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INDIA'S IT INDUSTRY AND THE MANAGEMENT OF E – WASTE

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Abstract:

Electronic waste (E-Waste) is one of the Fastest Growing Waste Streams in the Country. The electronics industry has emerged as the fastest growing segment of Indian industry both in terms of production as well as in terms of export. In 2016e-wasteis calculated to be of 17 lack tones. In India computer E-waste recycling was growing by 30.2% and the recycling of IT hardware was growing by 17.8 percentages. The entire E-waste treatment is being carried out in an unregulated environment, where there is no control on emissions. The Indian IT industry has a prominent global presence today largely due to software sector. The e-waste management market worth USD1.66billion in 2014 was estimated to grow at a CAGR of 20.6% between 2015 and 2020. It is likely to grow over 93.5million tonnes in 2016(Sinha ,2006) .In recent years, leading to MRC's development in India to set up manufacturing facilities, R&D (Research and Development) centers and software development facilities, the asymptotic growth in IT industry has brought its share of waste disposed problem.

Key Words: Impact of E-waste, The Indian Scenario, IT industry in India, Sources of E-waste, City wise e-Waste generation (tonnes), Recycling of E-waste in India, Recycling of E-waste in Indian

Introduction:

India's information technology industry has been one of the major driving forces of change for the growth of our economy in the last decade and has contributed significantly to the digital revolution, being experienced by the countries around the world. In recent years, the electronic industry has been growing very rapidly. Since, the production of Electrical and Electronic Equipments (EEE) is one of the fastest growing global manufacturing activities, the generation of e-wast inevitable. E-Waste comprises the leading and highest emergent manufacturing wastes (41.5million tonnes in 2011). E-waste is defined as electronic (or) electrical equipments/products that have become obsolete because of advancement in technology or changes in fashion. The projected growth of e-waste generation in India is about 34 percent years on year. The global e-waste is about 40 million tonnes a year. (Sinha, 2006) The e-waste management market worth USD1.66billion in 2014 was estimated to grow at a CAGR of 20.6% between 2015 and 2020. It is likely to grow over 93.5million tonnes in 2016.

Impact of E-Waste:

E-waste disposal is becoming a severe problem in many regions across the globe. As e-waste contains significant concentration of substances that are hazardous to human health and the environment, even a small amount of e-waste entering the residual will introduce relatively high amount of heavy metals and halogenated substances around the living environments. Nowadays, water is being transported from faraway places to cater to the demands of the population living both in urban and rural areas. There is a greater chance for such transported water being contaminated by e-waste. IT wastes, that are land filled, and produces contaminated leachates, which eventually pollute the groundwater. The E-waste can emit toxic films, gases and thereby pollutes the surrounding air. The most dangerous way of is reducing e-waste is through open air burning. The toxic fall-out from open-air burning affects the local environment and broader global air current and deposits highly toxic by-products in many places throughout the world. A national working group has been constituted to formulate a strategy for E-waste management. A comprehensive technical guide on "Environmental Management for Information Technology Industry in India" has been published and circulated widely by the Department of Information Technology (DIT) and Ministry of Communication and Information Technology (MCIT), which provides valuable information for a better environmental management plan

The Indian Scenario:

In Indian industries the total waste generated by obsolete or broken down electronic and electrical equipments has been estimated to be 1, 46,000 tonnes per year [CIT, 2006] In India around 2,50,000 workers including children are working in crude dismantling units and in Delhi alone 10,000-20,000 tonnes of e-waste are handled every year with bare hands. Manufacturers Association for Information Technology [MAIT] has collected the following statistics on the growth of electronics and IT equipment in India:

- ✓ Personal Computer (PC) sales were over 7.3 million units during 2007-08 which has grown by 16%. There is an installed base of over 25 million units.

- ✓ The consumer electronics market is growing at the rate of 13-15% annually. It has an installed base of 120 million televisions (TVs).
- ✓ The cellular subscriber base was up by 96.86% during 2007-08.Its installed base was estimated to grow by 300 million marks in 2010.

