Chapter 5
E-Waste Management: A Significant Solution for Green Computing

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ABSTRACT

Green computing can be described as efficient resource management in distributed computing environments such as cloud, fog, and edge computing environments. In green computing, green refers to the eco-friendly environment with environmental responsibility to efficiently manage the computing resources. Mainly, two significant reasons are associated with global warming issues from the distributed computing perspective. They are high power consumption of cloud datacenters and high CO2 emission rate. According to many survey reports, every year, cloud datacenters alone produce nearly 90 million metric tons of CO2 into the environment, and now, this high power consumption of datacenters has become one of the primary reasons for global warming issues. Also, it stated that this CO2 emission rate would increase by 8% every year if it did not identify proper control measurements. Therefore, it is crucial to enhance e-waste management by increasing the efficiency of computing resource usage and minimizing high power consumption, high CO2 emission rate, inefficient recycling policies, etc.

DOI: 10.4018/979-8-3693-1018-2.ch005

INTRODUCTION

E-waste, often known as electronic garbage, is a rising worldwide issue in our increasingly digital and technologically oriented society. E-waste is made up of abandoned electronic equipment and gadgets, which can include everything from obsolete cellphones and laptops to smartwatches and other home appliances. In the environment, decomposition is one of the most important factors unless the substances are moved into different forms. The electronic equipment is mainly made of metal and other chemical materials. Without a proper management strategy, it's quite impossible to prevent upcoming environmental threats and disasters. The world's technological dependency is increasing daily; parallelly, e-waste is also growing 400 metric tons of CO_2 were released into the atmosphere by the (ICT) industry worldwide in 2007. Personal computers and other gadgets, such as computer displays, have had a significant negative influence on the environment Airehrour et al. (2019). The production of 41.8 million metric tons of electronic garbage was seen all over the world a few years ago Debnath, Roychoudhuri, and Ghosh (2016a). As we move forward in time, the most recent research from the United Nations University (UNU) paints a troubling picture: the volume of electronic trash is expected to rise to a staggering 52.2 million metric tons by the year 2021. This trend emphasizes the frightening rate at which our digital consumption practices are causing the ever-escalating e-waste problem Prasad et al. (2021). Electronic waste poses a significant threat to both human health and the environment due to its composition of heavy metal ions like Cadmium, Lead, Bromine, Mercury, Chromium, and various flame retardants. When humans and the environment come into direct contact with such waste, it can lead to highly hazardous situations Rautela et al. (2021). These materials have the potential to wreak havoc on human health by directly harming vital systems, including the cardiovascular, respiratory, digestive, and neurological systems Kumar, Holuszko, and Espinosa (2017) Joshi et al. (2023). So overall, E-waste creates an imbalance in the ecological system. Through its lifecycle and emitting greenhouse gases, E-waste also causes global warming. While the production of electronic devices and other gadgets requires a high amount of energy. During the manufacturing, gases like CO_2, Sulphur, and CO_2 are uncovered in the air layer.

The 20th century was revolutionary because of several technological inventions. The present and future also depend on technological advancement. Alongside the more industrial extension, there is a necessity for that. The ecosystem of this planet is becoming more unsuitable for using unguided and excessive energy. On a worldwide scale, governments and academic experts agree that carbon dioxide and other pollutants are the primary drivers of global warming and climate change. These pollutants include a variety of indicators, such as sulfur dioxide, suspended particle matter, and nitrogen oxides. This collective acknowledgment emphasizes these pollutants' crucial role in influencing the Earth's climate and the necessity for comprehensive solutions to limit their effectsAmri, Zaied, and Lahouel (2019). As it's a concerning topic in the present world, research took place in this field to find the solution. Green computing takes place by fulfilling the necessity and reducing the excessive usage of resources. Green computing involves reducing energy consumption, managing resources, and adapting to renewable energy. As it is a pressing issue in the modern world, researchers dug deep into this area to discover the answer. "Green computing" is implemented by decreasing excessive resource use while satisfying needs. Green computing involves conserving energy, managing resources, and incorporating renewable energy. Green computing promotes the responsible handling and disposal of electronic equipment, serving as a deterrent to the sneaky introduction of harmful e-waste into our delicate ecosystems. Electronic equipment's proper stewardship protects the land, water, and air from the insidious incursion of dangerous contaminants through rigorous end-of-life treatment, preventing contamination and ecological damage Panda (2013a).