The E-waste Problem

Reinier Arbues

Ms. Baze

ERWC Period 2

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Abstract: This essay discusses e-waste, or electronic waste, such as discarded phones, TVs, etc., and how they end up in landfills. As newer devices continue to sell, tons of e-waste are being dumped. In these landfills, chemicals can leach, causing pollution and other environmental issues. These devices also contain rare metals including silver, which Earth is running out of. Device manufacturers are intentionally making their devices difficult to repair on their own, and are charging high prices to get them fixed by the company themselves. Many are not aware about the harmful effects of e-waste outside of the tech community, but activists such as New York repair technician Louis Rossmann campaigning for Right to Repair, are bringing this issue to light. This paper will talk about bringing awareness of the e-waste problem, device repairability, and potential other uses for obsolete electronics. This paper will also discuss volunteer experience at a local public library, encourage people to fix and maintain their own devices, and purchase devices that have better longevity next time.

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Can you think of every electronic gadget you use in your daily life? Now, think about how often you end up replacing each of them. As new device sales continue to grow, e-waste still remains a growing problem. Most of that waste is likely to end up in landfills. The majority of the public isn't aware about how widespread this issue is, devices are becoming less repairable as a way for tech companies to generate extra profit by forcing customers to buy new devices, and there's potential other environmentally-friendly uses for obsolete or broken electronics. Electronic waste, if improperly disposed of, can release harmful chemicals which can harm the environment and the health of people and animals.

Firstly, what is electronic waste? You may have heard of the term e-waste, but you may not know how big this problem is. E-waste, or electronic waste, are obsolete or no-longer-used electronics that are discarded, which usually end up in landfills. According to the United States Environmental Protection Agency, they consider e-waste as "a subset of used electronics and recognizes the inherent value of these materials that can be reused, refurbished or recycled to minimize the actual waste that might end up in a landfill or improperly disposed in an unprotected dump site either in the US or abroad". When you toss out an electronic device into a recycling center, you may think that it's actually being recycled, but what's actually happening is that these electronics are being sent to rot in landfills. Most of the time, these electronics that you

toss out can be refurbished, which allows you or someone to hold on to these devices. That same article also mentions that "An undetermined amount of used electronics is shipped from the United States and other developed countries to developing countries that lack the capacity to reject imports or to handle these materials appropriately". You may not have heard of this, but some of our e-waste is being shipped to third world countries, where they are not processed, instead they are dumped in landfills instead.

There's a lot of environmental hazards to dumping discarded e-waste in landfills. According to author Serenity Gibbons in the Forbes article "How Companies Are Addressing The E-Waste Problem", "When e-waste is buried in landfills, these toxic chemicals can leach into the soil and contaminate local water supplies. This jeopardizes the health of any nearby communities and can lead to environmental catastrophes. In rarer, more severe cases, e-waste is burned. Burning releases these toxic chemicals into the air which then gets breathed in by the local population."(Gibbons). E-waste, once thrown away and probably sent to landfills, will remain there, unnoticed. Sometimes, it's even buried and once left there long enough, they release toxic chemicals, which affects the environment and can cause harm to living beings. According to the same article, "most modern high-tech devices require a variety of different elements to function properly. Many of these elements are toxic". As technology progresses and computers get even more advanced over time, there's an increasing demand for different elements, which can harm the environment if not disposed of properly. Due to lack of awareness about e-waste and its effects, governments around the world and other organizations need to step up and bring this problem to light.

Secondly, how can repairability of electronics reduce e-waste? It allows people to fix their devices, rather than having to toss them out and replace them, therefore reducing the need