It was projected that 3 billion electronic and electrical appliances would become (WEEE-Waste Electrical and Electronic Equipment) as e-waste by 2010. That would tend to an average e-waste generation rate of 400 million units a year till 2010. According to Central Pollution Control Board (CPCB) estimates1,46,800 metric tonnes of e-waste was generated in India in 2005, which increases to an estimated 8,00,000 MT in 2012 and 16.4lakh MT by 2014. E-waste generated in few cities across the nation shows an alarming picture. Mumbai generates 11,000 tonnes of e-waste, Delhi generates 4000 tonnes, and Bangalore generates 8000 tones. Maharastra state alone produces 20770 tonnes of E-wastes annually.

IT Industry in India:

India's information technology industry is growing at a rapid rate and contributing significantly to the overall economic development. The electronics industry has emerged as the fastest growing segment of Indian industry both in terms of production as well as in terms of export. The domestic IT industry's contribution in terms of revenue has grown at a compound annual growth rate (CAGR)of 20.2% from $4.9 billion to $8.5 billion between FY04 and FY07 and its expected contribution would be by around $12.0 billion in FY2008. It is roughly 18.8% of the total industry's revenues. As per the IT industry's annual performance review conducted during FY2008 by MAIT[Manufacturers Association for Information Technology], total PC sales during FY2008 stood at 7,344,306 units. It had contributed around $432 billion in 2009 to $4150 billion. According to the United Nations global e-waste production reports put out by the Union Ministry of Environment and Forests (MOEF).The Maximum Achievable Control Technology [MACT] explained together with GTZ [German Technical Cooperation Agency] that India generated 330000 MT of electronic waste in 2007 while an additional 50,000 MT was illegally imported into the country by 2011. It is estimated that e-waste generated in India increased from 4,70,000 MT to 81,00.000 tones by 2012.

Sources of E-Waste:

In India E-waste comes from many major sources. Some major sources of E-waste are given as below. the source of E-waste under formal sector are the waste are the importers, producers/ manufactures, retailers (Business/ Government / others) consumers and traders

- ✓ Importers
- ✓ Producers/Manufacturers
- ✓ Retailers [Business/ Government /Others]
- ✓ Consumers [Individual, Business, Government]
- ✓ Traders
- ✓ Scrap dealers
  - Dissemblers/dismantlers
  - Smelters
  - Recyclers

Formal sector

Informal sector

The website has listed out the estimate values of desktop sales, Laptop sales, mobile phone sales, TV sales and their respective E-waste generation from 2007 to 2020. The present paper tries to find the nature of trends in the values of above variables.

Recycling of E-waste in India:

In the recycling of E-waste, India heavily depends on unorganized sector. Only a handful of organized E-waste recycling facilities are available. Millions of poor people in India are involved in the recycling operations. Nearly 95% e-waste is treated and processed by the urban slums of the country. India generated about 60 million tonnes per annum of municipal solid waste and 7.46 million ton per annum of hazardous waste plastic waste 15000 tonnes. [Central Pollution Control Board (CPCB) estimates]. The recycled metal market has been predicted to grow at an average annual growth rate of 8.1precentage in 2010 and that of recycled plastic at the rate of 10.2precentage.

In 2016e-wasteis calculated to be of 17 lack tones.In India computer E-waste recycling was growing by 30.2% and the recycling of IT hardware was growing by 17.8 percentage.

