

Title:

Is it ethical to source rare earth materials used as components in high technology devices?

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Introduction

The boom in technological advancements over the past 4 to 5 decades has led to an influx of electronic devices that helped to improve the lives of many. Technological breakthroughs such as microprocessors, light emitting diodes (LED), and lithium-ion batteries, they are almost to be found everywhere in our modern-day consumer electronics: TVs, speakers, displays, computers, lighting, and many more. In this information era, it is almost impossible for us to carry out our day-to-day routines without relying on consumer electronics. According to Ambaye (2020), the demand for rare earth materials has increased significantly over the years because of their extensive use [1], with the commonly sourced being praseodymium, cerium, lanthanum, neodymium, samarium, and gadolinium due to their abundance throughout the globe. This also led to an increase in areas around the world being converted to rare earth mining spots.



Figure 1: Donut

Context

Rare earth materials' impact towards humans

According to Liang's (2018) investigation, the increase in residual materials that were discarded, and the pollution caused by them in the environment has led to essence of the materials being present in the human body through the food chain [2]. Zhang (2014) evaluated the reproductive toxicity of Sm (Samarium) in testicular lesions of male ICR mice given a continuous oral administration of Sm nitrate for 90 days. They found that the Sm targeted the testis because it showed a decrease in testicular sperm and spermatogenic cells [3]. All of which sounds dangerous, but it can be under control if traces of material residue are out of reach from civilisation.

Research carried out by Liang (2018) found that children that are studying near the Bayan Obo mining area have traces of rare earth elements in their urine samples, so as the adults working or living near the mine. Even though the research did not find a link between the exposure of rare earth materials in drinking water and the health of the nearby residents, it is still mind boggling that organizations did not take any action to prevent or cure health issues that arise during material extraction. Furthermore,

according to Kant's principle of consistency, if every tech organization allows its employees to risk catching infections or long-term health damage for the sake of meeting demands, more and more people are going to get infected. Based on the act of Utilitarianism, it is considered as unethical because the end results in more harming than happiness to the group. It is also unethical based on Kant's principle of Interaction because organizations sacrificed their worker's and public health over their own interests, profits.

Rare earth materials polluting the environment

The extensive use of rare earth elements can potentially lead to severe contamination of the surrounding environment. This includes agriculture, aquatic life, and soil, which can directly or indirectly affect the public health. According to Kyung (2016), he found

the damage done by rare earth mining towards nature including organ and general body defects to animals, and growth inhibition and a reduction of chlorophyll production in plants. He also questioned the high demand for rare earth materials in several applications, yet very little information on its effects on human health and the environment [4]. This question alone already shows that organizations are not concerned about the public health, regardless of if they are aware about this issue or not. Weng (2013) stated that the deposit types of the rare earth materials can influence environmental effects, and that materials with radioactive properties in ores is the most common concern [5].

According to the Act of Utilitarianism, the organizations are unethical because the ignorance or the lack of prevention nor cure will harm not only their clients, but also the general public. This also unethical according to the Rule of Utilitarianism and Kant's Rule of Universality because the pollution caused by organization not only shows that they are irresponsible, but it also caused harm towards public health.

Who to blame? China?

Barakos (2016) stated that despite the spur in exploration activities, the global production of rare earth materials remains small, and majority of the operations are still based in China [6]. That statement was 6 years old; China is not the only country that is guilty of excessive mining but is still considered notorious in the rare earth industry. Harvard International Review stated that China's dominance over the rare earth industry was only because they cut corners by laxing environmental regulations, usage of low cost and high pollution methods. However, without China's corner cutting strategies, consumers all around the world might not be able to purchase their devices at an affordable price. So, who is there to blame, the consumers demanding for affordable devices, the organizations that mishandle the sourcing, or China with its lax pollution enforcement to meet consumer demand?

Ethical Recommendation

Based on the context stated above, it is not ethical to source rare earth materials used as components in high-technology devices. This is because organizations and countries are competing for rare earth extraction to meet demands, which eventually led to sacrifices to public and environmental health.

Organizations can extend their support towards their legacy devices. The extended support for legacy devices meant that consumers could maximize the usage of their devices and without worrying about it becoming useless or obsolete. However, organizations continue to provide support for legacy devices, which means they still have to allocate some of their costs for tooling, knowledge, and blueprints, which will reduce their revenues. According to the Act of Altruism, this is considered ethical because organizations made the lives of its customers easier even if it meant losing some profits.

Organizations can also incorporate or replace rare earth materials with something renewable or recyclable. By doing so, less rare earth materials are required to be

sourced and extracted as their demands slowly decreases in favour of recycled or renewable materials. Organizations can also save a fortune in their development costs in the long run as rare earth materials will continue to deplete and prices will eventually skyrocket. Manufacturers can start by slowly phase out the usage of rare earth materials and incorporate some renewable or recycled materials into their components (aluminium, plastic). At the very least, manufacturers can try to reduce the usage of rare earth materials in their products by re-engineering them to be smaller and more compact without sacrificing performance. In other words, it does not need to be bulkier than it needs to be.

Both recommendations are also considered ethical according to Kant's principle of consistency. This is because if every organization extends their support for legacy devices and to use renewable materials for new devices, this could mean a significant reduction in rare earth materials usage. This also results in a cleaner environment and lesser risk of toxic waste exposure to the public. This also obeys Kant's rule of Universality as these solutions would prove that the organizations are responsible as they change their ways of doing.

Conclusion

Based on the ethical dilemmas and explanations stated above, the act of sourcing rare earth materials is unanimously viewed by various research as unethical; corner cutting and improper disposal of rare earth sourcing all for the sake of meeting demands for a quick profit. The goal here is not to condemn the organizations that sourced rare earth materials, but to suggest alternatives that are somewhat more ethical than what they are currently doing so that they could produce lesser environmental and health impacts without affecting their business.

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