

# E-Waste Management: A Burning Issue In Present Scenario

**Satvir Kaur**

Research Scholar, School of Management Studies,  
Punjabi University, Patiala

*Abstract: Since a few years back, Environmental issues have taken a space in all over the world because it becomes serious issues due to a number of factors identifying that pose a serious threat to all humanity. We all are responsible for this because our production and consumption pattern have depleted the all natural resources. So now everybody has shown concern for conservation of the environment.*

*In the same time, Electronic waste and its management become burning issue all over the world. because growth in demand and consumption of electronic goods had led huge amount of waste and this waste become a new type of waste called electronic waste.*

*So there is dire need to adopt sustainable practices so that we can handle a waste. Under this paper, we are just trying to understand and identify various sources and causes of electronic waste.*

*Keyword: Electronic waste, Electronic gadgets, Environment Conservation, Sustainability.*

## I. INTRODUCTION

We all have been living in ultra-modern societies. we all are availing every facility at our door steps. Every organization thought consumers are the king of the market and they are doing their best to satisfying consumers. They are providing every facility to consumers that will make their life so easy. Nowadays electronic gadgets occupy a space in every sphere of our life. Our life becomes digital life. We all have a digital or electronic gadgets. Everybody from child to old persons has access to the electronic device. We can not imagine our life without these electronic gadgets. These all happen due to the tremendous growth of technology in electronic industries and their competencies to make a product with new and innovative features. Within few days new products came in market and we are replacing our gadgets too frequently. But this tremendous growth and our quick consumption and discarding behavior generate a new type of the waste all over the world. This waste is known as Electronic waste. Electronic waste is popularly known as E-waste.

E-waste is a term used to cover items of all types of electrical and electronic equipment (EEE) and its parts have been discarded by the owner as waste without the intention of

re-use. These products can connect with the help of power plug and run on batteries which have become obsolete due to advancement in technology, change in fashion, style and status. So any products which are reached at the end of their useful life and owners are not willing to use it further considered as E-waste.

“E-waste is a generic term encompassing various forms of electrical and electronic equipment that are old, end of life electronic appliances and have ceased to be any value to their owners”. (UNEP REPORT)

Electronic waste is also known as WEEE i.e. Waste electrical and electronic equipment.

Basically, E-waste is classified into following categories.

- ✓ Temperatures Converter Gadget- These equipment are commonly known as cooling and freezing equipment. Eg. Refrigerators, Freezers, Air Conditioners, Heat Pumps, Screens, Monitors, Television, Monitors, Laptops, Notebooks and Tablets.
- ✓ Lamps- It comprises straight fluorescent lamps, compact fluorescent lamps, high-intensity lamps and led lamps.
- ✓ Large Gadgets- It comprises washing machine, Clothes dryers, Dishwashing machine, Electric stoves.

- ✓ Small Gadgets- This equipment comprises vacuum cleaners, microwave electric kettles scales calculators, video camera.
- ✓ Small IT and Telecommunication- These are Mobile phones, GPS, Computers printers etc.

So all electronic gadgets which have been disposed of or unwanted by their original user are known as E-Waste. E-waste consists of both precious materials as well as harmful material which require special handling and recycling methods. The composition of E-waste is different and diverse in products across different categories. It contains different substances which fall under hazardous and non-hazardous categories. But major Constitutes of e-waste are rare earth metals like lanthanum, cerium and precious metals such as Copper, Aluminium, Silver and Iron. The Waste Electrical and Electronic Equipment (WEEE) or E-waste like another solid waste is one of the fastest growing advanced types of waste streams in the urban environment world.

## II. NEED OF STUDY

The concern for an environment has increased substantially. Everybody has shown the concern towards environment. E-waste is becoming burning issues and challenging task to handle it in present time. It has been generated at accerlaritng pace because with invent of new technology and innovation, everybody replacing the products at a high rate. but this waste become a big problem. It has a great impact on our health and environment. So it is urgent need to tackle this problem with effective manners.

### OBJECTIVE

- To study e-waste growth in the world.
- To study e-waste growth in India.
- To study e-waste effect on health and environment.
- To study e-waste management initiative in india.

