

17 COMPANIES GOING TOWARDS GREENER ELECTRONICS

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Abstract: There is no question that gadgets and other devices have changed the world today in incredible ways. Behind this innovative 21st-century technology lie supply chain and manufacturing processes still reliant on 19th-century sources of energy, dangerous mining practices, hazardous chemicals, and poorly designed products that drive consumption of the Earth's resources. This hidden reality stands in stark contrast to the forward-thinking, environmentally conscious image most IT companies' project. This paper provides an analysis of what 17 of the world's leading consumer electronics companies are doing to address their environmental impacts, by measuring three critical impact areas tied to product design and responsible supply chain management across the electronics sector: reduction of greenhouse gases through efficiency and renewable energy in Energy area, sustainable design and use of recycled materials in Resource Consumption area and elimination of hazardous chemicals from both the product itself and manufacturing in Chemicals area. Within each impact area, companies are graded on transparency, commitment, performance and advocacy efforts.

Key words: greener, electronics, energy, resources, chemicals.

1. INTRODUCTION

The extraction of essential raw materials for electronics poses significant risks to workers and results in lasting environmental damage. The reliance on coal-powered manufacturing exacerbates global warming and contributes to the severe consequences of climate change.

It is imperative for companies involved in the design and production of electronic devices to recognize their environmental impact and respond to public demand for innovation that prioritizes sustainability over mere technological advancements.

The current cycle of producing, selling, and disposing of billions of electronic devices annually generates short-term profits for manufacturers but inflicts substantial harm on the planet. Addressing the pollution associated with the intricate supply chain is a complex challenge that requires immediate action.

The IT sector has a history of disrupting established practices, and now is the opportune moment for it to leverage its capabilities to transform the manufacturing and usage of electronic devices. This transformation should aim to reduce the consumption of finite resources and dependence on fossil fuels, ultimately fostering a circular economy powered by renewable energy that can serve as a model for other industries.

2. MAJOR FINDINGS

Lack of transparency in supply chain – Despite representing the majority of the environmental footprint for most electronic manufacturers, most companies publish little information on their suppliers, keeping their environmental performance and impacts hidden from view. Of the 17 companies evaluated, only 6 publish a basic list of suppliers and only Fairphone and Dell provide details on the products or services from each supplier. Among the top 3 brands in the global smartphone market, Huawei is the only brand reporting nothing about its supply chain greenhouse gas emissions [1].

Supply chain driving demand for dirty energy – Upwards of 70 to 80% of the carbon footprint during the lifespan of personal computing devices occurs during manufacturing. Despite impressive progress a number of companies have made in starting the transition of their offices and datacenters to renewable energy, nearly all of the companies have yet to address the rapidly growing carbon footprint

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and dependence on dirty energy in their supply chains. Apple is the only company thus far that has committed to 100% renewable power for its supply chain. Estimated GHG emissions (both own operations and supply chain) for the 17 companies evaluated were more than 103 million metric tons of CO_{2e} in 2016, or roughly the same level emissions for the Czech Republic in one year [1].

Samsung lagging on renewable energy - Samsung is both the largest manufacturer of smartphones worldwide and a supplier of key components to many of the other brands of the 17 companies evaluated, yet the company is holding the sector back by failing to tackle its climate change responsibility by committing to 100% renewable energy for its operations. The company used more than 16,000 GWh of energy in 2016, with just 1% coming from renewables [1].

Chinese smartphone brands gaining global marketshare, but losing in green commitment – Chinese smartphone manufacturers, Huawei, Oppo and Xiaomi together occupied over a quarter of the global smartphone market share in quarter two of 2017 [2]. However, they score below average in all three impact areas, especially lacking transparency and substantial commitment in renewable energy. Huawei, now one of the top 3 smartphone brands in the world, has yet to realize its tremendous potential in environmental leadership.

Amazon remains one of the least transparent – Amazon remains one of the least transparent companies in the world in terms of its environmental performance, as it still refuses to report the greenhouse gas footprint of its own operations. While Amazon is willing to talk about its recent renewable energy deals, the company provides few details on its sourcing of recycled materials that are going into its devices, nor does it publish any restrictions on hazardous chemicals in its devices or being used in its supply chain as other leading electronics brands provide [1].

Planned obsolescence as design feature - Faced with market saturation for their devices in many countries, companies across the sector have increasingly changed the design of their products in a way that accelerates the replacement cycle, by making them difficult to service or upgrade, shortening the useful life of otherwise functional devices. Apple, Microsoft, and Samsung are among the companies moving in the wrong direction on sustainable product design. HP, Dell, and Fairphone are the notable exceptions to this trend, producing a growing number of products that are repairable and upgradable [1].

