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E-WASTE DISPOSAL AND MANAGEMENT

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Abstract

Electronic waste or E-waste is waste electronic and electrical equipment is an emerging issue posing serious pollution problems to the human and the environment. New effective waste management options need to be considered especially on recycling concepts. Now-a-days, the disposal of electronic waste becomes a tedious process as it is a non-degradable material. so by using those electronic wastes in concrete, we can achieve more strength and also it is economic in construction. an investigation to study the performance of concrete prepared with E-waste as a partial replacement of coarse aggregate

The exponential growth in electronic waste (e-waste) comprising end-of-life electrical and electronic equipment has emerged as a major environmental concern. E-waste recycling, which comprises systematic collection of e-waste and its treatment for recycling of useful materials, offers a valuable tool to minimize the escalating heap of e-waste, supplement the shortage of some primary resources and support the economy. However, depending on the processing methods used for recycling, e-waste can also be a source of toxic substances, such as heavy metals, and persistent organic pollutants, including poly cyclic aromatic hydrocarbons (PAHs), poly chlorinated biphenyls (PCB s), abominated flame retardants (Bf Rs), perfluoroalkyl and polyfluoroalkyl substances (PFASs), poly chlorinated bedizen-p-dioxins (PCDDs) and poly-chlorinated dibenzofurans (PCDFs). To efficiently harness the benefits of e-waste recycling without jeopardizing public health, a holistic approach encompassing improved product design and recycling rate and minimal emission of hazardous e-waste pollutants to the environment is required. In this review, we discuss the opportunities and constraints, and strategies for improved e-waste management. Further, we highlight the recent global trend in e-waste generation and provide an overview of the e-waste recycling process and the impact of e-waste pollutants on human health. Finally, a few strategies that can be implemented to make e-waste recycling an efficient and safer process have been discussed.

keywords

Cement, Coarse aggregate, Fine aggregate, E-waste, Compressive strength, Split tensile strength and flexural strength. Electronic waste (e-waste) is one of the fastest-growing pollution problems worldwide given the presence If a variety of toxic substances which can contaminate the environment and threaten human health, if disposal protocols are not meticulously managed. This paper presents an overview of toxic substances present in e-waste, their potential environmental and human health impacts together with management strategies currently being used in certain countries. Several tools including life cycle assessment (LCA), material flow analysis (MFA), multi criteria analysis (MCA) and extended producer responsibility (EPR) have been developed to manage e-wastes especially in developed countries. The key to success in terms of e-waste management is to develop Eco-design devices, properly collect e-waste, recover and recycle material by safe methods, dispose of e-waste by suitable techniques, forbid the transfer of used electronic devices to developing countries, and raise awareness of the impact of e-waste. No single tool is adequate but together they can complement each other to solve this issue. A national scheme such as EPR is a good policy in solving the growing e-waste problems.

Introduction

The generation of E-waste is the fastest growing area and the disposal poses a major problem in the related neighbourhood. The use of recycled plastic in the manufacturing of new plastic consumes considerable energy, raw material use and wear and tear on machinery. The use of recycled materials in construction applications is among the most attractive option because of the large quality demand, low quality requirements and widespread extent of construction. The use of E-waste plastic cement concrete aggregate has been focused in this investigation as a viable solution to the problem of recycling costs and high disposal costs. The various possibilities of recycling the plastics such as coke oven process, Thermal recycling, Mechanical recycling etc. The major challenge for the plastic waste recycling is the need for a continuous and stable supply of materials to be recycled and lack of cost effective technologies for recycling. Several research works carried out to examine the possibility of reusing waste recycled glass in concrete and construction applications as an alternative solution to the growing quantity of waste recycled glass. E-waste describes discarded computers, circuit boards, transistors, TV, broken electrical and electronic devices as shown in fig.1. Rapid technology change, low initial cost has resulted in a fast growing surplus of electronic waste around the globe. E-waste is one of the fastest growing waste streams in the world. In developed countries, previously, it was about 1% of total solid waste generation and currently it grows to 3% by 2015. In developing countries, it ranges 0.01% to 3% of the total