## III. RESEARCH METHDOLOGY

The study was based upon secondary data through literature review and analysis. The literature referred includes marketing journals, paper presentations of research scholars and other research material that are available on the internet.

## IV. E-WASTE IN WORLDWIDE

A 2015 reports by UNDP estimated that approximately 41.8 million tons of e-waste were generated in 2014, almost 25% more than 2010.

According to a report of the United Nations, the US had generated about 258.2 million units of used Computers, Monitors, TV and Cell phones in 2010. It has been also predicted that by 2020, E-Waste from old computers would jump by 400% on 2007 levels in China and by 500% in India - Additionally E-Waste from discarded mobile phones would be about seven times higher than 2007 levels in China and in

India 18 timers higher by 2020. China already produces about 2.3 million tons of E-Waste domestically second only to the US with about 3 million tons .The global e-waste monitor 2014 compiled by UN Think Tank United Nation University said, at 32 percent , the US and China produced the most e-waste overall in 2014. India came in fifth, behind the US, China, Japan, and Germany. The StEP initiative forecast that by 2017, the world will produce about 33 percent more e-waste or 72 million tons. That amount weighs about 11 times as much as the Great pyramid of Giza.

RANKING	COUNTRY
1	USA
2	CHINA
3	JAPAN
4	GERMANY
5	INDIA

Table 1: Five Topmost Countries in E-waste Generation

Global Quantity of E-waste Generated			
Year	E-waste generated(MT)	Population(billion)	E -waste generated(kg/inh)
2010	33.8	6.8	5.0
2011	35.8	6.9	5.2
2012	37.8	6.9	5.4
2013	39.8	7.0	5.7
2014	41.8	7.1	5.9
2015	43.8	7.2	6.1
2016	45.7	7.3	6.3
2017	47.8	7.4	6.5
2018	49.8	7.4	6.7

Data 2015 onward are forecast

Table 2: Global Quantity of E-waste Generated

Source: The Global E-Waste Monitor 2014, Compiled by United Nations University

Above statistics highlight, the imperative wants to tackle the problem of E-Waste in the world because collection, management, and recycling process is still not much popular among many countries. Developing Countries like India where the collection and management of E-Waste and the recycling process is yet to be properly regulated. E-Waste may cause environmental damage and health problems if it left openly.

## V. E -WASTE MANAGEMENT-INDIAN MARKET

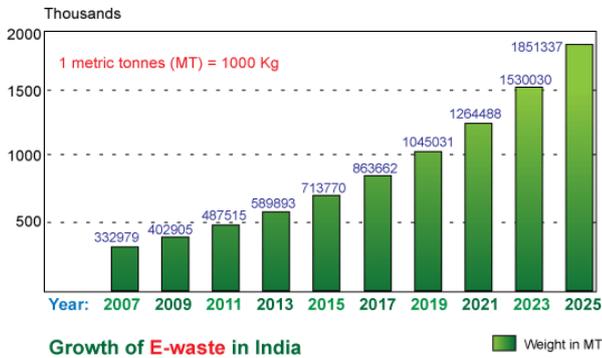
The electronic industries are largest and fastest growing industries in India. The rapidly advanced technology, competition among firms and up gradation of technology have forced the firms to launch new products frequently in the market and high purchasing power of consumers have encouraged them to replace their old gadgets and buy new products often.

But this easy replacement may create a new type of waste, that is E-waste. The rising level of e-waste has been a matter of serious concern. I because of its adverse effects on health and environment. The quantification of e-waste is very difficult in India and there is also no proper policy to check the flow of waste and recycling of e-waste. It is also important to note that a large amount of e-waste is imported from developed countries into India.

India is the fifth biggest producer of e-waste in the world, discarding 1.7 million tons of electronic and electrical equipment and the volume of global e-waste is likely to rise sharply by 21% in the next three year.(UNTHINK TANK UNITED NATION UNIVERSITY2015)

Telecom equipment alone accounts for 12% of e-waste, a joint study by Assocham-KPMG.

