E-WASTE IN INDIA

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CONTENTS

PREFACE

This publication titled *E-waste in India* is the next in the series of 'Occasional Papers' being brought out by the Rajya Sabha Secretariat on topical issues, from time to time, for the benefit of Members of Parliament.

The augmentation of human capabilities due to industrial revolution is well documented. The revolutionary changes experienced in societies across the world due to the application of electronics are far more deep and widespread than the impact of industrial revolution. The electronics age made unprecedented impact on human society and spectacularly enhanced our connectivity across the globe. The widespread use of electronic items has made communication easier, boosted business activities and created employment opportunities. However, along with the benefits, it has brought into focus many challenges, like the rising problem of e-waste, that have to be boldly dealt with by society. In the current scenario, it is always possible that human health and environment would be drastically endangered if concerted legislations and actions were not taken for efficient management and disposal of e-waste.

This Paper attempts to provide a brief insight into this relatively new concept of e-waste, its generation in India and the environmental and health concerns attached to it. It highlights the e-waste recycling economy in the thriving informal and the nascent formal sector and the urgent need for a more clear-cut legislation and forward looking vision. The Paper also looks into the global trade in e-waste and the international experience in this regard. A list of references too has been given at the end for further reading.

I am grateful to Dr. Ashok S. Ganguly, M.P., the Ministry of Environment and Forests, the Ministry of Micro, Small and Medium Enterprises, Ms. Sunita Narain, Director, Centre for Science and Environment and Shri Satish Sinha, Associate Director, Toxics Link for their useful comments and suggestions which have enriched the content of this backgrounder.

I sincerely hope that Members will find this paper relevant and useful.

New Delhi;
June, 2011

DR. V. K. AGNIHOTRI,
Secretary-General,
Rajya Sabha.

1

INTRODUCTION

1.1 Introduction

Advances in the field of science and technology brought about industrial revolution in the 18th Century which marked a new era in human civilization. In the 20th Century, the information and communication revolution has brought enormous changes in the way we organize our lives, our economies, industries and institutions. These spectacular developments in modern times have undoubtedly enhanced the quality of our lives. At the same time, these have led to manifold problems including the problem of massive amount of hazardous waste and other wastes generated from electric products. These hazardous and other wastes pose a great threat to the human health and environment. The issue of proper management of wastes, therefore, is critical to the protection of livelihood, health and environment. It constitutes a serious challenge to the modern societies and requires coordinated efforts to address it for achieving sustainable development.

According to the Basel Convention, wastes are substances or objects, which are disposed of or are intended to be disposed of, or are required to be disposed of by the provisions of national laws.[1] Additionally, wastes are such items which people are required to discard, for example by law because of their hazardous properties. Our daily activities give rise to a large variety of different wastes arising from different sources. Thus, municipal waste is waste generated by households and consists of paper, organic waste, metals, etc. The wastes generated by production processes, households and commercial activities are hazardous waste. Bio-medical waste is waste generated by hospitals and other health providers and consists of discarded drugs, waste sharps,

[1] Text of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, UNEP, Geneva, Switzerland, p.6, http://www.basel.int/text/

microbiology and biotechnology waste, human anatomical waste, animal waste, etc. Radioactive waste is any material that contains a concentration of radionuclides greater than those deemed safe by national authorities, and for which, no use is foreseen. Other sources of waste include end-of-life vehicles, packaging waste, tyres, agricultural waste, etc.[2] These waste substances are in the long run hazardous in nature as they are ignitable, corrosive, reactive, toxic, explosive, poisonous or infectious. Hence, they pose substantial or potential threat to public health and the environment.

1.2 What is e-waste?

Like hazardous waste, the problem of e-waste has become an immediate and long term concern as its unregulated accumulation and recycling can lead to major environmental problems endangering human health. The information technology has revolutionized the way we live, work and communicate bringing countless benefits and wealth to all its users. The creation of innovative and new technologies and the globalization of the economy have made a whole range of products available and affordable to the people changing their lifestyles significantly. New electronic products have become an integral part of our daily lives providing us with more comfort, security, easy and faster acquisition and exchange of information. But on the other hand, it has also led to unrestrained resource consumption and an alarming waste generation. Both developed countries and developing countries like India face the problem of e-waste management. The rapid growth of technology, upgradation of technical innovations and a high rate of obsolescence in the electronics industry have led to one of the fastest growing waste streams in the world which consist of end of life electrical and electronic equipment products. It comprises a whole range of electrical and electronic items such as refrigerators, washing machines, computers and printers, televisions, mobiles, i-pods, etc., many of which contain toxic materials. Many of the trends in consumption and production processes are unsustainable and pose serious challenge to environment and human health. Optimal and

[2] Performance Audit on "Management of Wastes in India", Report No. PA 14 of 2008, www.cag.gov.in/html/reports/civil/2008_PA14_SD.../chap_1.pdf

efficient use of natural resources, minimization of waste, development of cleaner products and environmentally sustainable recycling and disposal of waste are some of the issues which need to be addressed by all concerned while ensuring the economic growth and enhancing the quality of life.

The countries of the European Union (EU) and other developed countries to an extent have addressed the issue of e-waste by taking policy initiatives and by adopting scientific methods of recycling and disposal of such waste. The EU defines this new waste stream as 'Waste Electrical and Electronic Equipment' (WEEE). As per its directive, the main features of the WEEE include definition of 'EEE', its classification into 10 categories and its extent as per voltage rating of 1000 volts for alternating current and 1500 volts for direct current. The EEE has been further classified into 'components', 'sub-assemblies' and 'consumables'.[3] Since there is no definition of the WEEE in the environmental regulations in India, it is simply called 'e-waste'.

E-waste or electronic waste, therefore, broadly describes loosely discarded, surplus, obsolete, broken, electrical or electronic devices[4].

1.2.1 Composition of E-waste

E-waste consists of all waste from electronic and electrical appliances which have reached their end- of- life period or are no longer fit for their original intended use and are destined for recovery, recycling or disposal. It includes computer and its accessories-monitors, printers, keyboards, central processing units; typewriters, mobile phones and chargers, remotes, compact discs, headphones, batteries, LCD/Plasma TVs, air conditioners, refrigerators and other household appliances.[5] The composition of e-waste is diverse and falls under 'hazardous' and 'non-hazardous' categories. Broadly, it consists of ferrous and non-ferrous metals, plastics, glass, wood and plywood, printed circuit boards, concrete, ceramics, rubber and other items. Iron and steel constitute about 50% of the waste,

[3] Amit Jain, 'Global e-waste growth' in Rakesh Johri, *E-waste: Implications, regulations and management in India and current global best practices*, TERI, New Delhi, 2008, p.4

[4] "Rules on e-waste management by March", *The Hindu*, 20 December 2009.

[5] Neha Lalchandani, 'E-scare', The *Times of India*, 24 April 2010.

followed by plastics (21%), non-ferrous metals (13%) and other constituents. Non-ferrous metals consist of metals like copper, aluminium and precious metals like silver, gold, platinum, palladium and so on.[6] The presence of elements like lead, mercury, arsenic, cadmium, selenium, hexavalent chromium, and flame retardants beyond threshold quantities make e-waste hazardous in nature. It contains over 1000 different substances, many of which are toxic, and creates serious pollution upon disposal.[7] Obsolete computers pose the most significant environmental and health hazard among the e-wastes.

1.2.2 E-waste generation in India

All over the world, the quantity of electrical and electronic waste generated each year, especially computers and televisions, has assumed alarming proportions. In 2006, the International Association of Electronics Recyclers (IAER)[8] projected that 3 billion electronic and electrical appliances would become WEEE or e-waste by 2010. That would tantamount to an average e-waste generation rate of 400 million units a year till 2010. Globally, about 20-50 MT (million tonnes) of e-wastes are disposed off each year, which accounts for 5% of all municipal solid waste.[9]

Although no definite official data exist on how much waste is generated in India or how much is disposed of, there are estimations based on independent studies conducted by the NGOs or government agencies. According to the Comptroller and Auditor- General's (CAG) report, over 7.2 MT of industrial hazardous waste, 4 lakh tonnes of electronic waste, 1.5 MT of plastic waste, 1.7 MT of medical waste, 48 MT of municipal waste are generated in the country annually.[10] In 2005, the

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[6] Ibid n.3, p.3

[7] The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC), Exporting *Harm: The High-Tech Thrashing of Asia*, February 25, 2002.