Table 1: Recycling of E-waste in Indian IT industry

Take back agreement of outdated IT hardware with your suppliers	Tie-up with NGOs/others non project organization to review outdated IT hardware	In house, recycling of IT hardware
Don't really have any plans 13%	33.8%	22.2%
Recently started implementing 24.6%	27.3%	23.5%
Will implement in 3-6 month 29%	21.5%	21.5%
As an organization has not given it a thought 17.4%	11.3%	14.3%
We have already implemented16%	6.1%	18.4%

Source: www.ijergs.org

Table10 explains that the Information Technology industry's recycling method in the case of E-waste recycling industry. Above 30 percent of the suppliers of IT hardware are not for the recycling of outdated hardware materials. In case of NGOs 45 percent of them are not co-operating for the say disposal of E-waste. Finally, in the case of households 36.5percentage are not safely disposing the E-waste. Therefore, about 70 percent 55, percent and 63.5precent of the IT industry, NGOs and households respectively are co-operating and working for the recycling and safe disposal of recycle.

Main Reasons to Recycle E-Waste:

The Earth's natural resources are limited and we need to make sure that we preserve them and use them carefully; E-waste disposed in municipal dustbins releases hazardous toxic materials into the environment causing Environmental Pollution.

- ✓ To eliminate landfill.
- ✓ To protect our mother Earth by preventing air, water and soil pollution.
- ✓ To generate employment opportunity.

Benefits of Recycling:

Recycling E-waste can serve as secondary source of raw materials if it is managed safely. Other benefits are

- ✓ Economic Benefits- Revenue generation from recovered materials
- ✓ Environmental Benefits- Natural Resource conservation of reduction in pollution
- ✓ Social Benefits-Employment generation

Table 2: Quantity of WEE (Waste Electrical and Electronic Equipment generated in India states (% of the total waste)

City	WEE[tones]	%
Maharashtra	20270.59	19.8
Tamil Nadu	13486.24	13.1
Andhra Pradesh	12780.33	12.5
Uttar Pradesh	10381.11	10.1
West Bengal	10059.36	9.8
Delhi	9229.15	9..5
Karnataka	9118.74	8.9
Gujarat	8994.33	8.8
Madhya Pradesh	7800.62	7.8
Punjab	6958.46	6.1
Total	109078.93	106.4

Desktop Computers:

Mainly the computer drives the electronics industry and computer components sector with as much as a fifth of its revenues coming from sales of personal computers.

Table 3: Sales (2007-2013) and forecast (till 2016-17)

Year	Desktop Sales Million units	Percentage Change (%)
2007	5.522	
2008	5.28	-4.38
2009	5.522	4.58
2010	6.016	8.94
2011	6.71	11.53
2012	6.778	1.01
2013	5.015	-26.01
2014	4.212	-16.01
2015	3.631	-13.79
2016	3.284	-9.55

Source: www.ijergs.org

In the year of 2007, the desktop computers sales had been observed to be 5.522million units. It has changed to 3.631million units in 2015 and further expected reach 3.284million units in FY2016. In terms of percentage the desktop computers sales has decreased by 34.26% between 2007 and 2015 and further expected to decrease by 37.80% in 2016 in relation to 2008. An overall observation of the data reveals that the desktop sale has an increasing trend between 2007 and 2012 and it has a decreasing trend from 2012 to 2016.

E-Waste Generated from Desktop Computers:

Based on the average lifespan distribution, sales data and taking the average weight of desktop computers as 9.9kg, e-waste generated in metric tonnes due to desktop computer is estimated till the year 2020.

Table 4: E-waste generated from desktop computers

Year	E-Waste Desktop Computers Metric Units
2011	54667.8
2012	52272
2013	54667.8
2014	59558.4
2015	66429
2016	67102.2
2017	49648.5
2018	41698.8
2019	35946.9
2020	32511.6

Source: www.ijergs.org

The E-waste due to desktop computers has an increasing trend between 2011 and 2016 from 54,667 tonnes to 67102 tonnes. It has a decreasing projected trend between 2016 and 2020 from 67,102 tonnes to 32,511 tonnes.

Laptop Sales (2007-16) and Forecast (till 2018):

The laptops sales and manufacturing was very high in the recent years. The improved technology have positive effect and the production of laptops increased accordingly. Since, the laptops have the feature of easy to carry, it makes easy to complete many works comfortabily.