India is expected to generate about 1.5 lakh tons of e-waste by 2020 - Manufacturers Association for Information Technology (MAIT)

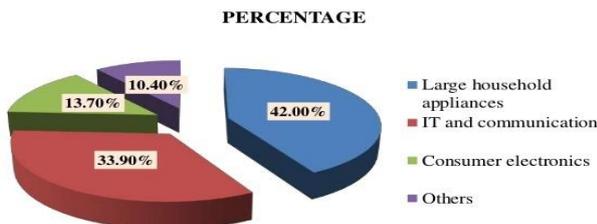


Source: Department of Information Technology Chart: CopperBridge Media

Source: Department of Information Technology  
Figure 1: Growth of E-Waste in India

The central pollution control board has given a report on contribution to e-waste in India. According to this report, Most of the electronic waste in India is generated by large household appliances and 33.90% is generated by IT and communication and 13.70% and 10.40% is produced by consumers electronics and others respectively.

### Contribution to e-waste



Central Pollution Control Board, 2008

Source: Central Pollution Control Board, 2008

Figure 2: Contribution to E-Waste

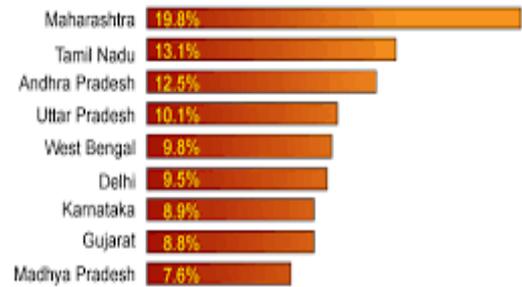
ITEMS	DISCARD RATE
Mobile	1 to 3 years
PC	Every 2 Years
Camera	3 to 5 years
Refrigerators and Television	5 to 7
Washing Machine	10 to 15
IT Accessories	Very Fast

Source: MAIT GTZ E-waste assessment

Table 3: Discard Rate of Electronic Items In India

As per the ASSOCHAM study, 70% of the total e-waste generated by 10 states and while 65 cities generate more than 60 percent of the total e-waste in India. Maharashtra followed

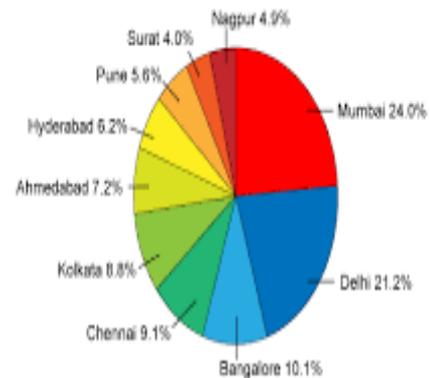
by Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab in the list of e-waste generating states in India. It is, however, increasing at an accelerating.



State-wise E-waste Generation in India (Tonnes/year)

Source: Department of Information Technology Chart: CopperBridge Media

Figure 3: State-wise E-waste Generation in India



City-wise E-waste Generation in India (Tonnes/year)

Source: Department of Information Technology Chart: CopperBridge Media

Source: Department of Information Technology

Figure 4

## VI. EFFECTS OF E-WASTE ON ENVIRONMENT AND HEALTH

Nowadays e-waste becomes an important global environmental and health issue. The electronic waste is filled with hazards contents like mercury, lead, cadmium, chromium and when they are thrown out openly, it has a harmful and detrimental effect on both health and environment.

Pollutants	Occurrence	Effects
Lead	Batteries, Solar, Transistors, Lithium batteries, Stabilizers, Lasers, LEDs, Thermo-Electrical element, Circuits board	It exerts toxic effects on various systems in the body such as central and peripheral nervous and the reproductive systems of male and female.
Mercury	Components of Copper machines	Causes damage to the Genitourinary