[8] The IAER was acquired by the Institute of Scrap Recycling Industries, Inc. (ISRI) in January 2009. ISRI, based in Washington D.C., USA, is the voice of the scrap recycling industry, an association of companies that process, broker and consume scrap commodities.

[9] UNEP Press Release, 'Basel Conference addresses Electronic Wastes Challenge', 27 November 2006 <http://www.unep.org/>

[10] Ravi Agarwal, 'A Policy? Rubbish', *The Hindustan Times*, 4 May 2010

Central Pollution Control Board (CPCB) estimated India's e-waste at 1.47 lakh tonnes or 0.573 MT per day.[11] A study released by the Electronics Industry Association of India (ELCINA) at the electronics industry expo – "Componex Nepcon 2009" had estimated the total e-waste generation in India at a whopping 4.34 lakh tonnes by end 2009.[12] The CPCB has estimated that it will exceed the 8 lakh tonnes or 0.8 MT mark by 2012.[13]

There are 10 States that contribute to 70 per cent of the total e-waste generated in the country, while 65 cities generate more than 60 per cent of the total e-waste in India. Among the 10 largest e-waste generating States, Maharashtra ranks first followed by Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab. Among the top ten cities generating e-waste, Mumbai ranks first followed by Delhi, Bengaluru, Chennai, Kolkata, Ahmedabad, Hyderabad, Pune, Surat and Nagpur.[14]

The main sources of electronic waste in India are the government, public and private (industrial) sectors, which account for almost 70 per cent of total waste generation. The contribution of individual households is relatively small at about 15 per cent; the rest being contributed by manufacturers. Though individual households are not large contributors to waste generated by computers, they consume large quantities of consumer durables and are, therefore, potential creators of waste.[15] An Indian market Research Bureau (IMRB) survey of 'E-waste generation at Source' in 2009 found that out of the total e-waste volume in India, televisions and desktops including servers comprised 68 per cent and 27 per cent respectively. Imports and mobile phones comprised of 2 per cent and 1 per cent respectively.

As a large-scale organised e-waste recycling facility, the Attero

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[11] Lok Sabha Unstarred Question no.650, dt. 28.07.2010.

[12] Sandeep Joshi, 'Growing e-waste is causing concern', *The Hindu*, 28 February 2009.

[13] Moushumi Basu, 'New e-waste management plan lucrative for states', *The Pioneer*, New Delhi, 18 May 2010.

[14] 'Disposal of e-waste', Rajya Sabha Unstarred Question no. 1887, dt. 07.12. 2009. Also see, Sanjay Jog, 'Ten states contribute 70% of e-waste generated in India', *The Financial Express*, 13 March 2008.

[15] Satish Sinha, 'Downside of the Digital Revolution',*Toxics Link*, 28 December 2007, <http://www.toxicslink.org>

Recycling Plant in Roorkee opened in January 2010. Despite 23 units currently registered with the Government of India, Ministry of Environment and Forests/ Central Pollution Control Board, as e-waste recyclers/reprocessors, having environmentally sound management facilities, the entire recycling process more or less still exists in the unorganised sector. The Cobalt-60 radiation tragedy at Mayapuri in Delhi in which one person lost his life and six persons were admitted to hospital served as a wakeup call drawing attention to the mounting quantity of hazardous waste including e-waste in the country while revealing systemic problems on the issue of waste disposal.[16] The Ministry of Environment and Forests (MoEF) has notified the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 for effective management of hazardous wastes, including e-waste in the country. But these rules do not apply to the radioactive wastes such as Cobalt – 60 which are covered under the Atomic Energy Act, 1962.[17]

1.3 Electronic waste in the global context

As the fastest growing component of municipal waste across the world, it is estimated that more than 50 MT of e-waste is generated globally every year. In other words, these would fill enough containers on a train to go round the world once.[18] However, since the markets in the West have matured, it is expected to account for only 2 per cent of the total solid waste generated in developed countries by 2010. Therefore, with increasing consumerism and an anticipated rise in the sales of electronic products in the countries experiencing rapid economic and industrial growth, the higher percentage of e-waste in municipal solid waste is going to be an issue of serious concern.

A report of the United Nations predicted that by 2020, e-waste from old computers would jump by 400 per cent on 2007 levels in

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[16] 'Mayapuri: Disaster protocol not clear, says health minister', *The Times of India*, New Delhi, 04 May 2010.

[17] Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4/2011-HSMD, dated 19 April, 2011.

[18] Schwarzer S., A.D. Bono et al, 'E-waste, the hidden side of IT equipment's manufacturing and use', *Environment Alert Bulletin* (UNEP Early Warning on Emerging Environmental Threats), No. 5, 2005.

China and by 500 per cent in India. Additionally, e-waste from discarded mobile phones would be about seven times higher than 2007 levels and, in India, 18 times higher by 2020.[19]

Such predictions highlight the urgent need to address the problem of e-waste in developing countries like India where the collection and management of e-waste and the recycling process is yet to be properly regulated. According to the UN Under-Secretary General and Executive Director of the United Nations Environment Programme (UNEP), Achim Steiner, China, India, Brazil, Mexico and others would face rising environmental damage and health problems if e-waste recycling is left to the vagaries of the informal sector.

China already produces about 2.3 million tonnes of e-waste domestically, second only to the U.S. with about three million tonnes.[20] The EU and the U.S. would account for maximum e-waste generation during this current decade. As per the Inventory Assessment Manual of the UNEP, 2007, it is estimated that the total e-waste generated in the EU is about 14-15 kg per capita or 5MT to 7MT per annum. In countries like India and China, annual generation per capita is less than 1kg.[21] In Europe, e-waste contributes up to 6 million tonnes of solid waste per annum. The e-waste generation in the EU is expected to grow at a rate of 3 per cent to 5 per cent per year. In the past, e-waste had increased by 16 per cent to 28 per cent every five years which is three times faster than average annual municipal solid waste generation.

In the U.S., e-waste accounts for 1 to 3 per cent of the total municipal waste generation. As per the United States Environmental Protection Agency (USEPA), it generated 2.6 MT of e-waste in 2005, which accounted for 1.4 per cent of total wastes. Electronic waste is generated by three major sectors in the U.S.:

- Individuals and small businesses;

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[19] Tom Young, 'E-waste a growing problem for China and India', 22 February 2010, <http://www.computing.co.uk>

[20] Ibid.

[21] 'Generation of E-waste', Rajya Sabha Unstarred Question No. 24, dated 26.07.2010.

- Large businesses, institutions and governments; and
- Original equipment manufacturers (OEMs)[22]

Electronic equipments, especially computers, are often discarded by the households and small businesses not because they are broken but simply because new technology has rendered them obsolete and undesirable. Sometimes, the new software is incompatible with the older hardware leaving customers with no option but to buy new ones. Data from a single-day recycling collection event revealed that more than 50 per cent of rejected computers are in good working order, but they are discarded nonetheless to make way for the latest technology.[23] The equipments discarded by individuals and small businesses form part of solid waste which gets disposed in landfills or incinerators except in the States of Massachusetts and California where landfills are banned. For large businesses, since it is illegal by law to dispose off computers in landfills, e-waste goes to the re-use/re-cycling/export market. In the case of original equipment manufactures or OEMs, e-waste is generated when units coming straight out of production do not meet quality standards and must be disposed off. While some have their own recycling plants, others enter into contract with recycling companies to handle their e-waste, which is often exported.

According to the newsletter issued by the International Association of Electronics Recyclers (IAER), used electronic equipments including household appliances and IT equipments also get dumped in landfill sites in the United Kingdom and Japan.[24]

Estimates by the *Electronics Industry Market Research and Knowledge Network* had anticipated the worldwide market for e-waste to rise at an average annual growth rate of 8.8 per cent, from $7.2 billion in 2004 to $11 billion in 2009. At that growth rate, it is expected to cross $17 billion by 2014/15 with e-waste generation reaching 40-70 MT per year by the same period.[25] Besides, the demand for metals from rapidly growing economies, especially India,

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[22] Ibid.

