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Survey on Electronic Devices and its Impact on Environment during Each Phase of Their Life Cycle

Sanjana Srinivas
Department of Information Science and Engineering, BMS College of Engineering, Bangalore, India.
1bm16is111@bmsce.ac.in

Hasmitha Ganesh
Department of Information Science and Engineering, BMS College of Engineering, Bangalore, India.
1bm16is037@bmsce.ac.in

Krishna Pooja Singh
Department of Information Science and Engineering, BMS College of Engineering, Bangalore, India.
1bm16is046@bmsce.ac.in

J Sagar
Department of Information Science and Engineering, BMS College of Engineering, Bangalore, India.
1bm16is041@bmsce.ac.in

Anitha H M
Department of Information Science and Engineering, BMS College of Engineering, Bangalore, India.
anithahm.ise@bmsce.ac.in

Abstract – The goal of this analysis is to address the environmental impact literature and the implications of transitioning to a cloud-based digital infrastructure network from the existing business model of selling, utilizing and discarding telephones and other similar electronic tools. In regard to the life cycle profile, the implications of this transition and resulting shifts in nature are discussed. The environmental impact of electrical products is primarily attributed to the usage of energy during the manufacturing process in the application step. When contrasting the amount of plumage of electrical soldered connections of the machines with the plumbing material of the fuel used to operate a fuel-fired power plant that provides the energy, the carbon usage benefit is emphasized. Waste in electrical and computing devices all-round the globe, and has become a huge environmental issue in vast amounts. For goods that complete a useful life, electronic waste is a growing, informal term. Disposal and administration activities discuss the present and potential production of e-wastes, probable pollution issues and operational administration. When addressing established e-waste management, current and potential e-waste development, evolving environmental issues relevant to its handling and management activities are addressed. E-waste is deemed hazardous since certain components contain unhealthy materials depending on their design and density. Such materials are in reality dangerous and present a danger to human life and the climate. Dangerous contaminants mixed with fresh soil and air produced detrimental consequences on the whole community, whether intentionally or unintentionally. Related impacts include acid spill, toxic contaminants such as heavy metals and carcinogenic chemicals and other side effects such as heavy metal bio amplification. When miss-aligned, you can leach the groundwater and soil with stereos, copiers, fax machines, electrical lights, mobile devices, video recording equipment, etc.

Index Terms – Environment, Hazard, Heavy metals, Carcinogens, Biomagnification, Electronic waste

1. INTRODUCTION

In the usage of energy over a life cycle process of the unit, the greatest environmental effect of electrical systems was suggested. The energy usage should be granted greater consideration to suppliers, consumers, clients and system users and others interested in the combined environmental impact of electronic technology.

Many of the worldwide environmental issues arise from carbon use expressly or implicitly. In reality, the fire of fossil fuels is a big source of energy and is responsible for environmental concerns, both hydroelectric and nuclear. Electronics is one of the largest rising classes in energy use and a significant contributor to these problems. Electricity utilization in electrical equipment is easy to show that they have significant impacts on the climate. This is more difficult to reconcile this with other adverse consequences of smart apps. All the environmental consequences are in essence and negligible.

The cell phone has been one of the most innovative technologies for informal contact with the broader world since its introduction in the early 80's. Miniaturization and device efficiency, as well as growing the network bandwidth of supporting networks, has allowed the mobile phone to become a resource capable of doing far more than voice calls.

That is particularly valid with regard to smartphones. Although smartphones have been around for almost two decades, it wasn't until Apple's iPhone came into existence in 2007 that the platform came to the notice of a massively wide number of consumers by offering a superior mobile internet interface. The fast rise in mobile phones has contributed to a market centered on an almost as heavy replacement in older smartphones. The high machine instability is further exacerbated by the reality that the networks are often not adequately disposed of. Cell phones need a lot of rare and precious metals in their production, resulting in irretrievable potential resource depletion.