	and steam irons, Batteries in Clocks and Pocket calculators, Switches, LCDs Nickel Alloys, Batteries, Relays, Semiconductors	system, when inorganic mercury spreads out in the water, it is transformed into methylated which bio-accumulates in living organism
Arsenic	Semiconductors, Diodes, Microwaves, LEDs (light emitting diodes), Solar Cells	It causes cancer in the Skin, Lungs, Bladder and Kidney
Cadmium	Batteries, Pigments, Alloys, Circuit Boards, Computer, Batteries, Monitor, Cathode Ray Tubes (CRTs)	It is poison. It accumulates in the human body, especially in the kidney.
Polycyclic aromatic hydrocarbons (PAH)	Transformers, Capacitors, softening agents for paints, glue, plastic Selenium Photoelectric cells, photocopiers, fax machines Silver Capacitors, Switches, Batteries, Resistors	Affects lung, Skin, and Bladder
Copper	Conductors cable, Copper Ribbons, Coils, Circuitry, Pigments	Copper contagion can lead to the flu like a condition known as metal fever.
Nickle	Alloys, batteries, Relays, Semiconductors, PCBs (polychlorinated biphenyls), Transformers, Capacitors, Photoelectric Cell	It is carcinogenic metals

Table 4

## VII. E-WASTE MANAGEMENT INITIATIVE IN INDIA

E-waste has become a serious problem in the world. Several initiatives have been taken for the management of e-waste across the world. In India, government, as well as business firms, have also taken the initiative to control this problem. The following are some initiative taken to address e-waste.

**E-WASTE (MANAGEMENT AND HANDLING) RULE, 2011:** The government of India have made legislation to forcefully implement to curbing of e-waste. The Ministry of the environment, forest and climate are the nodal agency for making policy, planning and coordinating the environment

program including electronic waste in India. The government has formulated the law on E-waste Management. This law is known as E-waste (Management and Handling) Rule, 2011 on Extended Producer Responsibility principle. The EPR is an environment protection strategy that makes producer responsible for the entire lifecycle of the product especially to take back, recycle and disposal of products. This rule makes environmentally sound management and disposal of electronic wastes mandatory. This is the first initiative in India that is meant for addressing issues related to E-waste. These rules are applied to producers, consumers, manufacturers, sellers, and purchasers. Under this rule, every stakeholder has a responsibility to control and to manage the e-waste. Public-private partnerships can also play very important role in the management of e-waste. As on 5th October 2010 eighteen companies were registered with the Ministry of Environment and Forest for Environmental sound recycling and reprocessing of e-waste eg M/s Ramky E-waste Recycling Facility Andhra Pradesh, M/s Ash Recyclers, Unit-II Banglore, M/s Jhagadia Copper Ltd Gujarat, M/s ECO Recycling Limited Maharashtra, M/s Earth Sense Recycle Pvt. Ltd etc. The legislation makes sure that the recycling of waste should be done by the manufacturers and the producers. For proper implementation of these rules, firms have to focus not only on forward supply chain but also on backward flow.

**KNOWLEDGE BANK FOR E-WASTE MANAGEMENT IN INDIA:** The Asia Eco programing sponsored by the European Commission is dedicated to the Environment Performance in Asian Economic sectors through the exchange of policies and practices that are related to environment and to promote sustainable investment so that ultimately we can achieve sustainable development.

**E-PARIS AREA:** It is a project supported by Indo-German E-waste Initiative. The pilot project is to manage e-waste without causing Ecological Damage.

**SAAHAS (THE JAYANAGAR-BASED NGO):** This organization took action and planned to hold the campaign in a government office to create awareness about e-waste and need to dispose of it safely.

**THE E-WASTE GUIDE, INDIA:** It is an initiative of the Indo-German swiss partnership. It is designed to serve as informal resources on E-waste as well as a common collaborative work platform for stakeholders.

**NATIONAL SOLID WASTE ASSOCIATION OF INDIA:** It is a leading professional non-profit organization in the field of solid waste management, including toxic and hazardous waste.

**CENTRAL POLLUTION CONTROL BOARD:** CPCB coordinates activities with the State Pollution Control Boards and ensures implementations of the conditions of imports. It also monitors the compliance of the conditions of authorization, import and export and conduct training courses for authorities dealing with management of hazardous wastes and to recommend standards for treatment, disposal of waste, leachate, and specifications of materials and recommend procedures for characterization of hazardous wastes.