[23] Ibid.

[24] International News on Electronic Recycling, *IAER Newsletter,* January 2009, <http://www.isrielectronics.org/communications/NL0109.html>

[25] Ibid. n. 3, pp.5-6

China and Brazil has been providing an impetus to the global demand for metals. The recycled metal market has been predicted to grow at an average annual growth rate of 8.1 per cent in 2010 and that of recycled plastics at the rate of 10.2 per cent.

A major reason for the rapid generation of e-waste and the resulting growth of the recycling market can be found in the high rate of obsolescence in the electronics market. Most electronic goods, especially in the West, have very short lifespan. Such goods are routinely replaced at least every two years, and then either simply discarded or exported to developing countries where there is still a demand for second-hand merchandise.[26] In a programme called "Following the Trail of Toxic E-waste", 60 Minutes of CBS News.com traced the route of toxic electronic waste illegally shipped from America to China *via* Hong Kong. In this programme, Allen Hershkowitz, a senior scientist and authority on waste management at the U.S. Natural Resources Defence Council, was quoted saying that the problem with e-waste was that it was the fastest-growing component of the municipal waste stream worldwide. When asked what he meant by "fastest-growing," he said that about 1,30,000 computers were thrown out every day in the United States and over 100 million cell phones were thrown out annually.[27]

Recycling facilities exist in developed countries and stringent measures have been taken by the Governments regarding disposal of e-waste. However, there are difficulties in implementing regulations and dealing with e-waste owing to increased activism by environmentalists and the high cost of recycling. Despite concerns on the issues of fraudulent traders and environmentally unsound practices, it has been easier and cheaper for these countries to ship e-wastes to the developing countries where access to and recycling of such discarded electronic goods make a good economic option. For both sides, it is profitable or a win-win situation. The only difference being that the rich country is dumping toxic waste on the poorer country.

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[26] Jayanti Ghosh, 'Digital Dumps', *Frontline*, Vol. 25, Issue-05, March 01-14, 2008.

[27] "Following the Trail of Toxic E-waste", 60 Minutes, CBS News.com, 30 August 2009,<http://www.cbsnews.com/stories/2008/11/06/60minutes/main4579229.shtml>

This can be further elaborated by giving an example of dismantling of ships, which involves the process by which end-of-life ships are converted into steel and other recyclable items, and the remainder is then disposed of. These operations are performed mainly in South Asia, with India, Bangladesh and Pakistan currently occupying 70-80 per cent of the market. The industry offers a valuable end-of-life solution to old ships although there are concerns about the environmental, health and safety standards employed, especially in South Asia, as the industry has historically gravitated towards low labour cost countries with weak regulations on occupational health, safety and the environment.[28]

1.4 Growth of electrical and electronic industry in India

1.4.1 A brief history

Our first Prime Minister Pandit Jawaharlal Nehru had said in 1961 that the pace of change in the world was greater due to new avenues opening out with the application of electronics, atomic energy, etc. He then observed that the nation or the community which kept pace with those developments could keep pace with the rest of the world. In fact, initiated and controlled by the Government, the Electronics Industry in India took off around 1965 with an orientation towards space and defence technologies. It was followed by developments in consumer electronics mainly with transistor radios, black & white televisions, calculators and other audio products. Successive Prime Ministers laid emphasis on electronics for industrial growth and progress and for the all round modernization and advancement of our nation. It was during Prime Minister Smt. Indira Gandhi's tenure that the Electronics Commission composed of scientists and engineers was set up for the development of what she described as 'a vital industry'. It was during Prime Minister Rajiv Gandhi's tenure that electronics received much more serious attention followed by concrete programme of action to unleash a countrywide electronics revolution. While inaugurating the seminar on

[28] Press Release on 'Old ships and Obsolete Computers Part of Major Transition for Global Waste Management', issued by the Secretariats of the Basel, Rotterdam and Stockholm Conventions, Geneva, Switzerland, 14 May 2010, <http://www.unep.org/hazardoussubstances/News/PressRelease/>

Investment Opportunities on Electronics' on 21 February 1985, in New Delhi, he remarked that electronics was critical to India's growth. He stated that India missed the industrial revolution which multiplied several folds the power of human beings to carry out diverse activities. Regretting that India required almost three hundred years to catch up with that revolution, he maintained that the second revolution that is the electronics revolution or the computer revolution was about to by-pass India because we could not remain tuned to it in time. He, therefore, underlined the necessity of running behind it and joining it to use its unprecedented power for taking India to twenty first century. Exuding confidence that India was capable of doing it, he stated that application of electronics would make revolutionary impact on every segment of the industry and in every field of human activity and society. He, for the first time, introduced computers to India on a large scale and established several technology missions one of which was on telecommunication. Such forward looking initiatives ushered in computer and telecommunication revolution across the country, quickening the pace of work and providing connectivity at a faster pace.

The period between 1984 and 1990, which has been called as the 'golden period', witnessed continuous and rapid growth in the electronics industry. Since the 1990s, the Indian economy moved away from being tightly regulated by the Government to the regime of liberalization and opening up to the global economy. The economic crisis triggered by the Gulf War in 1991, put pressure on the electronics industry but developments continued with digitalization in all sectors and the software boom in the mid-1990s. In 1997, the Information Technology Agreement (ITA) was signed at the World Trade Organization (WTO) whereby India eliminated all customs duties on the Information Technology (IT) hardware by 2005.[29]

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[29] Corporate Catalyst in India, 'Electronics Industry in India: A report on Indian Electronics Industry', 2009 < www.cci.in/pdf/surveys_reports/electronics-industry.pdf>

Indian economy has witnessed significant growth in the last two decades. The IT sector has contributed significantly to the overall economic growth. In recent years, the electronic industry has been growing very rapidly. The electronics market in India jumped from US$ 11.5 billion in 2004 to US$ 32 billion in 2009 making it one of the fastest growing electronics market worldwide with the potential to reach US$150 billion by 2010.[30] India's low manufacturing costs, skilled labour, raw materials, availability of engineering skills and opportunity to meet demand in the populous Indian market have contributed significantly to facilitate the growth of the electronics industry. Besides, India's, large and growing middle class of 320-340 million has disposable income for consumer goods.[31]

India, in the last couple of decades, has also been vastly influenced by the culture of consumerism. The application of electronics related technology has been very wide spread in all sectors. Coupled with the rapid pace of industrialization, Personal Computers (PCs) — desktops and notebooks, televisions and mobile phones and other manufacturing items like refrigerators have experienced high growth and even faster replacement cycle. The electronics manufacturing industry has emerged as one of the most innovative industries in the world over. It is constantly engaged in creating and utilizing new technologies. This has also partly contributed to what is called inbuilt product obsolescence. This has resulted into an ever increasing quantity of electronics and electrical appliances being discarded, as it is often cheaper to buy new product than to repair or upgrade a broken or obsolete one.

1.4.2 Computer and computer components segment

The electronics industry is driven mainly by the computer and computer component sectors with as much as a fifth of its revenues coming from sales of Personal Computers. The huge scale of demand in the market can be observed from the sale of the P.Cs.

[30] Ibid.

[31] <http.//www.emsnow.com/newsarchives/archivedetails/cfm?ID=9572>

(desktops and notebooks) in the period 2003—2009 as given in the table below:

Total Computer Sale : 2003—2009[32]

Year	Units
2003-04	3,124,22
2004-05	3,809,724
2005-06	5,046,558
2006-07	6,341,451
2007-08	7,344,306
2008-09	6,796,107

Personal computers sales have seen a major jump in the last few years from around units of 3.1 million in 2003-04 to 7.3 million in 2007-08 approximately. It dropped to 6.7 million units in 2008-09 during the recession but the industry once again picked up in 2009-10. The total sales of personal computers for the quarter October - December 2009 were 2 million (20 lakh) units, registering a growth of 42 per cent over the same period in the previous fiscal year. In the same quarter, the sales of desktops stood at 1.35 million (13.5 lakh) units, while netbooks and notebooks taken together recorded a consumption of 0.66 million (6.6 lakh) units growing 27 per cent and 90 per cent respectively, on a year-on-year basis.[33] Overall PC sales for 2009-10 are expected to cross 7.3 million (73 lakh) units, registering a 7 per cent annual growth.[34]

A shift in the governance systems with e-governance initiatives adopted by the Central and the State Governments, the telecom, banking and education sectors, Small and Medium Enterprises (SMEs) and IT enabled services have been a major factor leading to the vibrancy of consumption in the information technology market. The third quarter of 2009-10 had also seen an increase in consumption in households and smaller towns. Today, the small cities constitute close to 50 per cent of the sales of personal computers.