municipal solid waste generation. Several tones of E-waste need to be disposed every year. Traditional landfill or stockpile method is not environmental friendly solution and the disposal process is also very difficult. Looking to the global issue of environmental pollution by E-waste, research efforts have been focused on consuming this waste on massive scale in efficient and environmental friendly manner. Researchers plan to use E-waste in form of concrete ingredient as the concrete is second most sought material by human beings after water. E-waste in concrete will not only be its safe disposal method but adding admixtures may also improve the concrete properties like compressive, tensile and flexural strength. The main aim of this paper is to have an experimental study on effective utilization of E-waste as 10%, 20% and 30% partial replacement of coarse aggregate in concrete. By this project it helps us to know the detail works that are tube carried out for the concrete construction at particular place with the partial replacement of coarse aggregate by E waste. The results of the studies will include the workability and characteristic strength of E-waste concrete. Fig.1 shows the view of electronic wastes or E-waste (a) Electronic chip boards (b) Chip removed electronic boards (c) Crushed electronic waste

Electronic waste" may be defined as discarded computers, mobile phones, office electronic equipment's, entertainment device electronics, television sets refrigerators etc. Because loads of surplus electronics are frequently commingled (good, recyclable, and non- recyclable), several public policy advocates apply the term "e-waste" broadly to all surplus electronics

Management Of solid waste has become a critical issue for almost all the major cities in India. Increase in population coupled with the rapid urbanization of Indian cities, has lead to new conception patterns. Which typically affect the waste stream through the successive addition Of new kinds Of waste. Over last two decades. spectacular advances in technology and the changing lifestyle of people has lead to an increasing rate of consumption electronic products.

Literature Review

Geographical distribution is based on the object countries of the researches. Some of the researches focus on lab study so the countries of research are the countries where the study conducted or the samples taken. Other researches review or compare the practices of management in several countries. Therefore, the total number of all countries discussed may exceed the number of articles reviewed since an article may review several countries. Some articles do not mention or review specific countries so the origin countries of the writers are taken to identify the geographical aspect. The distribution of researches countries is shown in Figure 5.

During 2004-2020, most of the researches discussed or conducted in the Asia region (64.2%) and mainly focused on China (22.4%) and India (11.9%). It is

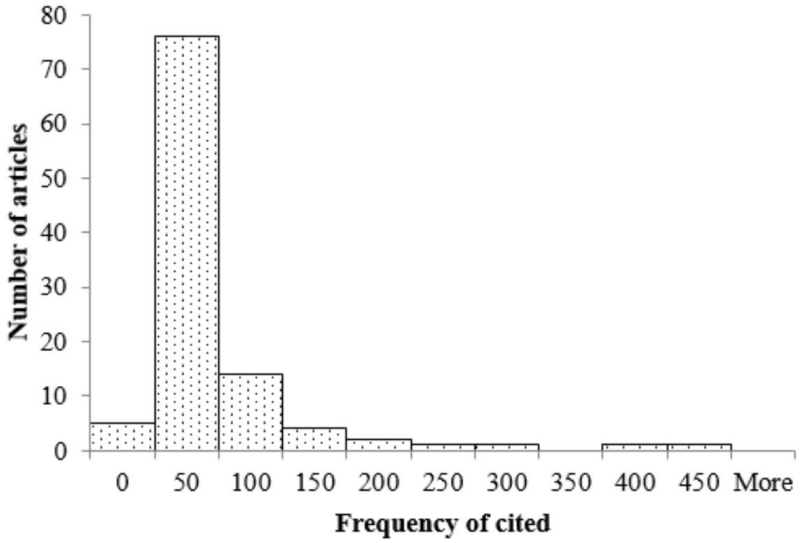


Figure 1.1 frequency of cited

associated with the fact that China is the major contributor because of the import of e-waste and rapid economics and industrial development (Hossain et al., 2012). Figure 5 also shows that the e-waste researches in China and India are consistent each year.

Figure 4. Citation Frequency of Articles Reviewed

The e-waste research in Europe is quite popular, which 21.6% of articles reviewed or conducted in various countries across Europe. As developed countries, European Union (EU) that contributes 26.7% of global e-waste reflects its concern on e-waste not only by researches on emerging technologies but also by the detailed regulation, such as Directive 2002/95/EC which disallows the use of toxic and hazardous substances and Directive 2002/96/EC regarding WEEE and EPR.