**TAKE BACK POLICIES:** Many electronic companies have started taking back scheme because ACC to new Act, producers must be responsible for the entire lifecycle of their products. Some telecommunication companies like Nokia, Acer, Motorola, Wipro, HP provide take back scheme and

establish collection centers so that they can collect discarded goods. Wipro Hitachi and HCL have best take back practices in India. Nokia has 354 collection centers that take back discarded products at free of cost.

#### VIII. SUSTAINABILITY, E-WASTE AND CONSUMER'S ROLE

The present age is known as the age of information and technology revolution. Rapid developments are taking place in every sphere of life. The new technologies and competition among firms are resulting in the production of a number of goods with innovative features. But at the same time these technological changes, the growth of production and high purchasing power of customers is leading to depletion of a number of resources and degradation of the environment. So deep concern for the environment is increasing day by day. Nowadays, development through sustainability has become the most important goal of every economy. Sustainability refers to a way of life in which individuals and business firms try to lessen the negative impact due to their activities on the environment. Sustainability is like the two-sided coin. One is sustainable production and other is sustainable consumption.

Since the last decade, it has been noticed that business firms have changed their production process and focused on the development of green products. But recently, consumers attention towards participation in sustainable consumption is also growing because household consumption accounts for more than 60% of all environmental impacts and 80% of this impact occurs during end use (UNEP2010).

In the present scenario, with IT revolution, everybody has access to computers, Laptops, Mobile phone, etc. With technological changes, consumers have a lot of options to replace or buy the new products. They replace their products very frequently but this stipulates a big amount of obsolete electronic products that become big issues in these times. It has a dangerous impact on our environment. So now, business firms feel that it is their responsibility to manage all of the waste properly. Retailers and marketers also have the responsibility to help consumers to become aware of and to have knowledge about sustainable consumption through product/service offerings, corporate social responsibility practices, marketing and educational campaigns (e.g., Piercy and Nikala, 2009). Business firms are formulating new policies and under these policies, they consider consumer's post-consumption behavior. It is the responsibility of firms to observe how consumers use their product and what should they do with discarded products. Nowadays, most of the firms are taking the initiative to aware consumers because it is a dire need and without the participation of consumers, sustainability can not be achieved. So, consumers behavior is very important for achieving sustainability.

Consumers can play very important role in sustainable development by changing their consumption pattern through a selection of eco-friendly products, minimizing wastage and separating disposal for recycling. Consumer's behavior plays an important role when an obsolete product has to be replaced and when old equipment has discarded as it depends upon consumers that what type of method they choose for

discarding their old product. Consumers have a two-sided role in e-waste problem, as electronic customers and as e-waste holders. Both roles are important in solving e-waste problem. But beyond this, consumer's disposal practices, willingness and pay fee for recycling and consumer opinion regarding environmental degradation from recycling and cost to replace the equipment are all important for sustainable development. These all things are very important to understand consumers behavior and helpful in achieving sustainability. So there are a number of factors that attract consumers to participate in e-waste handling. Consumers prefer to participate in e-waste Management when they know that their discarded elements and products are recycled and their components are reused in another product. So sustainability and e-waste management system could be improved by effective and active participation by consumers.

#### IX. CONCLUSION

No doubt Electronic waste becomes a burning issue in present time. It has rapidly grown. It has an impact on our environment as well on our health. So it is urgent need to take action to tackle this problem otherwise we and our future generation face very cruel consequences. it will become difficult to survive for us in future time if not properly action has been taken. In the present time, several initiatives have been taken all over the world and a number of the initiative have been taken to explore the new ways to manage e-waste. Everybody had shown concern for conservation of environment because we can lead a healthy life only in a healthy environment. To address this problem, a number of action has been taken already and no of the decision will be taken in future for creating a high-quality and eco-friendly environment.