Table 5: Laptop sales (2007-16) and forecast (till 2018)

Year	**Laptops Sales Million Units**	**Percentage Change (%)**
2007	1.822	
2008	1.516	-16.79
2009	2.508	65.43
2010	3.284	30.94
2011	4.022	22.47
2012	4.421	9.92
2013	6.849	54.91
2014	7.936	15.87
2015	10.038	26.48
2016	12.698	26.49
2017	15.899	25.20
2018	20.09	26.36

Source: www.ijergs.org

In the year of 2007, the Laptop sales have been observed to be of 1.822million units. It has increased to 10.038million units in 2015 and further expected to reach 20.09million units in 2018. In terms of percentage, the Laptop sales have increased by 562.13precentage between 2008and 2015 and further expected to increase by 1002.634 precentage in 2018 in relation to 2007.

E-Waste Generated from Laptops:

Based on the average lifespan distribution, sales data and taking the average weight of laptop PCs as 3.5kg, the e-waste generated in metric tonnes estimated till the year 2020.

Table 4: E-waste generated from laptops

Year	**E-Waste Laptops Metric Ton**
2012	7875
2013	9971
2014	12640
2015	15248
2016	20673
2017	25290
2018	32360
2019	40367
2020	50769

Source: www.ijergs.org

The e-wast from laptops weighed 7,875 tonnes in the year 2012 and has increased to 15,248tonnes during the year 2015 and was further expected to grow to 50,769tonnes in the year 2020. in terms of percentage vales the increase in e-waste due to laptops was 93.62 percentage between 2012 and 2015 and the expected percentage increase would be 544.68 during 2020 when compare to 2012.

Mobile Phone Sales (2010-2013) and Forecast Till (2020):

The consistent growth in the smart phone market is driven by enhanced consumer preference for smart device and narrowing price differences. It is expected to grow due the variety of factors including greater availability of low-cost devices and additional sales emphasis by top-flight vendors even in less populated parts of the country.

Table 5: Mobile Phone Sales (2010-2013) and Forecast till (2020)

Year	Mobile Phone Sales Million Units	Percentage Change (%)
2008	94.6	
2009	100.9	6.65
2010	166.5	65.01
2011	213	28.0
2012	231	8.45
2013	251	8.65
2014	278	10.75
2015	303	9.0
2016	326	8.1
2017	348	7.1
2018	368	6.45
2019	386	5.09
2020	403	4.40

Source: www.ijergs.org

In the year 2008, the mobile phone sales had been observed to be 94.6million units. It has increased to 303million units in 2015 and further expected reach 403million units during the FY2020. In terms of percentage, the mobile phone sales has increased by 203% between 2008 and 2015 and further expected to increase by 303% in 2020 in relation to 2008.

E-Waste from Mobile Phones in India:

Based on the sales data, average lifespan and taking the average Weight as 130gm, e-waste from mobile phones in India is estimated for the year 2020.

Table 6: E-waste from mobile phones in India

Year	E-Waste Mobile Phones Metric Ton
2014	22919
2015	23101
2016	28827.5
2017	33475
2018	36172.5
2019	38870
2020	41925

Source: www.ijergs.org

The E-waste from work out and cell phone units was observed to be at 22,919 tonnes in 2014 and it is expected to grow to 41,925 tonnes in 2020. The expected growth in the E-waste is around 83 precent between a short span of six years from 2014 to 2020.

Year Wise TV Sales in India:

Television is the largest contribution to the consumer durables segment. Introduction of HD TVs is said increase the demand for LCDs among affluent customers. To (LCDs).The price decline due to relatively low import duty on LCDs panel's higher penetration levels, and the introduction of small entry – size models are key growth drivers.