Lack of urgency, transparency in tackling global e-waste problem - Worldwide e-waste volumes are expected to surpass 65 million metric tons in 2017 [3]. While a number of brands now offer some voluntary take-back programs, there is little if any reporting on what is actually being collected or where it goes upon collection. The end result: less than 16% of global e-waste volumes are estimated to be recycled in the formal sector [4] despite the valuable materials contained within. Often “recycled” e-waste ends up at informal recyclers and handled in ways that endanger worker health and the local environment [5].

Use of secondary materials remains limited, with some recent progress - While a few IT companies have incorporated recycled plastics in their products for several years, very little progress has been made in sourcing other secondary materials into new products. Fairphone incorporates recycled tungsten, and Dell has shown success in using closed-loop plastic collected from its take-back channel. Apple recently committed to “closing the loop” for its materials, starting with tin and aluminum [1].

Stalled commitments to product detox – Numerous companies, including Acer, Apple, Samsung, LG, Lenovo, Dell and HP made commitments in 2009/2010 to phase out PVC and BFRs from their products, to stem the tide of toxice-waste. Now in 2017, only Apple and Google products are free of BFR and PVC across their product lines [1].

Lack of transparency and monitoring of workplace chemicals - To eliminate hazardous releases to the environment from manufacturing facilities and also to protect worker health and safety, all companies in the Guide have work to do to identify and eliminate hazardous chemicals used in the production of their products, improve worker health and safety due diligence, and develop safe substitutions. Apple, Dell, Google, HP and Microsoft are the only companies in the Guide that publish their list of substances that must be restricted in the manufacturing of their devices (MRSL) [1].

In the following Figure 1, details on each company’s assessment are presented, including grades for energy, resources and chemicals as well as the overall grades. Washington-based environmental advocacy group Greenpeace has published its report, Guide to Greener Electronics[1], a report card ranking the top 17 electronics manufacturers based on their energy use, resource consumption and the elimination of hazardous chemicals from products and manufacturing. According to the report, Fairphone and Apple received the highest marks, scoring a B and B-, respectively. Greenpeace reported that Amazon, Oppo, Vivo and Xiaomi were given failing grades overall. The Guide to Greener Electronics, published by Greenpeace USA, provides an analysis of what 17 of the world’s leading consumer electronics companies are doing to address their environmental impacts. Grades also are given in various categories where Greenpeace thinks work still needs to be done.


















| Overall Grades | | ENERGY | RESOURCES | CHEMICALS |
|---|----|--------|-----------|-----------|
|  | B | B | A- | B- |
|  | B- | A- | C | B |
|  | C+ | C+ | B- | C+ |
|  | C+ | B | B- | C+ |
|  | C- | C | C | D |
|  | C- | D+ | D+ | C |
|  | D+ | C- | C- | D |
|  | D+ | D | C- | D+ |
|  | D+ | C- | C- | D |
|  | D+ | C- | D | C- |
|  | D | D | D+ | D |
|  | D | D | D | D+ |
|  | D- | D | D | D- |
|  | F | D | D- | F |
|  | F | F | F | F |
|  | F | F | F | F |
|  | F | F | F | F |

Figure 1 - Details on each company’s assessment[1]

3. PROPOSED SOLUTIONS

Electronics manufacturing remains at the cutting edge of technological development and has a strong economic future. There is no reason why it should not also be at the cutting edge when it comes to sustainable product design and innovative manufacturing. This includes a crucial role in the rapid transition to renewable energy (RE), the substitution of hazardous chemicals, and greater worker health protection as well as the prevention of environmental pollution and human rights abuses at its source and once products become waste [1].

However, it is not enough for the industry to merely clean up its manufacturing methods for these devices. From its choice of energy to selection of raw materials, the industry needs to reinvent the way that electronic devices are made and used in society to reverse the ever-increasing environmental impacts driven by the growth of the sector.

There are 3 solutions, i.e. critical intervention points consumer electronics companies must employ to upgrade their business model and reverse the ever-increasing consumption of the planet's finite resources and reliance on fossil fuels:

3.1. Take Responsibility for the Supply Chain Footprint

Electronics manufacturing involves material inputs and manual labor from almost every continent. The supply chain for a single electronic device involves hundreds of supplier companies, in a web that crisscrosses the planet. The fact that most electronics brands do not own the facilities that make their devices does not absolve brands of their responsibility for upstream environmental impacts [1].

Greater Transparency - Electronics brands should disclose the list of suppliers they use to make their products, including what the supplier does and where it is located. Electronics brands should also disclose information about these facilities, including amount and type of energy used in the manufacture of a brand's products, the amount and type of GHG emissions generated, and the chemicals used in these facilities. Regular public reporting of these metrics will help to drive improvement over time.