Figure 1. Electronic Waste [16]

Many countries handle electronic waste largely by informal firms, which use wasteful and polluting recycling methods to collect recycled components at shockingly low wages as shown in Figure 1. E-waste is exported rapidly through production in the context of free exchange from developing countries. India is a region of growing demand for electronics due to population growth in recent decades and shifts in lifestyle. It is estimated to reach 80,000,000 tons annually in 2012. Electric waste is 15% more generated in Indian.

The Central Pollution Control Board (CPCB), a review of 65 towns in India, estimates that the Delhi, Madhya Pradesh, Karnataka, Uttar Pradesh, Gujarat as well as Maharashtra produce approximately 60-70 percent of total e-wastes.

There is a trend impacting industries that affect consumer models and especially the electronics industry, where e-waste volumes have risen due to limited life cycles and increasingly evolving technologies. Most e-waste materials are delivered to locations. Due to their content quality and consequent constraints on landfills, however, their restricted recyclable ability has led to the growth, not only in terms of the waste management, but also in terms of the recovery portion of useful items, of the preservation Strategies for their recycling and reuse.

An upward growth in human potential is a result of the industrial revolution. The technical progress witnessed is much more dramatic and pervasive than the effects on societies worldwide of the industrial revolution. Our world-wide interactions have had an unequaled impact on human society throughout the era of computers. Connectivity was allowed and increased commercial usage of electronic devices. Nevertheless, it has considered other issues, including the increasing e-waste problem which society has to face with courage even with the major benefits. Furthermore, under the current scenario, productive storage and recycling of e-waste, human safety and the atmosphere will be considerably affected if appropriate regulatory safeguards and steps were not taken. India's principal sources of electronic waste are:

A. Computer monitor

B. Solder in written circuit, glass panels & gaskets.

C. Refrigerators & Batteries

D. Mo Chip Resistors & Half Conductor

E. Mobile phones

F. Microwave and Air conditioners

1.1. Electrical waste

Electronic waste is often referred to as technology for component restoration, reusability, re-sale, storage, storage or disposal. Informal processing of e-waste may have negative consequences on human safety and the climate in developing countries. The elements in electrical waste, including CPUs, are harmful to feather, cadmium, beryllium or flame retardant products. Recycling and recycling of e-waste can present substantial safety hazards for workers and their populations. After a useful existence, waste is created during the disposal of an electronic device.

1.2. Environment

The effect of technology on human health has been a problem for a minimum of 200 years. Such issues ranged from the waste and contamination generated by mining and heavy industry to emissions from power plants for automotive and fossil fuel. Now the production, manufacture and disposal of electronics goods poses additional risks to the delicate equilibrium of Earth's ecosystems. However, electronics can be the solution to many of our existing and potential environmental and energy-related issues as well. By intentionally meticulous use of products, equipment, design, manufacture, delivery, use, and end-of-life disposal, the environmental impacts from electronics may be substantially minimized or removed. Figure 2 shows electrical waste.

Figure 2. Electrical Waste [17]

2. RELATED WORK

Life Cycle Assessment (LCA) is a tool for the estimation of environmental effects and potential implications in the production, processing, delivery and selling of goods, the usage and eventual end-of-life treatment of raw materials and energy storage, such as waste disposal, recycling and electricity (e.g., cage-to-grave) over the commodity life cycle. Atmospheric changes and ecosystem consequences entail climate change, stratospheric ozone loss, human and environment toxicological tension, reduction of energy, water consumption, etc.

This paper [1] explains and deals with circumstances in which LCA is used to assess the environmental effects of electronic devices and processes. It covers portable electronics, micro-integration electronics, solar photovoltaic (PV) cells and hybrid cars. The four interactive examples illustrate and objectively evaluate LCA as a method for evaluating the environmental implications and consequences of a product's life cycle. In the context of climate change, it includes environmental and cause effects, stratospheric ozone loss, toxicological risk for human safety, biodiversity, reduction of energy, usage of water. Of consumer electronic goods, devices of micro convergence, photovoltaic solar cells and electric cars, this was done.