of Earth's resources and its impact on the environment. According to author Brian X. Chen in the New York Times article "A Smartphone That Lasts a Decade? Yes, It's Possible." discussing repairability of newer phones, "These latest wares underscore how today's smartphones aren't made for longevity. Most of the gadgets come tightly sealed up with glue to keep you out of them. Parts, like cameras and screens, are impossible to upgrade a la carte. Software updates are guaranteed for only a finite amount of time, usually two years for Androids and about five years for iPhones."(New York Times). Companies such as Apple and Samsung make it difficult to take their phones apart, affecting repairability, which typically leads to consumers throwing devices away when they break or upgrade to a newer device. They also have a timeframe for how long they will release operating system updates for that device. Unlike desktop computers, you cannot swap out a part in a phone to make it faster, due to the fact that all of these parts are soldered onto a single board. According to former vice president of advanced technology at Apple, Don Norman, quoted in the same article, "You want to make the computer out of one piece of metal, and you want it to be as thin as possible. So you had to make the battery with no case so it gets really hard to get to. You use glue instead of screws." In this case, Apple tries to make their phones and laptops thin, to prioritize design over repairability, in order to gain an advantage in sales. When you take apart an iPhone for example, the back cover is attached with both glue and screws, and you need special tools just to even replace the battery in that phone. This is another example of tech companies making it difficult to repair their devices, in order to get people to buy new devices and toss out their old ones.

Right now, it's difficult to repair electronic devices from larger device manufacturers. Louis Rossmann, a well-known right-to-repair activist and technician, described his experience with fixing an Apple device at a testimony in the Washington State Senate. The Senate was

discussing SB 5799, back in 2020, a bill which dealt with the right to fix your own devices. He said, "The way that I get this chip right now is I actually have to buy an iPhone battery charging case that costs $129, and has a battery, rip it apart, take that chip off, because they use that same chip in the battery charging case, and then dispose of the battery as e-waste, which is a complete waste." Most device manufacturers have made it difficult for consumers to obtain replacement parts for their devices, and Apple for example, has gone as far as adding identification for these parts, to detect if it is replaced. From the same testimony, Rossmann also talked about obtaining parts from the manufacturers that create Apple's parts. He says, "When I contact any electronics reseller, they say 'I'm sorry, we can't sell it to you' this means that rather than paying me to fix the machine or anybody else your only option is to go to Apple and have this $3000 or $4000 device fixed by them for $1500". What he means is that rather than letting consumers buy the parts and fix the devices themselves for a cheaper price, Apple would rather force consumers to go to the stores, and get their devices fixed there for inflated prices. This shows how repairability is important, and companies should prioritize environment over profitability, by allowing device repairability.

Furthermore, there are some environmentally friendly uses for obsolete or broken electronics, rather than throwing them out. From the New York Times article "A Smartphone That Lasts a Decade? Yes, It's Possible.", Chen says "Yet the idea of a longer-lasting phone needn't be a fantasy. One already exists: the $580 Fairphone 4 made by a startup, Fairphone, in Amsterdam. The Fairphone 4, which is sold only in Europe, has a plastic cover that can be easily removed to expose its innards. Its components can be swapped out in minutes by removing a few ordinary screws."(New York Times). Smaller tech companies, like Fairphone, are leading by example of how e-waste can be reduced through designing devices that are repairable, and big

phone manufacturers like Apple, Samsung, and Google, should follow them. The company's Fairphone 4 makes it easy to take apart, in case a part malfunctions or breaks, you can just swap it out. Chen, in the article, also says that an "important step is to maintain our devices as we do our cars — consider, for instance, taking a broken device to a repair shop before resorting to replacing it. Another action is to reject the marketing hype over every incremental feature introduced with every new phone." Companies are trying to prioritize the looks of their devices over repairability. Every time a company announces a new device, you may think "Wow!" However, try to think about repairability first, like what if that device breaks, how are you going to take it apart? Therefore, we can solve the e-waste problem, through environmentally friendly uses such as opting to buy devices that are easier to take apart and fix by yourself, rather than having to take them to a store or ship them to the manufacturer.

Another way to utilize no-longer-used electronics is to mine them for rare metals. As mentioned by Elizabeth Ratcliffe from the Royal Society of Chemistry in the BBC article "Mine e-waste, not the Earth, say scientists", a lot of people are "unwittingly stockpiling precious metals in our homes, in old phones and defunct computers". The article also mentions that the Earth is running out of metals, such as gallium, arsenic, silver, etc, and these electronics contain these materials. These metals are also contained in tools used in other fields. According to the article "'Urban mines': how to unlock our electronic junk's potential." from The Conversation, "For instance, chromium (Cr), copper (Cu) and zinc (Zn) have a life recycling rate of over 50%, which means that more than half of the quantities put into circulation are recycled. However, their recycled content is between 10 and 25%, as primary extraction of these metals is constantly increasing: the share of recycled metal in the total flows therefore remains low." This is also evidence that not a lot of metals are being extracted from recycled electronic devices, and more

work can be done to ensure that metals are mined from reusable sources and not directly mined from the Earth. Rather than using up Earth's resources to get these materials, these electronics instead have the potential to be used as sources of metals, to be repurposed for other applications.