[32] MAIT: IT Industry Performance Annual Review: 2008-09, Press Conference, New Delhi: 14 July 2009

[33] Press Release, 'Economic recovery drives IT hardware market in Q3'. <www.mait.com/admin/press_images/press22march10.htm>

[34] Ibid.

Region wise, the personal computers market has grown in the eastern and western regions indicating a progressive application of technology in governance and the common person's life.

1.4.3 The Consumer Electronics (Television) segment

In the television segment, the advent of the Liquid Crystal Display (LCD) and plasma screens have altered the concept of the television for viewers. Better technology has meant improved picture quality and a diminishing price difference between the traditional CRT (Cathode Ray Tube) television and the new flat screen LCD television. It has resulted in the popularity of the latter. Moreover, increasing disposable income and the price decline influenced by robust demand has been factoring the growth in this segment. A phenomenal rise in the sale volume of the flat panel colour television by 70.9 per cent in 2007 as against just over 33 per cent of the CRT colour television demonstrates this new trend.

Further, according to the retail market research agency ORG-GfK data for the five month period January to May 2007, the total CTV (Colour Television) sales touched the 42,54, 700-units mark in terms of volume and the Rs. 3,975.48 crore mark in terms of value. The flat panel CTV segment formed 64.3 per cent of the entire market, worth Rs. 2,545.81 crore with a total of 27,34,000 units sold during the period. The conventional curve CTV segment stood at 33.5 per cent of the whole market, worth Rs. 813.28 crore (14, 26,600 units).[35]

According to a report on Indian Consumer Durables Industry by the Corporate Catalyst India, the sales trend of television indicated that sales would go up from 8,867,000 units in 2005 to 11,795,000 units in 2010. According to Display Search, a leading global provider of consumer and retail market research, globally, overall TV shipments were expected to rise from 205 million units in 2008 to 218 million units by 2010.[36]

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[35] Debdatta Das, 'Flat colour TV sales surge by our 70%', The Hindu Business Line, 20 July, 2007.
Since July 2009, ORG-GfK Marketing Services (India) Private Limited was renamed GfK- Nielsen India Private Limited.

[36] Antone Gonsalves, 'LCD TV Sales Boom Foreseen in 2010', Information Week. The Business Value of Technology, 31 December 2009, < http://www.informationweek.com>

1.4.4 The telecommunications segment

The telecom industry in India has also witnessed an unprecedented growth in recent times owing to the subscription and developmental potential of its large population. The total telephone (landline and wireless) subscriber base had reached 653.92 million by the end of May 2010. Currently, there are an estimated 617.53 million mobile phone users compared to 36.39 million fixed line subscribers in India.[37] In April 2010 alone, 16.90 million subscribers were added in the wireless (cell phone) segment. It is estimated that India would overtake China to become the world's largest mobile telecommunications market by the year 2013. It is predicted that by then, the teledensity would shoot up from 55.38 per cent in May 2010 to 75 per cent and the total mobile subscriber base would be a staggering 1.159 billion![38]

The cell phone or mobile users have increased in number very rapidly in India and this momentum will be maintained in the coming years. However, the waste generated by this product is physically less in volume due to the nature of the product.

In the telecommunications segment, due to the increasing use of fiber optic technology to replace copper for faster transmission of data and for expanding the bandwidth of service networks, the optical components markets are also expected to rise from a market worth at $3.8 billion in 2008 to $11.3 billion by 2015.[39]

1.4.5 Changing consumption patterns

The global recession in 2008-09 had resulted in the electronic manufacturing services industry diminishing by 11 per cent in 2009. But the resurgence of consumer spending in the latter part of 2009 led analysts to believe that the electronic industry is going to enjoy a compound annual growth rate of 8 per cent in the period 2010-2014. It is expected that India and other emerging economies will

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[37] <http://www.telecomindiaonline.com/india-telecom-growth-and-subscribers-2010.html>

[38] <http://en.wikipedia.org/wiki/Telecommunications_Statistics_in_ India>

[39] Electronics.ca Research Network, 'Optical Components Worldwid e: Markets Reach $11.3 Billion by 2015', 29 September, 2009, _<http://www.electronics.ca/press center/>

present some of the best markets for consumer spending in 2010 and beyond.[40] Such a prediction would imply that obsolescence would be an ever recurring factor in the growth dynamics of the electronic manufacturing industry. The generation of such obsolete electronic items or e-waste is therefore, likely to increase manifold in proportion to the growth in the electronics industry.

Most of the IT products, especially computers and mobile phones, have a short lifespan. The products are not designed for longevity and become obsolete in no time. The most commonly used PC, which earlier had a lifespan of seven years, today has an average lifespan of two to five years. The shorter lifespan of products is a marketing strategy to maintain the pace of consumption and production processes. Therefore, new technologies and 'upgrades' come into the market almost every 18 months influencing consumption patterns.

Further, the availability of choices, changing pace of life, rapid urbanization, and increased purchasing capacity of the middle class have all contributed to the growth of the electrical and consumer durable industry.[41] The increasing affordability and availability of these products leads to a gradual penetration into smaller towns which are now showing impressive sales of consumer electronics. Some of the consumer products like refrigerators, televisions and so on were once a lifetime purchase. But today consumers outgrow older models as new products come into the market and find that it is easier and cheaper to buy new electronic equipment than repair an old product. Due to the extreme rate of obsolescence, the electronic industry is producing much higher volumes of waste. This has been compounded by the change in the consumption pattern in India which has also contributed to the large volumes of e-waste being generated in the country.

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[40] Electronics.ca Research Network, 'Worldwide Electronic Manufacturing Services Will Return to Steady, But Uneven Growth in 2010', 26 April 2010, < *http://www.electronics.ca/presscenter/*>

[41] Satish Sinha, 'Dark shadows of digitization on Indian horizon' in Rakesh Johri, E-waste: *Implications, regulations and management in India and current global best practices,* TERI, New Delhi, 2008, p. 27

Given below is the quantity of e-waste generated by Indian states according to an assessment study conducted by the International Resource Group Systems South Asia Pvt. Ltd (IRGSSA) in 2005. The study is primarily based on the average national penetration levels of computer in the population.

Quantity of WEEE (Waste Electrical and Electronic Equipment) generated in Indian States[42]

State/UT	WEEE (tonnes)
Andaman and Nicobar Islands	92.2
Andhra Pradesh	12780.3
Arunachal Pradesh	131.7
Assam	2176.7
Bihar	3055.6
Chandigarh	359.7
Chhattisgarh	2149.9
Dadra and Nagar Haveli	29.4
Daman and Diu	40.8
Delhi	9729.2
Goa	427.4
Gujarat	8994.3
Haryana	4506.9
Himachal Pradesh	1595.1
Jammu and Kashmir	1521.5
Jharkhand	2021.6
Karnataka	9118.7

[42] Country level WEEE assessment study by the International Resource Group Systems South Asia Pvt. Ltd (IRGSSA), (m/s IRG Systems South Asia Pvt. Ltd), 2005.

State/UT	WEEE (tonnes)
Kerala	6171.8
Lakshadweep	7.4
Madhya Pradesh	7800.6
Maharashtra	20270.6
Manipur	231.7
Meghalaya	211.6
Mizoram	79.3
Nagaland	145.1
Orissa	2937.8
Puducherry	284.2
Punjab	6958.5
Rajasthan	6326.9
Sikkim	78.1
Tamil Nadu	13486.2
Tripura	378.3
Uttar Pradesh	10381.1
Uttarakhand	1641.1
West Bengal	10059.4
Total	**146180.7**

The State of Maharashtra tops the list generating 20,270 tonnes of e-waste annually. The other States leading in the generation of e-waste are Tamil Nadu, Andhra Pradesh, Uttar Pradesh and West Bengal.