The power electronics[2] technology has evolved dramatically over decades of rapidly emerging power semiconductor products, converters, pulse width modulating (PWM) techniques, electrical appliances, motor drives, sophisticated control and simulation techniques. In the US, nearly 70% of electrical energy is now being transmitted via appliances, which would eventually increase to about 100%, according to numbers from Electric Power Researcher Institute. We expect to see the immense effect of electronics in the 21st centuries on electricity efficiency, recycling and hybrid-electric technology not just in world industrialization and electricity grids, but also, the effect of emerging technologies will be addressed on electricity efficiency, recycling, bulk energy storage and hybrid / electric vehicles.

Finally, before finalizing and future prognosis, other samples of applications should be tracked. This report offers an in-depth analysis and possible mitigation strategies of the global energy crisis and climate-change issues resulting from the use of manmade fossil fuel. It also discusses the rising impact of energy technology on energy production, green energy technologies, bulk energy storage and electric / hybrid cars in the 21st century, in addition to widely agreed developments from global industrialization.

LCA is a comprehensive research method [3] and model that helps to quantify Eco environmental impact on production processes in a specific range (ten times) of magnitude. With the consumer economy, goods and services are valuable, but their social benefits also entail significant environmental burdens. In 2015, it was reported that at least 3.5 billion consumer electronic goods will be shipped such as cell phones, ipads, notebooks and desktop PCs / monitors. Because LCA is a data intensive approach, technological resources have been established specifically for adaptation and among the leading instruments are GaBi, SimaPro and Environmental Improvement Made Simple (EIME). Such techniques are used to generate a relatively accurate test for the LCA. Such methods are used to generate a fairly accurate LCA check. However, they come with costs and, at times, secondary data that may or may not be of adequate consistency to fit this function. The balancing points are the purpose of the LCA, the benefits that can be gained by applying the LCA in design or communication materials, and the expense of gathering primary data in respect to the required reliability.

We just hit the surface of LCA, an incredibly modern discipline. There is a lot of research going on to improve stuff. Pattern analysis, neural networks, preparation, inference, foggy thinking, rules-based. Furthermore, so-called free accessible global EIO repositories are being established that should facilitate robust, sufficiently spatially broad LCAs with the linking of pollutants from all nations to natural resources. The conclusions, estimates and arguments made for all but especially for LCAs must be critically evaluated. No exception are only CE LCAs

E-waste is typically interchangeably found [4] in Installations for electrical and electronic waste. The issue of e-waste cannot be addressed by any process. Workers in recycling and e-waste are vulnerable to pollutants, no matter whether they work in the formal and informal market. It is just the same sensitivity point. Formal (relatively safer) recycling / disposal cannot be contrasted with informal recycling. Formal recycling / depletion methods, by comparison, are not panacea; they are also at risk of exposing dirt, land and water to e-waste pollutants. Combinations of e-waste management schemes can be used to mitigate e-waste economic, human health and animal impacts. Throughout the underdeveloped and emerging nations, awareness is particularly important; they too do not realize the essence of the issue because much of the e-waste is accessible in the world. They will all be mindful of and strive for innovative approaches to "cool" consumer goods in any step of existence. Awareness of the detrimental health, human and animal consequences of e-waste will be part of the curriculum of schools and higher education institutions. There is also a need for innovation in the introduction of modern and updated approaches for e-waste management such as creative product design, greater transparency to vendors, standards and marking. Producers and suppliers must ensure the greening of equipment during their stages of life.