#### REFERENCES

- [1] Alibeli, M. A. & Johnson, C. (2009). Environmental concern: A cross-national analysis. *Journal of International and Cross-Cultural Studies*, 3[1], pp(1-10).
- [2] An Assessment of E-waste Takeback in India – ewasteguide. Retrieved September 19. From [http://www.greenpeaceindia.org//site/ewasteguide.info/files/take-back- blues\\_2008\\_Greenpeace.pdf](http://www.greenpeaceindia.org//site/ewasteguide.info/files/take-back- blues_2008_Greenpeace.pdf).
- [3] Ashok Kumar Das, E-Waste Management in India Current Scenario.
- [4] Bala, S. & Goel, S. (2013). E-waste Management in relation to awareness of college students. *Edutracks*, 13[1], pp(29-32).
- [5] Bhat, V. & Patil, Y. (2014). E-waste consciousness and disposal practices among residents of Pune city. *Procedia-Social and Behavioral Sciences*, 133, pp(491-498). <http://dx.doi: 10.1016/j.sbspro.2014.04.21>.
- [6] Bhat, V. & Patil, Y. (2014). Mobile User's Perspectives Towards E-Waste: A Case of Pune city. *International journal of academic conferences proceeding*, 1[21]. Available at SSRN: <http://ssrn.com/abstract=2523780>.