1.5 Environment concerns and Health hazards

Following Supreme Court directions,[43] the states have notified a set of hazardous waste laws and built a number of hazardous waste disposal facilities in the last ten years. However, the CAG report found that over 75 per cent of state bodies were not implementing these laws.[44] According to the MoEF, presently there are 28 operational Treatment, Storage and Disposal Facilities (TSDFs) for hazardous waste management in the country. The rising quality of life and high rates of resource consumption patterns has had an unintended and negative impact on the environment through the generation of wastes far beyond the handling capacities of governments and agencies.

Added to the burden of the management of hazardous municipal waste, the management of huge and growing quantities of electronic waste is emerging as one of the most important environmental problems of developing countries, especially India. Approximately 2 lakh tonnes of e-waste was generated in the country in 2007. With the prediction that nearly 8 lakh tonnes of e-waste would be generated by the end of 2012, e-waste has become more of a problem than all other wastes because of the very significant health and environment hazards associated with it. E-waste is getting generated at a 10 per cent annual growth rate which is one of the highest in the world.[45] India's environment therefore, faces a serious threat.

The problems associated with electronic waste are now being recognized. E-waste is highly complex to handle due to its

[43] The Hon'ble Supreme Court of India *vide* its order dated 14 October, 2003 in the matter of *Writ Petition (Civil) No. 657 of 1995 filed by the Research Foundation for Science, Technology and Natural Resource Policy Vs Union of India and Others, inter-alia,* directed the Central Government to constitute a Monitoring Committee to oversee timely compliance of its directions given in the said Writ Petition. <http://cpcb.nic.in/oldwebsite/Hazardous%20Waste SupremeCourtDirectives.html>

[45] Ibid n.10

[46] Sandeep Joshi, 'Growing e-waste causing concern', *The Hindu,* 28 February, 2009.

composition. It is made up of multiple components some of which contain toxic substances that have an adverse impact on human health and environment if not handled properly. Often, these problems arise out of improper recycling and disposal methods.[46] This underlines the need for appropriate technology for handling and disposal of these chemicals.

1.5.1 Pollutants in e-waste

Pollutants or toxins in e-waste are typically concentrated in circuit boards, batteries, plastics, and LCDs (liquid crystal displays). Given below is a table showing the major pollutants occurring in waste electrical and electronic equipments:

Pollutants and their occurrence in waste electrical and electronic equipment[47]

Pollutant	Occurrence
Arsenic	Semiconductors, diodes, microwaves, LEDs (Light-emitting diodes), solar cells
Barium	Electron tubes, filler for plastic and rubber, lubricant additives
Brominated flame-proofing agent	Casing, circuit boards (plastic), cables and PVC cables
Cadmium	Batteries, pigments, solder, alloys, circuit boards, computer batteries, monitor cathode ray tubes (CRTs)
Chrome	Dyes/pigments, switches, solar
Cobalt	Insulators
Copper	Conducted in cables, copper ribbons, coils, circuitry, pigments
Lead	Lead rechargeable batteries, solar, transistors, lithium batteries, PVC

[46] P. Srisudha, 'Tackling e-waste', *The Hindu*, 28 June, 2009.

[47] Alexander Janz and Bernd Bilitewski, 'Hazardous substances in waste electrical and electronic equipment' in Rakesh Johri, *E-waste: Implications, regulations and management in India and current global best practices,* TERI, New Delhi, 2008, p.93.

Pollutant	Occurrence
	(polyvinyl chloride) stabilizers, lasers, LEDs, thermoelectric elements, circuit boards
Liquid crystal	Displays
Lithium	Mobile telephones, photographic equipment, video equipment (batteries)
Mercury	Components in copper machines and steam irons; batteries in clocks and pocket calculators, switches, LCDs
Nickel	Alloys, batteries, relays, semiconductors, pigments
PCBs (polychlorinated biphenyls)	Transformers, capacitors, softening agents for paint, glue, plastic
Selenium	Photoelectric cells, pigments, photocopiers, fax machines
Silver	Capacitors, switches (contacts), batteries, resistors
Zinc	Steel, brass, alloys, disposable and rechargeable batteries, luminous substances

1.5.2 Impact of hazardous substances on health and environment

The waste from electronic products include toxic substances such as cadmium and lead in the circuit boards; lead oxide and cadmium in monitor cathode ray tubes (CRTs); mercury in switches and flat screen monitors; cadmium in computer batteries; polychlorinated biphenyls in older capacitors and transformers; and brominated flame retardants on printed circuit boards, plastic casings, cables and PVC cable insulation that releases highly toxic dioxins and furans when burned to retrieve copper from the wires.[48] Many of these substances are toxic and carcinogenic. The materials are complex and have been found to be difficult to recycle in an environmentally sustainable manner even in developed countries.

[48] Ibid n.7, p.9

Listed in the table below are the harmful elements in the compositions of electrical and electronic appliances that can be hazardous to health and environment:[49]

Metal	Danger
Lead	A neurotoxin that affects the kidneys and the reproductive system. High quantities can be fatal. It affects mental development in children. Mechanical breaking of CRTs (cathode ray tubes) and removing solder from microchips release lead as powder and fumes.
Plastics	Found in circuit boards, cabinets and cables, they contain carcinogens. BFRs or brominated flame retardants give out carcinogenic brominated dioxins and furans. Dioxins can harm reproductive and immune systems. Burning PVC, a component of plastics, also produces dioxins. BFR can leach into landfills. Even the dust on computer cabinets contains BFR.
Chromium	Used to protect metal housings and plates in a computer from corrosion. Inhaling hexavalent chromium or chromium 6 can damage liver and kidneys and cause bronchial maladies including asthmatic bronchitis and lung cancer.
Mercury	Affects the central nervous system, kidneys and immune system. It impairs foetus growth and harms infants through mother's milk. It is released while breaking and burning of circuit boards and switches. Mercury in water bodies can form methylated mercury through microbial activity. Methylated mercury is toxic and can enter the human food chain through aquatic.
Beryllium	Found in switch boards and printed circuit boards. It is carcinogenic and causes lung diseases.
Cadmium	A carcinogen. Long-term exposure causes *Itai-itai* disease, which causes severe pain in the joints and spine. It affects the kidneys and softens bones. Cadmium is released into the environment as powder while crushing and milling of plastics, CRTs and circuit boards. Cadmium may be released with dust, entering surface water and groundwater.
Acid	Sulphuric and hydrochloric acids are used to separate metals from circuit boards. Fumes contain chlorine and sulphur dioxide, which cause respiratory problems. They are corrosive to the eye and skin.

[49] 'IT's underbelly', *Down to Earth,* vol.19, no.1, May16 - 31, 2010.

Most electronic goods contain significant quantities of toxic metals and chemicals like mercury, which is currently being phased out in the developed countries. Mercury is mobile and poisonous in any form - inorganic, organic or elemental. Its organic compound methyl mercury has been scientifically proved to be a neuro-toxicant that damages the brain. It is geno-toxic too as it passes through the placental and the blood-brain barrier, putting the foetus at risk. Mercury is known to cause severe and permanent damage to the central nervous system, lungs and kidneys. It can trigger depression and suicidal tendencies and cause paralysis, Alzheimer's disease, speech and vision impairment, allergies, hypospermia and impotence. Mercury bio-accumulates (builds up in organisms) and biomagnifies (moves up the food chain). According to the United Nations Environment Programme's (UNEP) Global Mercury Assessment Report, even minuscule increases in methyl mercury exposures can affect the cardiovascular system.[50]

E-waste typically contains complex combinations of materials and components down to microscopic levels. The wastes are broken down in not just for recycling but for the recoverable materials such as plastic, iron, aluminium, copper and gold. However, since e-waste also contains significant concentration of substances that are hazardous to human health and the environment, even a small amount of e-waste entering the residual waste will introduce relatively high amount of heavy metals and halogenated substances. Such harmful substances leach into the surrounding soil, water and air during waste treatment or when they are dumped in landfills or left to lie around near it. Sooner or later they would adversely affect human health and ecology.