You, as a consumer, can take action to reduce e-waste. One thing you can do is to sell or donate your old electronics rather than storing them somewhere or recycling them. This will breathe in a new life to your device, and prolong its lifespan. That's one less device thrown into landfills. If you really need to purchase a new device, opt for something that has replaceable, or upgradeable parts. For example, if you're buying a laptop, some manufacturers sell ones with swappable RAM and storage. This lets you get the most out of your device, since you can swap these parts out if you run out of storage or need more memory, rather than purchasing an entirely new device. One more thing you can do is learn how to repair your own devices. Websites such as iFixit offer repair manuals and even parts (for some devices only), which lets you fix your electronics if they break, therefore reducing the need to replace them. If they don't have it, you can go on online marketplaces such as Amazon or eBay to find these parts. Even Apple, despite being known for their anti-consumer repair stance, still has a self-repair service, but it's limited to some devices, and they do not provide repair guides for devices released before 2020. The easiest way you can reduce your e-waste contribution is to take good care of your current devices, examples include putting a case on your phone, not spilling water on it, etc. Before purchasing a new phone, laptop, TV, console, etc., think about your current ones. Can you justify that purchase or not?

Others may argue that recycling electronic waste is better than maintaining old devices. While recycling e-waste seems like a good way to get rid of old electronics, there's some drawbacks. Most of the time, when you "recycle" e-waste, it's not properly disposed of and ends

up with other plastic waste. According to Howard University law professor Carlton Waterhouse in the Washington Post article "People Are Paying to Break Printers with Sledgehammers in Smash Rooms", discussing the industry of smashing electronics, he says that people who handle e-waste that is not disposed of properly, can come into contact of toxic material, which can affect their health. This is where the environmental hazards of disposing e-waste comes from, since most "recycled" material go to landfills, the toxic chemicals can leak out of these devices, and therefore cause pollution of the environment. From the article "'Urban mines': how to unlock our electronic junk's potential." from The Conversation talking about how different metals can be recycled, "certain practices limit its metals' recyclability, such as the use of metals in particular alloys, since not all alloys can be recycled, or hybridisation, since composite materials are harder – not impossible – to recycle. For instance, for liquid food packaging, most cartons are made from cardboard and PolyAl, a blend of aluminium and polyethylene (a type of plastic)." According to this article, it proves that some electronic devices cannot be recycled, and it means that rather than throwing a device away, it's better to keep it and maintain its longevity. Therefore, rather than taking your old device to a recycling center, where it's unlikely that it's recycled properly, instead, refurbish it, or donate it to someone in need of a device.

I volunteered in the South San Francisco public library for a month and I recommend other people do it. Even though this volunteer opportunity may not be related to electronics, there's still some e-waste related info you can learn. At the library, when you volunteer, you shelve books, which isn't really related to e-waste, but you also shelve DVDs, CDs, etc. You will also be given an opportunity to volunteer in the Makerspace area of the library, where you get to help with the 3D printers and the laser cutters. When I volunteered at the Makerspace area, I was tasked with putting a robot together, and it was easy to figure out, if you just follow the

instruction booklet. Volunteering in the library, especially in the Makerspace area, shows you how easy it is to take apart and assemble electronic devices.

      In conclusion, we need to bring more public awareness to e-waste. These devices are ending up in landfills rather than being properly recycled, and some of Earth's metals are predicted to run out, which most people are not aware are contained in their old devices. Companies are intentionally making it difficult for consumers to fix their own devices, making the problem worse. You can help reduce e-waste contribution by opting to purchase devices with replaceable parts, and donate your old electronics rather than throw them away.

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