We will resume mineral extraction and refining .[5], begin the manufacturing of the products and the development of the electrical machinery and cover then all phases of the existence of the electrical equipment, resulting in the breakdown and reuse of the goods, to perform a rational study of the scale of environmental effects. The study builds on the awareness of the forms, quantities and environmental consequences of the technological losses, most often seen as waste, to be used in the electrical machinery generated. In order to understand the functioning and effect on the climate, or on the operation, repair and care of the workers, in terms of sustainability, the study of specific system built as a material framework is complicated and challenging at any point (electric, magnetic, thermal, etc). The key explanations for their environmental impact, the heat produces, noise, friction, the lack of lubricants and coolants, dust or toxic gases can be argued the electric machines themselves pollute less during operation. With proper set operating modes, all of these impact variables may be mitigated by operation and maintenance.

The best existing approaches from various countries should be used to create a global e-waste management system [6]. Good sourcing and recycling right up to the processing and storage of goods can be done by careful handling of e-waste, which would make this huge amount of e-waste viable items and market prospects. Large pollutant forms used with each commodity category will typically be categorized as dangerous (heavy metal) waste and non-hazardous (ferrous, non-ferrous, plastics, rubber, glass, etc.) waste. The inappropriate treatment of e-waste will harm the atmosphere and human safety due to its toxic components. The bulk of e-waste is reaching the non-organized market, the key driving factor being its profit, thus technical improvements in informal recycling systems, and better waste management training. Electronic machinery needs to be marketed to the local business and population, in order to obtain greater environmental performance without compromising economic and social benefits.

E-waste, the main source identified to heavy metals, toxic chemicals and carcinogens, may definitely be avoidable by careful treatment and processing to e-waste diseases linked to skin, respiratory, reproductive, immune, and endocrine and nervous systems, such as cancer. The deployment of electrical and electronic equipment (EEE) is growing rapidly in order to cross the technical revolution, and where the ICT waste is not adequately disposed of, the environment and public safety have a disturbing effect. The latest policies of established norms and guidelines for a safe e-waste management program have become urgently important.

Growing panel pollution from photovoltaic [7] sources raises major problems for the ecosystem, but on the other side provides incentives for investment and new economic directions. The central goal of the European CABRISS project "Implementing a circulatory economy focused on recycle, reuse and regeneration of photovoltaics, silicone and silver products" is to create a circular economy for the photovoltaic, computer and glass industries in particular. CABRISS manages the research of sixteen European corporations and academic institutions. The project includes developing: I the recycling technologies for renewable PV production, Ag and Si and other applications; and ii) a design of solar cells manufacturing that would use Si waste to produce hybrid si-based solar cells in high flow, cost efficient and reusable ways at the end of lifespan. The CABRISS consortium agreed from the outset to provide both tests to promote the entry to the market in compliance with acceptable European requirements.

This paper [8] explains the energy chain measurement approach to life cycles and the life cycle evaluation technique (LCA). Consistency LCA (cLCA), as opposed to attributional LCA (aLCA), is addressed.Functions like piezoelectric, thermoelectric, electrical, ionic and semiconductive ceramics create new boundaries that sustain other facets of daily existence [9]. This extensive usage requires an appreciation of the environmental effects of their industrial manufacturing. The Life Cycle Assessment (LCA) is a method used to define the paths of renewable products, both during manufacturing and as finished product, through evaluating the environmental pressures of goods. Although the LCA methodology has been commonly used in various drug supply chains to assess the environmental impacts, its application to environmental profiling of functional ceramics is now gaining attention. This paper discusses recent trends in LCA and established and new technologies, with a focus on the production and manufacture of FM&D. Selected literature on practical ceramics LCA will be addressed, emphasizing the value of utilizing LCA until costly expenditures and resources are expended at the design and/or lab level. Based on established literature, we demonstrate that the incorporation of environmental and sustainability concepts into the overall development cycle of FM&D, This will enable prompt notification of main results to practical materials suppliers when predicting potential adverse effects, thus recognizing incentives for change. This drives study, production and implementation and offers insights into priority-setting study practices while preventing unforeseen effects. The analysis would allow the material science community to communicate with the LCA to discuss essential criteria for material design, replacement and optimization.