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[50] Asha Krishnakumar, 'Importing danger', *Frontline,* Vol. 20, Issue 25, 06 – 19 December, 2003.

Unless suitable safety measures are taken, these toxic substances can critically affect the health of employees and others in the vicinity – who manually sort and treat the waste – by entering their body

- through respiratory tracts,
- through the skin, or
- through the mucous membrane of the mouth and the digestive tract.[51]

Therefore, the health impact of e-waste is evident. There is no doubt that it has been linked to the growing incidence of several lethal or severely debilitating health conditions, including cancer, neurological and respiratory disorders, and birth defects. This impact is found to be worse in developing countries like India where people engaged in recycling e-waste are mostly in the unorganized sector, living in close proximity to dumps or landfills of untreated e-waste and working without any protection or safeguards. Many workers engaged in these recycling operations are the urban poor and unaware of the hazards associated with them. For instance, such recycling activities lead to the deterioration of local drinking water which can result in serious illnesses. It was found that a river water sample from the Lianjiang river near a Chinese "recycling village" had lead levels that were 2400 times higher than the World Health Organization Drinking Water Guidelines thereby involving a serious health hazard.[52]

1.5.3 Dealing with e-waste

Currently, around the world, the volume of obsolete computers and other e-wastes temporarily stored for recycling or disposal is growing at an alarming rate. The generation of

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[51] Ibid. n.47, p.91.
[52] Ibid. n.18.

huge quantity of electronic waste presents an enormous environmental and health hazard to any community. This is best indicated by the table below which shows the amount of waste that 500 million computers can create.

How much waste is in 500 million computers?[53]

Plastic	6.32 Billion Pounds
Lead	1.58 Billion Pounds
Cadmium	3 Million Pounds
Chromium	1.9 Million Pounds
Mercury	632,000 Pounds

There are basically four ways in which e-waste has been treated till date. But none has been found to be fully satisfactory. The most common one has been storing e-wastes in landfills, but it is replete with all the dangers of leaching described earlier. The hazardous effects are far worse in the older or less stringently maintained landfills or dumpsites. In the US, about 70 per cent of heavy metals (including mercury and cadmium) found in landfills come from electronic discards. Because of its hazardous nature, dumping in landfills have been banned in most of the states in the US and European Union.

Another method commonly used has been to incinerate or burn the goods concerned, but this process releases heavy metals such as lead, cadmium and mercury into the atmosphere. Municipal incinerators have been some of the largest point sources for dioxins in the US and Canadian environments and of heavy metal contamination of the atmosphere.

[53] Ibid. n.7, p.6; one pound = 0.4536 kilograms.

Reusing and recycling are the other ways of dealing with e-wastes. They have been preferable because they increase the lifespan of the products and therefore imply less waste over time. Re-use constitutes direct second hand use, or use after slight modifications are made to the original functioning equipment like memory upgrades, etc. However, they end up as waste eventually as they have limited life span. The reuse of second-hand electronic goods in the developing world including India falls in this category, where the waste ends up locally and where there is no adequate facility and competence to deal with them appropriately.

While recycling appears to be a safe method to utilize or dispose e-wastes, it can be a misleading characterization of disparate practices-including dismantling, shredding, burning, exporting, etc. which are mostly unregulated and often create additional hazards itself. "Recycling" of hazardous wastes, even under the best of circumstances, has little environment benefit as it simply moves the hazards into secondary products that eventually have to be disposed of. One view says that unless the goal is to redesign the product to use non-hazardous materials, recycling may be a false solution.[54] On the other hand, the Toxics Link, NGO based in Delhi holds that recycling isn't just good for the environment but also good business practice. Recycling is therefore an important solution, especially if we consider that e-waste contains many valuable and rare materials.[55]

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[54] Ibid.

[55] Comments and Suggestions made by Mr. Satish Sinha, Associate Director, Toxics Link, New Delhi by email dated April 5, 2011 on the draft back-grounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat.

2

RECYCLING E-WASTE : A THRIVING ECONOMY OF THE UNORGANIZED SECTOR

2.1 Global trade in hazardous waste

Among all the international agreements, the Basel Convention on the Control of the Trans-boundary Movement of Hazardous Waste and Their Disposal is the most comprehensive global environmental agreement on hazardous and other wastes. It was adopted in 1989 and came into force in 1992 for the purpose of protecting human health and the environment against the adverse effects resulting from the generation, management, transboundary movement and disposal of hazardous and other wastes. Originally, it did not mention e-waste, but later it addressed the issues of electronic waste along with end-of-life ships at the Conference of the Parties of the Basel Agreement in late 2006. Currently, electronic waste, mobile phones, Polychlorinated Biphenyls (PCBs) and compounds used in industry as heat exchange fluids, in electric transformers and capacitors are among the wastes regulated by the Basel Convention. Many of the global e-waste exports, therefore, are in contrary to the Basel Convention.

2.1.1 Rising illegal e-waste exports

In August 2006, when the Abidjan Hazardous Wastes Crisis[56] exposed the occurrence of illegal hazardous waste exports from

[56] A ship called the Probo Koala, chartered by the Swiss-based oil and commodity shipping company Trafigura Beheer BV, offloaded toxic waste at the port of Abidjan in Côte d'Ivoire (Ivory Coast). The waste was then dumped by a local contractor at as many as 12 sites in and around the city of Abidjan in August 2006. According to the UN and the Government of Côte d'Ivoire, the gas caused by the release of these chemicals resulted in the deaths of 17 and the injury of over 30,000 Ivorians with injuries that ranged from mild headaches to severe burns of skin and lungs. Almost 1,00,000 Ivorians sought medical attention for the effects of these chemicals.

Europe, the UNEP Executive Director, Achim Steiner stated: "As global trade flows expand and tough domestic controls raise the costs of hazardous wastes disposal in developed countries, the opportunities and incentives for illegal trafficking of wastes will continue to grow."[57] It is an affirmation of the rising trend in the export of hazardous wastes by fraudulent means in global trade.

Many studies have confirmed and revealed the danger posed by many wastes, their toxicity, carcinogenicity and other characteristics harmful to the human health and environment. This awareness has been the basis of global action leading to the tightening of laws and regulations. This has, in turn, triggered an increase in the cost of hazardous waste disposal through safer means compelling many countries to search for more economically viable ways of disposing waste abroad. As a result, many developed countries, which are able to circumvent the national legislations, export hazardous wastes including electronic wastes to the developing countries which are having neither the knowledge of the hazardous nature or having rudimentary knowledge, nor the capacity to dispose off the wastes safely. Normally, a computer recycler in the U.S., for instance, would scan the incoming electronic waste materials for its most valuable components and probably sell them in a store or to specially brokers. The rest of the material would be broken down and sorted according to the type of waste (*eg.* circuit boards, wires and cables, plastics, cathode ray tubes (CRTs), and non-recyclables). These are sold to the brokers who then ship them mainly to China or the South Asian countries—India, Pakistan and Bangladesh. Alternatively, the e-waste materials are sometimes simply sold off in bulk without any separation whatsoever. E-waste brokering is an aggressive and competitive business and buyers for all kinds of e-waste for the Asian market are always available.

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[57] 'UNEP Responds to Abidjan Hazardous Wastes Crisis', <http://www.unep.org/>, Geneva, 8 September, 2006.

