e-waste in the proper channels if it is inconvenient or requires their time and effort;

- **Absence of suitable sites:** There may be a lack of proper locations for hazardous waste disposal where residues from e-waste recycling can be sent; and
- **Weak governance and lax enforcement:** A country with inadequate management or enforcement of e-waste legislation may result in rampant non-compliance.

The report also points to common practices such as open burning, which can cause acute and chronic ill-effects on public health and the environment.

Open burning of e-waste is practiced mainly by informal recyclers when segregating organic and inorganic compounds (e.g. burning cables to recover copper).

Though less common, spontaneous combustion sometimes occurs at open dumping sites when components such as batteries trigger fires due to short circuits.

Informal recycling, also called "backyard recycling," is a challenge for most developing countries in the region, with a large and burgeoning business of conducting unlicensed and often illegal recycling practices from the backyard.

These processes are not only hazardous for the recyclers, their communities and the environment, but they are also inefficient, as they are unable to extract the full value of the processed products.

Mostly, these recyclers recover gold, silver, palladium and copper, largely from printed circuit boards (PCBs) and wires using hazardous wet chemical leaching processes commonly also known as acid baths.

Typically, informal recyclers use solvents such as sulphuric acid (for copper) or aqua regia (for gold). The leachate solutions go through separation and purification processes to concentrate the valuable metals and separate impurities. This often results in

the release of toxic fumes.

"Open burning and acid bath recycling in the informal sector have serious negative impacts on processors' occupational health," Shunichi Honda co-author of this study warns. "In the absence of protective materials such as gloves, glasses, masks, etc., inhalation of and exposure to hazardous chemicals and substances directly affect workers' health."

"Associations have been reported between exposure from improper treatment of e-waste and altered thyroid function, reduced lung function, negative birth outcomes, reduced childhood growth, negative mental health outcomes, impaired cognitive development, cytotoxicity and genotoxicity."

Adds co-author Deepali Sinha Khatriwal, Associate Programme Officer, UN University: "Indirect exposure to these hazardous substances is also a cause of many health issues, particularly for families of informal recyclers who often live and work in the same location, as well as for communities living in and around the area of informal recycling sites."

Top marks to Japan, South Korea, Taiwan

According to the report, Japan, South Korea and Taiwan have a head-start in the region in establishing e-waste collection and recycling systems, having begun in the late nineties to adopt and enforce e-waste specific legislations. This was built in large part on experience in solid waste management. Among the most advanced economies and areas in Asia, the three are also characterised by high per capita e-waste generation, formal collection and recycling infrastructure and relatively strong enforcement.

Hong Kong and Singapore, meanwhile, do not have specific e-waste legislation. Instead, the governments collaborate with producers to manage e-waste through a public-private partnership. As small island nations with large shipping and trade networks, both countries have significant transboundary movements of e-waste generated domestically, as well as in transit from other

countries.

China, the Philippines, Malaysia and Vietnam all have recent e-waste legislation. The four countries are therefore in a transitional phase, with a mix of formal and informal elements in an evolving ecosystem in terms of collection and recycling infrastructure. The countries face similar challenges in enforcing regulations with limited resources and capacity and low public awareness regarding the hazards of improper disposal of e-waste.

Cambodia, Indonesia and Thailand have yet to establish legal frameworks for e-waste management. However, there is an active informal sector in these countries with an established network for collection and import of end-of-life products and their recycling, particularly repair, refurbishment and parts harvesting.

Additional background

The total amount of electrical and electronic equipment (EEE—anything with a battery or a cord) put on the market worldwide increased from 51.33 million tonnes in 2007 to 56.56 million tonnes in 2012.

Asia, including the 12 nations and areas in this new study, is the largest consumer of EEE, buying nearly half of EEE put on the market (20.62 million tonnes in 2005; 26.69 million tonnes in 2012).

The increase is particularly striking given the drop in EEE sales in Europe and the Americas in 2012 following the global financial crisis.

Asia as a whole accounts for the majority of EEE sales and generates the highest volume of e-waste, estimated at 16 million tonnes in 2014. However, on a per-capita basis, this amounts to only to 3.7 kg per inhabitant, as compared to Europe and the Americas, which generate nearly four times as much per capita—15.6 kg per inhabitant.

With growing incomes, consumers in Asia now replace their gadgets more frequently. In addition, many products are designed for low-cost production, but not necessarily repair, refurbishment or easy recycling.

Cambodia, Japan, the Philippines, Singapore, Thailand and Vietnam have not ratified the Ban Amendment and, of these countries, only Cambodia prohibits the import of e-waste and only Vietnam prohibits the import of second-hand electronics.

Taiwan (which does not apply to the Basel Convention) controls the import of e-waste through its national legal framework, which is the equivalent of the Basel Convention.

All the countries in the region control e-waste either via the Basel Convention or their national legal frameworks. However, measures to control the import of second-hand electronics are different among the countries and regions. There are two types of control measures to import of e-waste and second-hand electronics: 1) do control the import of e-waste but do not restrict of second-hand electronics (Taiwan, Japan, the Philippines, Republic of Korea, Singapore and Vietnam); and 2) prohibit the import of e-waste and prohibit or restrict the import of second-hand electronics (Cambodia, China, Hong Kong, Malaysia and Vietnam).

Despite these formal steps, enforcement of these measures remains a significant challenge in these countries and many others around the globe.

Provided by United Nations University

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