A flexible life cycle inventory (LCI) framework [10] was developed to provide material composition and output data for a power electronic inverter device to monitor the propulsion engines of electric vehicles. It is to resolve current data limitations in electric vehicle life cycle assessment (LCA). The software provides modern, simple to use data with adequate information to enable for reasonable sizing of modules and an in-depth study of inverter units. This is a standby, three-phase inverter, characteristic of electric vehicles with independent bipolar gate (IGBTs). The simulation of the inverter architecture including scaling concepts is described in this Article (party I), exemplifies results, and evaluates the models' mass estimations.

The LCI concept incorporates various scaling ideas in an individual configuration, which measures major design results from specific power demands and stress levels. This model will be used to determine the mass and material composition of an electrical propulsion engine control device with a power electronic inverter for LCA if precise details are not available.

Solar cells are considered as one of the most significant alternative energy options [11] in a carbon-constrained environment that can help decrease oil import dependence while increasing energy efficiency. The main reason for endorsing the latest solar cells is the promise as a viable alternative to conventional silicone manufacturing in economic and environmental fields. To check this point, this article analyses several photovoltaic (PV) technologies, including content parameters and performances, production processes and production difficulties in relation to perovskite-structured solar cells (PSCs), and manufacturing complexity, economics, key technological challenges for further developments and current research efforts.

The main results reported alongside sensitivity tests indicate that PSCs provide the shorter energy recovery time in contrast with other PV technologies. PSCs provide more environmentally efficient and renewable alternatives. The study and examination offered provides useful input and advice in defining the pathways and openings for potential PV projects to deliver cleaner and more efficient electricity.

Both smart electronic devices include high-volume condensers [12] that have critical circuit operation, including versatile filters, power storage and sensing features, disconnection and circuit smoothing. The key market share are multilayer ceramic condensers (MLCC), however Tantalum electrolytic condensers (TECs) offer a viable alternative if more power is required. The decreased rates, narrower sizes ideal for large devices, excellent high-frequency functionality, better durability, rib stability and endurance, however, render it easier to substitute TECs with MLCCs on the market.

In the total effect evaluation three recovery strategies are considered: incineration; hydrometallurgy and pyrometallurgy. The key environmental hotspot for MLCCs is electrical energy use during manufacture coupled with nickel paste. In TECs the high proportion of tantalum produced by intense extraction, treatment and purification specifications results in a generally greater effect on the atmosphere relative to MLCCs. Of the three methods of regeneration, both MLCCs and TECs are impaired by the hydrometallurgical cycle. In general, recent research indicates that the change from TECs to MLCCs is both technical and efficient as the industry leads.

Global environmental consequences [13] exist throughout the global economy, multinational supply chains — production, utilization and recycling of products. The goal of the Life Cycle Assessment (LCA) is to track and review these impacts from a device point of view by defining enhancement measures without increasing burdens. We review recent LCA growth, including current and evolving technologies that promote eco-friendly strategy, product creation, procurement and customer choices decisions. LCA is a feasible screening method capable of finding environmental hot spots in the dynamic supply chain but we also caution about simplifications and complexities being done in full size. Future success of the LCA would make it more applicable to suppliers and customers alike by improving geographical information and precision and applying the evaluation to economic and social aspects.

Life Cycle Assessment [14] is a method utilized for evaluating the environmental effects and energy employed over the life cycle of a commodity, from the procurement of raw materials to manufacturing and usage to waste management. Methods in LCA were solid, and in practice LCA was commonly implemented.

The goal of this paper is to examine recent LCA technique innovations. The emphasis is on several fields in which the methodological progress in recent years has been intense.