2.1.2 Main factors in global waste trade economy

Like most waste trade, e-waste export to the developing countries is governed by brute global economics in which market forces, if left unregulated, dictates that the toxic waste will always run "downhill" on an economic path of least resistance.[58] Illegal export becomes possible when the environment and occupational regulations are non-existent, minimal, lax or not well-enforced, as they are in some developing countries. Low labour costs in these countries also provide the impetus for the export in wastes. For instance, labour cost in China is $1.50 per day.[59]

In addition, exporting e-waste is more lucrative for the exporter country than recycling or disposing it within the country. For instance, waste traders in Europe or USA have to pay US $20 to recycle a computer safely in their countries while they can sell it at half the cost to the informal traders in developing countries.[60] Again, while it costs Rs. 12,000 to recycle a tonne of rubbish after segregation in the U.K., shipping the rubbish to India costs just about Rs. 2,800.[61]

The U.S. produced five times more hazardous waste in 2002 (265 million tonnes) than it did in 1975 (57 million tonnes). The cost of managing such waste within the country would be enormous depending on the toxicity and reactivity of the substances. Thus, it would be more economical to ship toxic wastes to the developing countries when the cost is negligible. Considering its cost-effectiveness, export is a clandestine option chosen by some companies in the industrialized countries. The illegal exports are mostly justified as 'charity' or as 'recycling'. Through these

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[58] The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC), *Exporting Harm. The High-Tech Thrashing of Asia.* February 25, 2002, p.11.

[59] Schwarzer S., A.D. Bono *et al*, 'E-waste, the hidden side of IT equipment's manufacturing and use', *Environment Alert Bulletin* (UNEP Early Warning on Emerging Environmental Threats) No. 5, 2005.

[60] G.S. Mudur, 'Rest in Pieces', *The Telegraph,* 28 March, 2004.

[61] Radha Venkatesan, 'Is India a global trash can?', *The Times of India,* — 24 April, 2010.

methods, obsolete devices find their way from the industrialized countries to the developing countries where they can be used for a few more years. For instance, in 2005, out of nearly 5 million Personal Computers in India, 1.38 million were either model 486s (about eight years old by 2005) or even older.[62] Reuse or recycling may prolong the life span of a product but sooner or later, it would find its way into the waste mainstream. Therefore, while the developed countries legally evade the problem of waste disposal, the developing countries are left to reckon with the ultimate problem of waste disposal.

2.1.3 Waste trading as a quintessential part of electronics recycling

Importing waste is no doubt a lucrative economy. The main objective behind the import of used electronics is the recovery of valuable metals and elements that are contained in electronic waste, including steel, aluminium, copper, tin, nickel, etc. which are in bulk; cadmium and mercury which are in smaller amounts; and barium, nickel, gold, titanium, cobalt, palladium, manganese, silver and platinum, etc. which are in traceable amounts. These various commodities provide useful raw material feedstock in the manufacture of new products. The largest market of a non-working equipment or e-waste is for the circuit boards that are rich in precious metals, *i.e.* silver, gold, palladium and platinum. Sound management practices for the recovery of these elements are debatable. However, export and import trade has become an essential aspect of the electronics recycling.

Moreover, many of the markets for processed plastics and other raw materials derived from end-of-life electronics equipment are also outside of the U.S. In fact, there are no smelters for copper or for the recovery of precious metals from circuit boards in the U.S. The five primary copper and precious metal smelters in the world are located in Canada, Belgium, Sweden, Germany and Japan. There are no Cathode

[62] Ibid n.57.

Ray Tube (CRT) glass furnaces in North America and there are less than 20 worldwide. There are approximately 15 in Asia (*e.g.* South Korea, Malaysia, India, Thailand, Singapore and China) and one in Poland. As the demand for the CRT glass cullet remains strong, the number of glass furnaces continues to be inadequate and insufficient. The challenge is further complicated by the Government restrictions.[63]

2.1.4 Free trade agreements as a means of waste trading

A muted aspect of the global trade in waste which has raised some concerns is that developed countries like Japan are making full use of the Free Trade Agreements (FTAs) or so-called "Economic Partnership Agreements" (EPAs) to export their waste to the developing world. Often involved in the EPA arrangements are unspoken *quid-pro quo* deals such as the Philippines promised access to domestic and nursing labour markets in Japan, or Thailand getting a package mass transit investment for Bangkok.[64]

Since 2004, the Governments of Japan and Thailand have been formally negotiating an FTA that seeks to eliminate tariffs on an unprecedented list of Japanese hazardous waste exports to Thailand. The latter would have to accept waste, including slag, residues from incinerated municipal waste, chemical and allied industries and hospital waste.[65] Other industrialized countries which have been exporting waste to the South-east Asian countries including Thailand, Philippines and Indonesia through existing loopholes that permit some forms of waste being shipped for recycling include the United States, Australia, Britain, New Zealand, Canada and South Korea.[66]

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[63] Institute of Scrap Recycling Industries Inc. (ISRI), 'Electronics Recycling', <http://www.isri.org/>

[64] Greenpeace, 'Japan "Twisting Arms" of Asian Neighbours to Take Toxic Waste", 16 February 2007, <http://www.greenpeace.org/seasia/en/press/releases/>

[65] Marwaan Macan- Markar, 'Free Trade Cannot Include Toxic Waste', *Toxic Trade News,* Basel Action Network (BAN), 16 February 2007

[66] Ibid.

It is reported that Japan and the EU are currently negotiating a similar FTA with India which could result in enormous increase in the import of waste severely hampering environmental safeguard measures. A leaked portion of the negotiation text of the FTA between the EU and India has caused some apprehension. The leaked text of the India-EU FTA phrases a new name for waste. It mentions that "non-new goods shall be understood to include notably used and remanufactured goods" and that "non-new goods" would not have any restrictions such as import or export tariffs. Thus, import of waste could be treated just like import of fresh products.[67]

The growing pressure on the developing countries to import waste through bilateral or free trade agreements is a cause of serious concern as it encourages the business of recycling wastes. It could also override the existing national and international laws against the hazardous waste import, especially the Basel Convention and its global Ban Amendment forbidding toxic waste exports to the developing countries.[68] For instance, despite the international ban, the U.K. could export nearly 23,000 MT of electronic waste "illegally" in 2003 to parts of South- east Asia, India and China.

2.2 Import of hazardous e-waste in India

India is one of the largest waste importing countries in the world. All types of wastes are imported into the country, in the form of cheap raw materials including hazardous and toxic wastes. Data released by the Customs Department reveal imports of even prohibited wastes like clinical waste, incineration ash, municipal waste and e-waste, all of which exceed 50 lakh tonnes annually. In 2009, India generated

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[67] Press Release: 'The e-waste industry in India: CSE exposes what lies beneath', Centre for Science and Environment, New Delhi, 18 May 2010, < http://www.cseindia.org/>

[68] Ibid n. 64.

5.9 million tonnes of hazardous waste domestically and imported 6.4 million tonnes.[69] It generates about 3,50,000 tonnes of electronic waste every year and imports another 50,000 tonnes.

So far, India has been the destination of the hazardous and industrial wastes like mercury, electronic and plastic wastes from the United States; asbestos from Canada; defective steel and tin plates from the E.U., Australia and the U.S.; toxic waste oil from the United Arab Emirates, Iran and Kuwait; zinc ash, residues and skimmings, lead waste and scrap, used batteries and waste and scrap of metals such as cadmium, chromium, cobalt, antimony, hafnium and thallium from Germany, Denmark, the Netherlands, the United Kingdom, Belgium and Norway.[70] These wastes contain toxic components which are damaging to the public health and environment.

New draft rules on the import and the management of e-waste are currently being considered. Till the rules are notified, the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 regulate the export-import trade or transboundary movements of hazardous wastes including e-waste. According to these Rules, import of hazardous wastes for disposal is not permitted. However, import of waste is permitted only for reuse, recycling or reprocessing. Monitoring of units recycling hazardous wastes is the responsibility of the State Pollution Control Board or the Pollution Control Committee in a Union Territory. The Rules also require all import consignments to be accompanied by a movement document and a test report from an accredited laboratory or a pre-shipment inspection certificate from a recognized agency.[71]

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69 PP Sangal, 'The challenge of hazardous waste', *The Economic Times,* 19 May 2010.

70 Asha Krishnakumar, 'Importing Danger', *Frontline,* Vol. 20- Issue 25, Dec. 06-19, 2003.

71 'Trade of Hazardous waste', Rajya Sabha Starred Question No. 119, dated 02.08.2010.

The proposed e-waste rules, 2011 do not address the issue of import/export of e-waste. The transboundary movement of hazardous waste including e-waste is regulated by the Hazardous Waste Rules, 2008. Import of e-waste can be considered for actual users only with the permission of Ministry of Environment and Forests and licence from Directorate General of Foreign Trade[72].