Reduce Supply Chain GHG Emissions and Transition to Renewable Energy - Many tech companies have led the way in transitioning to renewable energy to power their corporate offices, and in some cases data centers and retail operations. However, it's in the manufacturing of their products where most of the GHG emissions are generated for major device manufacturers. The surge in electronics production in Asia since the 1990s has contributed to the demand for coal-powered electricity that is fueling climate change and degrading local air quality. Companies can start with setting a goal to reduce supply chain emissions like HP, or actively partner with suppliers to procure renewable energy like Apple.

Moving Beyond the Audit - Most electronics companies have established a code of conduct for their supply chain and conduct regular audits of their suppliers as a means of assessing compliance [6]. While audits, if done thoroughly, have shown their potential to be a useful tool to help brands identify problems in their supply chain and form a roadmap for improvements by the suppliers. There are increasing signs of limits of the auditing process as a means of driving change, particularly given that many brands are simultaneously seeking to cut margins as low as possible, and typically resist entering into longer term relationships that might create a greater incentive to tackling root cause issues. Leading companies in this year's Guide are moving beyond the audit, and partnering with suppliers to drive investments needed to improve environmental performance and worker health. This work can take multiple forms, from working with suppliers to install onsite RE to working with competitors to research and develop safer chemicals or greater stocks of recycled materials.

3.2. Design Sustainable Products

Design for the Planet - The short lifespans of consumer electronics exacerbate the toll these devices take on the planet's finite resources and contribution to overall GHG emissions. By extending

the useful life of an electronic device, the negative environmental impacts created in the manufacture and disposal of that device are spread out over time, helping to reduce the sector's overall impact. Brands need to design phones that are easy to repair and contain standard parts that can be replaced without the need to replace the whole device. Software updates should extend, or at minimum does not end, older products' lifespans [1].

Eliminate Hazardous Chemicals - Hazardous substances in devices perpetuate a toxic cycle, creating massive amounts of hazardous waste that endangers recyclers, the environment, and makes a circular production model challenging. Brands need to phase out harmful substances in the design phase so that end-of-life handling can be safer and more effective in achieving closed-loop production cycles.

Use Recycled and Recyclable Materials - The current linear production model requires massive amounts of virgin inputs, the sourcing of which damages the environment, depletes finite resources, and endangers workers and communities. Brands can reduce the need for virgin materials by incorporating more recycled/secondary inputs such plastic and metals and striving to use as many closed-loop inputs in their products. Brands must ensure their products are designed to allow for easy recycling after the product no longer functions [1].

3.3. Take Responsibility for End-of-Life Chain

Refurbish Devices and Components - To reduce the environmental impacts associated with electronics manufacturing, devices should be kept in use as long as possible, even beyond use by the original customer. Electronics brands can support this by marketing still functional refurbished products, while also making repair manuals and spare parts available so repairing, rather than replacing, a device becomes a more accessible and affordable option for consumers.

Strengthen Take-back Systems - With e-waste volumes mounting across the world, it's clear the current system of electronics take-back is not keeping up with new production. Electronics brands not only have a responsibility to ensure safe and responsible treatment of their products when they no longer function, but they also have an opportunity to reuse many of the valuable commodities and components contained in discarded electronics. Electronics brands must make their take-back systems easy to use and accessible to consumers.

Improve Recycling Technology - When electronics are recycled in the formal sector, the current technologies, including the smelting and shredding of entire devices, do not maximize the amount and variety of materials which can be recovered. Dismantling devices before recycling treatment has been shown to be the most efficient in recovering the highest variety and quality of materials [7]. In addition to improving product design for disassembly, electronics brands must work with recycling partners that pursue dismantling and direct processing of components to maximize material recovery.

4. CONCLUSION

While the IT sector has changed the world in amazing ways, the business model that supports these devices remains largely dependent on a linear system of production requiring constant consumption of virgin inputs and sacrificing the health of workers and the environment. While there have been initial, but important, steps forward by a few major IT companies to reduce their environmental footprint, most brands continue to make product design and supply chain decisions that are increasing. Brands can reduce the need for virgin materials by incorporating more recycled/secondary materials such as plastic and metals and using as many closed-loop inputs in their products. They also must ensure their products are designed to allow for easy recycling after the product no longer functions.

5. REFERENCES

- [1] Cook, G., & Jardim, E., *Guide to Greener Electronics*, Greenpeace, 2017.
- [2] Worldwide Quarterly Mobile Tracker, IDC, August 2017.
- [3] E-waste World Map Reveals National Volumes, International Flows, StEPInitiative, December 2013.
- [4] The Global E-waste Monitor, United Nations University, 2014.
- [5] Waste Crime – Waste Risks, United Nations Environment Programme, September 2015.
- [6] Electronic Industry Citizenship Coalition Standards & Accountability, Available at: <https://www.responsiblebusiness.org/code-standards-and-accountability> .
- [7] Report on Recyclability, Fairphone, February 2017. Available at: <https://www.fairphone.com/en/2017/02/27/recyclable-fairphone-2> .