Life Cycle Inventory (LCI) [15] is the critical process of Life Cycle Measurement (LCA) for calculating and processing input and output data of devices. The three main LCI approaches presently available are mechanism dependent modeling, LCI output data (IO), and hybrid. Different literature research follows increasing LCI methods. In comparison, various approaches may yield varying outcomes with the same commodity on the climate. The LCI approach to be used is therefore highly necessary when carrying out LCA studies. The measurement process, relative benefits and disadvantages for the intended intent should be understood to use a different LCI system.

The awareness and the implementation of these approaches were split into separate literature studies. The paper presents numerical illustrations, benefits, difficulty and implementations for the study of LCI production and its numerous methodological advances. This analysis is useful to pick and implement a suitable LCI process. This provides for more analysis on specialized topics such as LCA applications and expanded LCA implementation such as: expense of a life-cycle, environmental assessment and the eco supply chain and eco product design.

3. PROPOSED MODELLING

Present strategy – Recycling poses a range of problems as it concerns e-waste, including treating toxic compounds produced from CRT glass and discovering the demand for plastics that are flame retardant. Throughout America, it has been reported that as much as three quarters of all imported computing equipment are housed throughout garages and wardrobes. Furthermore, there is actually no infrastructure to recycle effective EEE in an environmentally safe way. They either expand in sites or incinerators or are shipped to Asia when thrown away. In 2005, an estimated 2 billion heaps of electric waste were generated within the US alone (US EPA), but only 17 to 18% were retrieved for recycling. In most of the surrounding landfills, the remainder, about 80 percent, were disposed of. The toxic chemicals in e-wastes can be leaked into soil and water, and dioxins can be introduced into the environment as the plastic additives are burned. Furthermore, 50%–80% of e-waste obtained for recycling in the United States is supposed to eventually be shipped to developed countries, but the approval only of this hazardous waste stream for the majority of these countries is unlawful. Many of this illicit trade of waste goes to unregulated recycling industries in several countries in Asia and in West Africa, where very obsolete and hazardous techniques are discarded or disposed of. In the opposite, the cost for e-waste control is another big obstacle. Transportation and logistics costs are experienced by most recyclers, which prohibit waste volumes from moving through this region.

3.1. E-waste Estimation Technology

Microsoft Excel has developed into a linear regression tool to predict the number of products and tons of e-waste over the planned years. For Step 1, we have configured drug distribution details as accurately as annual average weight calculations. The formula took into consideration the company profits from 1980 to 2007 and estimated the expected sum of management for end of life (EOL) after 2007.

The modelling activities led to estimate the quantity of EOL products created annually. Recycling or recycling consists of EOL power. The disposal was adjusted to the forecast as the difference between what was created for EOL control and what was recycled. This correlates in the first steps in phase3: 'dispose' and 'bring to recycling'

3.2. Estimating the EOL Electronics Component

Recycled Purchaser electronics consists in the healing of products by municipal and different packages for removing and repairing material, as well as in the reuse of products whether domestically or abroad. This also covers businesses and institutions that employ computer recyclers directly to recycle their EOL appliances. The EOL electronic device is often obtained for reuse or recycle through donation organizations. In the EOL management process "reuse" applies to items that may be marketed where they are, or restored by means of recycling, through the recycled products management framework. It is believed that the reuse of model electronics before joining the management gadget (i.e. goods that circumvent people) arrives before EOL power.

3.3. Determine EOL Electronics

Subtracting the sum planned to be used for recycling from the sum anticipated for the management of EOL to determine the proportion of the EOL electronics produced per year. EOL electronics Disposal Table 2 includes disposal estimates for the duration 1999-2007. 18.4% of the EOL electronics produced in 2007 were collected for recycling according to this report. While fabric quantity was increased during the years 1999 through 2005, EOL products were produced at a pace that remained substantially constant with respect to the percentage of material being recycled. Between 2006 and 2007, there was a planned rise in the recycling rate. Recovery and disposal plans for countries' devices have provided a boost to the industry of computer recycling. The majority of EOL garment that is not being recycled is probably on the whole being dumped into landfills.