Materials And Methodology

SOUCRCE OF E-WASTE
Electronic waste especially computer waste is growing exponentially in volume because of increasing demand of information technology and its application in the national growth process. Various government department, public as well as private sectors are fast feeding old electronics appliances such as computers.
Telephones, into the waste stream
Individual household and small business
Large business, institution, government house and foreign embassies
PC manufacturers and retailers
E-waste fem imports
Secondary market of old PCs

PERCENTAGE OF SOURCES CONSTITUTING E-WASTE:
E-WASTE FROM INDIVIDUAL HOUSEHOLD
As far as PCs emanating from individual households are concerned, it is difficult to know the E-Waste from imports
The biggest source of PC scrap are imports. Huge quantities of e-waste such as monitors, printers, keyboards, CPUs, projectors, mobile phones, PVC wires, etc. are imported. The computers thus imported are or all ranges, models and sizes, and functional as well as junk materials.

SECONDARY MARKET
These are the waste coming from the secondary market. It includes TV, computers, mobiles, electric-boards etc.

Categories Of E-Waste

The electrical and electronic equipment can be broadly categorized into following categories, Large-household-appliances (refrigerator, freezer. washing machine cooking appliances. etc.) Small-household appliances (vacuum cleaners, watches, grinders, etc.) Consumer equipment (TV, radio, video camera, amplifiers, etc.) Lightning equipment (CFL, high intensity sodium lamp, etc.) Electrical and electronic 1001s (drills, saws, sewing machine, etc.)

Toys, leisure, and sport equipment (computer/video games, electric trains, etc.) Medical devices (with the exception of all implanted and infected products radiotherapy equipment, cardiology, dialysis, nuclear medicine, etc.) Monitoring and cunt-ml instruments (smoke detector, heating regulators, thermostat, etc.) Automatic dispensers (for hot drinks, money, hot and cold bottles, etc.)

Research Question

1.Definition of E-waste

E-waste refers to discarded electronic devices and equipment, such as computers, phones, televisions, and appliances.

2.composition

E-waste-contains a mixture-of materials,including metals, plastics, and hazardous substances, which require specialized handling and disposal.

3. Rapid Growth

The rapid pace of technological advancement has led to a surge in e-waste, with millions of tons generated globally each year.

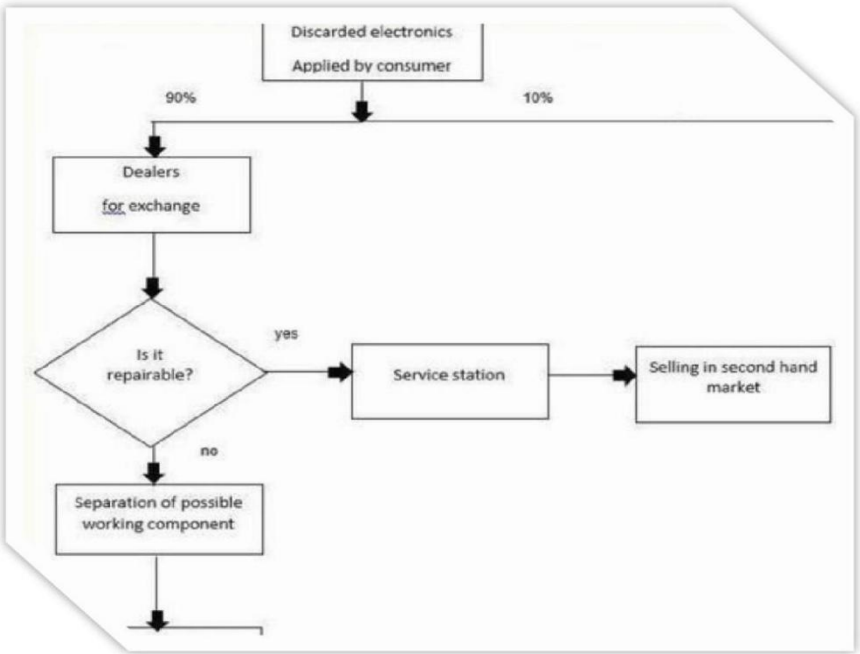
4. Environmental Impact

Improper disposal of e-waste can lead to soil and water contamination, as well as air pollution, posing risks to human and environmental health.

Research Approach Or Procedures

PRODUCT REUSE

Reuse is the environmentally preferable option for managing older electronics equipment. By extending the useful life of old products, reuse conserves the energy and raw materials needed to manufacture new products and doing so reduces the pollution associated with energy use and manufacturing. Reuse also gives people who cannot afford new products access to electronic equipment at reduced or at low cost.