- [7] Ciocoiu, N., Dobra, C. & Tartiu, V. (2011). The role of consumer behaviour in e- waste management system in Romania. *Review of International Comparative Management*, 1, pp(208-213).
- [8] Chen, T. B. & Chai, L.T. (2010). Attitude towards the environment and green products: Consumers Perspective. *Management Science and Engineering*, 4[ 2], pp(27-39).
- [9] Dixit, S. & Vaish, A. (2013). Sustaining environment and organisation through e-waste management: A study of post-consumption behaviour for the mobile industry in India. *Logistics International Journal of Systems and Management*, 16[1], pp(1-13).
- [10] Ercan, O. & Bilen, K. (2014). Electronic Waste Awareness and Environmental Attitudes of Primary School Students. *Anthropologist*, 17, pp(13-23).
- [11] Electronic Waste - India Environment Portal | News, reports ...Retrieved Oct 24, 2015, from <http://www.indiaenvironmentportal.org.in/category/2513/.../electronic-waste/pdf>.
- [12] Electronic waste manangement. Retrieved October 24, 2015, from [http://www.moef.nic.in/sites/.../notified%20e-waste%20rule%202015\\_1\\_0.pdf](http://www.moef.nic.in/sites/.../notified%20e-waste%20rule%202015_1_0.pdf).
- [13] Electronic Waste and India, Department of information and technology. Retrieved oct 10, 2015 from [http://deity.gov.in/sites/upload\\_files/dit/files/ste\\_Sep11Ewa\\_892011.pdf](http://deity.gov.in/sites/upload_files/dit/files/ste_Sep11Ewa_892011.pdf).
- [14] Electronic Waste recycling. Retrieved dec 14, 2015 from, <http://www.cpcb.nic.in/divisionsofheadoffice/hwmd/e-Waste.pdf>
- [15]. Electronic Waste and India, Department of information. Retrieved oct 10 from [http://deity.gov.in/sites/upload\\_files/dit/files/ste\\_Sep11Ewa\\_892011.pdf](http://deity.gov.in/sites/upload_files/dit/files/ste_Sep11Ewa_892011.pdf).
- [16] E-Waste in India. UNDP report. Retrieved October 20, from <http://i.unu.edu/media/unu.edu/news/52624/UNU-1stGlobal-E-Waste-Monitor-2014-small.pdf>
- [17] Gupta, M. (2014). Management of hazardous electronic waste. *International journal computer application*, 90 [1], pp(11-14).
- [18] Gorauskiene, I. (2008). Behaviour of Consumers as One of the Most Important Factors in E-Waste Problem. *Environmental Research, Engineering, and Management*, 4[46], pp (56-65).
- [19] Kwarta, S., Pandey, S. & Sharma, S. (2014). Understanding public knowledge and awareness on e-waste in an urban setting in India. *Management of Environmental Quality: An International Journal*, 25[6], pp(752-765). [http://dx.doi.org/10.1108/MEQ-12-2013\\_0139](http://dx.doi.org/10.1108/MEQ-12-2013_0139).
- [20] Mburu, P. & Tudueto, T. (2013). Investigation of consumer behavior on discarding of their electrical /electronic waste: A case of Gaborone city. *Journal of Business Management and Economics*, 4[9], pp(200-205). <http://www.e3journals.org> ISSN 2141-7482.
- [21] Mmereki, D., Wang, L. & Brick, L. (2012). Estimation of waste electronic and electrical equipment arising in Botswana-A case study of Gaborone City. *International journal of Environmental Sciences*, 3[1], pp(441-45)
- [22] Meaning and definition of e-waste. Retrieved October 20,2015, from [https://en.wikipedia.org/wiki/Electronic\\_waste](https://en.wikipedia.org/wiki/Electronic_waste).
- [23] Oomman, U. P. (2014). A Survey of Consumer Behaviour towards e- waste management in the city of Mumbai. *International Journal of Research in Applied, Natural and Social Sciences*, 2[8], pp(1-10).
- [24] Okaye, A. & Odoh, C. (2014). Assessment of the level of awareness of e-waste management and concern for environment amongst Nigerian. *Journal of environment protection*, 5, pp(120-134). <http://dx.doi.org/10.4236/jep.2014.52016>.
- [25] Queiruga, D., Genalez, J. & Lannelongue, G. (2011). Evaluation of the electronic waste management in Spain, *Journal of cleaner production*, 24.
- [26] Sikdar, M. & Vaniya, S. (2014). The New Millennium and Emerging Concerns.
- [27] *International Journal of Scientific and Research Publications*, 4, pp (1-12). <http://www.ijsrp.org>.
- [28] Sachan, R. & Agrawal, S. (2013). Knowledge of E-Waste among Young Adults. *International Journal of Engineering Science*, 2 [7], pp(39-41). <http://www.jesri.com>.
- [30] Singh, R. P. & Kumar, S. S. (2013). INDIA: A matter of electronic waste, the government Initiatives. *Journal of Business Management & Social Sciences Research*, 2[4], pp(15-20).
- [31] Saritha, V., Kumar, S. & Srikanth, V. (2015). Consumer Attitudes and Perceptions on Electronic waste: An assessment. *Pollution*, 1[1], pp (31-43).
- [32] Tiep, H. S., Kin T. Y., Ahmed, E. M. & Teck, L. C. (2015). E-Waste Management Practices of Households in Melaka. *International Journal of Environmental Science and Development*, 6[11], pp (811-817).
- [33] Tarawneh, A. & Saiden, M. (2013). Households Awareness, Behaviors, and Willingness to Participate in E-waste Management in Jordan. *International Journal of Ecosystem*, 3, pp(124 143). <http://dx.doi: 10.5923/j.ije.20130305.04>.
- [34] The global e-waste Monitor-United Nations University. Retrived 20 Oct, From <http://i.unu.edu>news>ewaste-2014-unu-report>
- [35] Vinod, K., Ruchi, G., Zillur, R. & Kazmi, A. (2011). Sustainability and E-wasteManagement
- [36] Scenario in India. The First International Conference on Interdisciplinary Research and Development, 31 MAY-1JUNE 2011, Thailand, PP(43.1 – 43.5).
- [37] Wilhem, W. B. (2012). Encouraging Sustainable Consumption through Product Lifetime Extension:
- [38] The Case of Mobile Phones. *International Journal of Business and Social Science*, 3[3], pp(17-30).
- [39] Wang, Z., Zhang, B., Yin, j. & Xiang, Z. (2011). Willingness and behavior towards e-waste recycling for residents in Beijing city. *Journal of Cleaner Production*, 19[9], pp(977-984). <http://dx. Doi.10.1016/j.jclepro.2010.09.01>.
- [40] Yin, J., Gao, Y., Xu, H. (2013). Survey and analysis of consumers' behavior of waste mobile phone recycling in China. *Journal of Cleaner Production*, pp(1-9). <http://dx.doi.org/10.1016/j.jclepro.2013.10.006>.

[41]Wilhem, W. B. (2012). Encouraging Sustainable Consumption through Product Lifetime Extension: The

Case of Mobile Phones. International Journal of Business and Social Science, 3[3], pp(17 30)

IJIRAS