4. RESULTS AND DISCUSSION

Electronic devices and therefore E-waste are scattered over our environment to the best of our understanding. They have a diverse chemical structure and are distinguished by an issue with the quantification of their flows locally and internationally. The waste generated by improper management has damaged the atmosphere of developing countries even dramatically without requiring them to be processed and repaired. There is not enough recorded empirical analysis of the implications for wildlife, human safety and environmental regeneration in areas under threat from other e-waste polluters (e.g. Li, Sb, and Hg). 23 academic findings have been identified that examined associations between publicity to e-waste and fitness and learning outcomes. However, no experiments were undertaken to examine the connection between e-waste consumption and aggression or criminal activity. Violence and illegal activity were mentioned in the study as possible findings because of reported linkages between heavy metal ads, hostility and violent crime. A productive return system that offers producers opportunities for producing less unnecessary, less harmful materials and less complexity in decomposing, re-use and recycling goods will also help minimize waste. That is when recycled material, including chemicals, sludge, etc. is disposed of in rivers, oceans. Water is now being shipped from remote towns to suit people's needs. Electrical waste incineration can produce poisonous gases and gasses that pollute the atmosphere. Deposits that are improperly regulated may create environmental hazards.

If any electronic equipment including circuit interrupters are broken, Mercury can leach. The same refers to biphenyls (PCBs) made in polychlorinated condensers. The radioactive collapse from natural combustion impacts the surrounding atmosphere and the larger global air currents, which store very harmful byproducts in various locations elsewhere in the planet. The electricity use factors in some of the highest environmental effects of the commodity during the life cycle application phase of electronics.

Manufacturers who wish to produce products who value the climate should reduce energy usage of their products with care. Many producers already have opportunities to de-energy their products, however further incentives should be given. The most important aspect of the electricity use is unused resources of electronic devices, which is often overlooked in design. When suppliers are sufficiently designed to reach better performance, low-cost, low-pressure switching power supplies, this condition may be reversed.

5. CONCLUSION

In order to provide a standardized framework for e-waste reduction, common practices in various countries should be implemented. Effective collection and recycling right up to resource manufacturing and storage would be achievable by better handling e-waste, which turns this huge piling of e-waste into productive goods and industry opportunities. The e-waste management would provide all round programs like technology growth, administrative systems, operational approaches, health procedures for workers employed in these units and, eventually, general education by the incorporation of them in the curriculum. Most E-waste makes a way into the unorganized market with advantages as the key driving force, thus technical advances in informal recycling and training. It can undermine the output of leachate which can contaminate groundwater and generate volatile waste gas, without losing economic and social advantages. Manufacturing firms of electronic products shall have legal obligation to mention in their user manual the disposal methods of their items. When e-wash is considered to be the primary source of heavy metals, hazardous substances and cancerous materials, possible skin-related diseases, respiratory disorders. The digital usage of electrical and electronic equipment (EEEs) is increasing rapidly and current policies and recommendations for an e-waste management system are urgently required.

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Authors

Sanjana Srinivas is a state-level debater ,orator and anchor. She has bagged several awards at various inter-collegiate competitions and hosted several shows inside college and across the city. She has been pursuing her passion of journalism from the age of 9.

Hasmitha Ganesh is a professional Bharatanatyam dancer and has performed at international and national level.She also holds a Unesco Certificate for dance.

Krishna Pooja is an avid reader and is extremely passionate about content writing. She is also a sports enthusiast.

J Sagar is interested in coding and has an expertise in Adobe photoshop software.

Anitha H M has pursued her B.E in Computer Science and Engineering, MTech from VTU and is currently pursuing her Ph.D. under the guidance of Dr.P. Jayarekha. She has over 18 years of teaching experience. Her research interests are cloud security, virtualization technology and computer networks. She is currently working as Assistant Professor in Department of Information Science and Engineering at BMS College of Engineering, Bangalore. She has published papers in international journals and conferences.