Data Collection

E-waste (electronic waste) disposal and management are critical issues in our increasingly digital world. Let's explore some key points related to e-waste data collection and management:

1.Global E-Waste Statistics:
E-waste refers to discarded electronic devices with a battery or plug that are no longer wanted, functional, or obsolete.

2. The Global E-waste Monitor 2024
The Global E-waste Monitor is an essential reference tool for policymakers and industry stakeholders.In 2022, a record 62 billion kg of e-waste was generated globally, equivalent to an average of 7.8 kg per capita per year.Only 22.3% of this e-waste mass was formally collected and recycled in an environmentally sound manner.

3.Importance of Data Collection:
Accurate data collection on e-waste helps identify trends, set waste reduction goals, and measure recycling success.

4.E-waste Management Challenges:
E-The economic impact of e-waste management in 2022 resulted in a loss equivalent to USD 37 billion.

5.E-Waste Databases

database provides valuable insights for policymakers and stakeholders.

effective e-waste data collection is crucial for informed decision-making and sustainable management practices. As we continue to digitize our lives, addressing e-waste challenges becomes even more critical

Data Analysis Method

Proper management of e-waste is crucial to minimize its impact on human health and the environment. Here are a few approaches for analyzing e-waste management:

1.Survey Data Analysis:
Researchers often conduct surveys to collect data from e-waste management companies. These surveys help assess various aspects related to e-waste, including disposal practices, recycling efforts, and health implications.

2.Machine Learning Models:
Machine learning techniques can be applied to analyze e-waste data

3.Data Envelopment Analysis (DEA):
DEA is an efficiency measurement method used to evaluate the performance of e-waste management systems.It assesses the relative efficiency of different strategies by comparing inputs (resources) and outputs (results).

4.Io T Sensor Data and Predictive Analytic:
Implementing smart waste management systems involves using Internet of Things (IoT) sensors to monitor waste bins.
By analyzing historical sensor data, decision-makers can predict waste generation trends and patterns. This information helps optimize collection routes, allocate resources efficiently, and reduce overall waste.

5.Standardized Metrics:
Metrics play a crucial role in assessing e-waste management effectiveness. Some common indicators include:
.Total Electrical and Electronic Equipment (EEE) put on the market.
.Total e-waste generated.
.Officially collected and recycled e-waste.
.E-waste collection rate.

Analyzing data and adopting innovative strategies can lead to better outcomes for both human health and the environment.

Interpretation

E-waste management refers to properly disposing and managing electronic waste, including old or discarded electronic gadgets such as phones, computers, and televisions.
the E-waste (Management) Rules, 2022 were introduced in India to address the growing problem of e-waste. Here are some highlights from these rules:

1.Scope and Definitions:
The 2022 Rules apply to manufacturers, producers, refurbishes, dismantles, and recyclers of e-waste.
The definition of e-waste has been widened to include solar photo-voltaic modules or panels or cells that are discarded as waste.
The term bulk consumer now includes any entity that has used at least one thousand units of electrical and electronic equipment listed in Schedule I of the 2022 Rules during a financial year, including e-retailers.

2.Extended Producer Responsibility (EPR):
EPR is a policy-based approach where responsibility is placed on producers of specific categories of waste for the treatment and safe disposal of such waste.
Under the 2022 Rules, producers have annual e-waste recycling targets to ensure proper recycling and safe disposal of e-waste.

3.Registration Requirement:
Unlike the 2016 Rules, which required authorization from the State Pollution Control Board, the 2022 Rules mandate e-waste producers to obtain registration on a portal developed by the Central Pollution Control Board.

4.Reducing Compliance s for Bulk Consumers
The 2022 rules aims to reduce compliance burdens on private companies ,public organizations ,and multinational corporations , which are considered bulk consumers of e-waste under the 2016 rules

In India, e-waste management is predominantly informal ,with approximately 90% of e-waste collection and 70% of recycling being managed by a competitive informal sector. . It's crucial to continue improving e-waste management practices to protect our environment and human health

Conclusion

In this project, the Compressive strength, split tensile strength and Flexural strength have been studied for various replacements of coarse aggregate by E-waste. From the results we have chosen the optimum percentage of replacement is 20%, which gives the strength more than the conventional concrete. It was found that the use of E-waste concrete helps in high compressive, split tensile and flexural strength with high permeability and is therefore safe compared to normal concrete construction. Based on the results of this project, it is recommended that E-waste concrete can be used for an economical construction.

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