Table 7: Year wise TV sales in India

Year	M TV Sales Million Units	Percentage Change (%)
2000	5	
2001	5.4	8
2002	6.7	24.07
2003	8.15	21.64
2004	10	22.69
2005	10.781	7.81
2006	12	11.30
2007	13.28	10.66

2008	14.53	9.41
2009	15.77	8.53
2010	17.14	8.68
2011	18.45	7.64
2012	19.8	7.31
2013	21.1	6.56
2014	22.4	6.16
2015	23.8	6.25
2016	25.15	5.67
2017(E)	26.6	5.45

Source: www.ijergs.org

In the year 2000, TV sales in India have been observed to be at 5million units. It has increased to 23.8million units in 2015 and further expected reach 26.6million units in FY2017. In terms of percentage, the TV sales has increased by 376precentage between 2000 and 2015 and further expected to increase by 432% in 2017 in relation to 2000.

E-Waste Generated from TVs in India:

Televisions are more likely disposed off by the people in case of technological failures as they prefer to exchange with a new one rather than repairing non-functional equipments. There is a huge gap between the potential e-waste generation and the e-waste actually recycled.

Table 8: E-waste generated from TVs in India

Year	E-waste TVs Metric ton
2012	90300
2013	105750
2014	130200
2015	145800
2016	168000
2017	184200
2018	202770
2019	221550
2020	241500

Source: www.ijergs.org

The disposed of TVs due to the changing preference to improved technology and repaired technology and repaired non-functional TV units amounts to 90,300 tonnes in 2012 and it is expected to increase to 241,500 tonnes in the year 2020 which is certainty a whopping increase. (2.67 times of increase.)

Forecast for Total E-Waste Generated Annually:

Forecasts (2014-2020) for the total E-waste and the gross annual E-waste generated from the four types of electronic devices can be summarized below

Table 9: Forecast for total E-waste generated annually (value in metric tonnes)

Device	2014	2015	2016	2017	2018	2019	2020
Desktop PCs	59558	66429	67102	49648.5	41699	35947	32511
Laptops	12640	15284	20673	25290	32360	40367	50769
Mobile Phones	22919	23101	28827.5	33475	36172.5	38870	41925
Televisions	130200	145800	168000	184200	202770	221550	241500
Total E-Waste Generated Annually	225317	250578	284602.5	292613.5	313001.5	336734	366705

Source: www.ijergs.org

E-Waste Management in India:

India should start a surveillance system for the health consequences and disceases due to the generation of e-wastes E-waste. The reduction of the hazardous substances in the electronic and electrical equipment and the promotion of use of their safer substitutes are practiced in few countries. Many countries have adopted the Restriction of Hazardous Substances [ROHS] and regulations in the manufacturing of such items. In India, primarily, recycling, reuse and recovery are done as measures of treating E-waste. A most of the electrical and electronic equipments contain many precious metals recycling may be done for tapping such minerals. This process is an import step in the management of E-waste. The entire E-waste treatment is being carried out in an unregulated environment, where there is no control on emissions. This is big problem in the recycling of e-wastes in Indi there are two E-waste dismantling facilities in formal sectors of India. These are Mr. Thrishiraya recycling facilities, Chennai and M/s E. Parisara, Bangalore.

Source: www.ijergs.org

Conclusion:

Electronic E-waste is one of the rapidly growing problems of the world. In India, E-waste management has greater significance not only due to the generation of its own E-waste but also because of the dumping of e-waste from developed countries. The hazardous content of these materials pose an environmental threat to human health. Thus, proper management is necessary while disposing or recycling E-wastes. A large number of workers are involved in crude dismantling of these electronic items for their livelihood and their health is at risk. Therefore, there is an urgent need to plan a preventive strategy in relation to health hazardous of E-waste handling among these workers in India. There is no large scale organized E-waste recycling facility in India and the entire recycling existed in unorganized factor. The Indian IT industry has a prominent global presence today largely due to software sector. In recent years, leading to MRC's development in India to set up manufacturing facilities, R&D (Research and Development) centers and software development facilities, the asymptotic growth in IT industry has brought its share of waste disposed problem.

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