2.2.1 India's stand on liberalizing import rules

Global trade in remanufactured products has already crossed $100 billion. Like other Asian countries, India has also felt the pressure from the developed countries to liberalize its import rules to allow access to its markets for their re- manufactured goods. It is argued by the countries like U.S., Switzerland and Japan that promoting trade in re-manufactured goods helps both the developed and the developing countries by increasing access to low cost, superior quality products while helping solid waste management and encouraging transfer of technology and skills. But India is apprehensive that it could lead to a deluge of import of low-quality cheap goods and actually amount to transfer of waste from the developed to the developing countries. Thus, it has opposed suggestion by some developed countries for more liberal trade in remanufactured goods or refurbished old products apprehending that it could harm the country's domestic industry and also have adverse environmental ramifications. Agreeing with the Government's stand on the issue, Amit Mitra, Secretary-General of the Federation of Indian Chambers of Commerce and Industry (FICCI), has been quoted as saying, "Unrestricted imports of remanufactured goods would adversely impact our

[72] Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4/2011-HSMD, dated 19 April 2011.

domestic manufacturing sector and also have the risk of diluting safety standards and dumping of e-waste".[73]

2.2.2 Loopholes in legislations

However, some provisions contained in some specific policies enable import of e-waste. For instance, India's EXIM (export-import) policy allows import of the secondhand computers not more than 10 years old, besides letting computers in as donations. The Foreign Trade (Development and Regulation) Act, 1992 provides for import of computers and peripherals from zones which have been set up primarily for export, *i.e.* EOU (Export Oriented Units), EPZ (Exports Processing Zones), STP (Software Technology Parks) and EHTP (Electronics Hardware Technology Parks) at a zero custom duty. These computers can be donated to the recognized non-commercial educational institutions, registered charitable hospitals, public libraries, public-funded research and development establishments and organizations of the Government of India and State/ UT Governments.[74]

Moreover, there is no Exim code for trade in second-hand computers for donation purpose or for resale. Both second hand and new computers are placed under the same EXIM code in the Indian Customs Tariff Act allowing exporters to club new computers with the old ones. Besides, the Directorate-General of Foreign Trade (DGFT) rules are flexible to interpretation enabling the Customs Authorities to take on- the- spot decisions and provide rules exemption. Thus, if a consignment of second hand computers is found without a license, traders manage to get their shipment released by paying a penalty. Importers also escape full penalty by an under-assessment of illegally imported goods.[75]

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[73] Amiti Sen, 'India vows to fight liberal import of used goods', *The Economic Times*, New Delhi, 16 August 2010.

[74] Report on Assessment of Electronic Wastes in Mumbai-Pune Area, Maharashtra Pollution Control Board, Mumbai, March 2007, <http://mpcb.mah.nic.in>

[75] Ibid.

Such provisions in the law can be misused by the developed countries to export hazardous e-waste to the country. In the new draft rules on e-waste, Rule 16 in Chapter VI says that 'every producer, distributor collection centre, refurbisher, dismantler, recycler, consumer or bulk consumer shall not import used electrical and electronic equipment or components in India for use unless it is imported for the purpose of repair or refurbishment or to fulfill obligations under the Extended Producer Responsibility (EPR)'. The fact that e-waste could still be imported under the pretext of metal scrap and second-hand electrical appliances have been a matter of serious concern.

As per the proposed e-waste rules, 2011, the clause for import of used electrical and electronic equipment in India for use has been deleted. However, as per the EXIM Policy of Ministry of Commerce import of second hand computers including personnel computers/lap tops and refurbished/ re-conditioned spares is restricted[76].

2.2.3 Porous Ports and lack of checking facilities

Among all ports, the Mumbai Port Trust and the Jawaharlal Nehru Port Trust have been found to have the largest amount of hazardous goods lying around.[77] Much of the global waste which is imported into India and find their way into the ports is labelled as waste or mixed waste paper consignments. Customs officials are unable to check every container because of shortage of men and machinery and resort to random checks.

Of the 12 major ports and 14 intermediate ports in India, the Jawaharlal Nehru Port at Nhava Sheva has two scanning machines. It is the largest port in India, handling close to 50 per cent of the country's port traffic. More than a million containers

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[76] Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4/2011-HSMD, dated 19 April, 2011.

[77] 'Mumbai Port has largest amount of hazardous material', *The Times of India*, 16 August, 2010.

arrive at the port and the scanners have limitations. If cobalt-60, a radioactive substance, is packed in a lead box, the scanners would detect the lead only because the metal blocks radiation from cobalt-60. Besides, beaches and small ports have also grown to be hubs for illegal import of the hazardous waste.

2.2.4 Procedure of importing e-waste

The standard procedure followed for importing a consignment to India involves an importer, an exporter, an agency registered and notified by the Directorate-General of Foreign Trade, a bank and the customs department at the port. First, the importer is required to get a pre-inspection certificate of the import material by a registered agency, which could be an Indian or a foreign company. After the agency issues the certificate, a bill detailing the number of containers, excise duty classification and product details is prepared. Thereafter, the consignment is shipped. When it reaches India, the customs officials at the port check the certificate, levy a customs duty on the product as specified in the Central Excise Tariff Act and release the consignment to the importer.

The e-waste trade is a thriving business in India with strategic port cities like Singapore and Dubai serving as transit centres in the e-waste trade route. E-waste from Australia, North America, South Korea and Japan is received in Singapore and dispatched again to the importing Asian countries including India.[78] Dubai also serves as a centre where scrap and wastes of all kinds from U.S.A., Europe and the West Asian countries are collected and re-exported. India is a major buyer from Dubai. The Dubai based exporters are well aware of the Indian domestic scrap market such that prices of any scrap are kept at par with the Indian market price.[79]

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[78] 'The great e-waste recycling circus', <http://www.grid.unep.ch/waste/download/waste 3637.pdf>

[79] Ibid. n.58, p.25.

The transboundary movements of hazardous wastes, including e-waste are regulated under the Hazardous Wastes Rules, 2008. As per these Rules, import of e-waste is permitted to actual users in the country with permission of MoEF and licence issued by Directorate General of Foreign Trade (DGFT) for recycling or reprocessing only. Import of e-waste by traders is not permitted[80].

2.2.5 Illegal waste imports seized in ports

India annually imports approximately 3.5 million metric tonnes of scrap metal worth Rs. 5,500 crores, entering the country at an average of 500 container loads daily. It is unloaded at any of the major and minor ports along the coast and transported to the Inland Container Depots throughout the country from where they enter a flourishing grey market.[81] The Custom officials at regular intervals have intervened successfully and seized hazardous goods entering the ports. In 2009, nine containers of hazardous waste imported from Malaysia, Saudi Arabia and Barcelona by three different companies in Tamil Nadu were caught at the port of Tuticorin in Tamil Nadu.

In early 2010, twenty containers of hazardous waste from Greece and Reunion, a French colony, imported by a paper factory in Tamil Nadu were sent back from the Tuticorin Port. As recently as in August, 2010, more than 120 tonnes of e-waste in eight containers and imported from various countries by different companies were seized in Chennai. Of the total five consignments, one was from Australia, one from Canada, two from Korea and one from Brunei. Subsequent examination of the goods revealed that there were very old, used and unusable computer monitors, CPUs and processors, control panels, electrical motor parts, printers and keyboards.

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[80] Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4/2011-HSMD, dated 19 April, 2011.

[81] Shankar Roy Chowdhury, 'Terror from Waste' *The Asian Age*, 4 May, 2010.

A large proportion of the computer monitors were found to be more than ten years old and clearly meant for recycling. These imports were found to be in direct violation of the provisions of the Customs Act, 1962 read with the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.[82]

2.3 E-waste economy in the unorganized sector

India has the label of being the second largest e-waste generator in Asia. According to a MAIT – GTZ estimate,[83] India generated 330,000 lakh tonnes of e-waste in 2007, which is equivalent of 110 million laptops. More than 90 per cent of the e-waste generated in the country ends up in the unorganized market for recycling and disposal. The unorganized sector mainly consists of the urban slums of the metros and mini-metros, where recycling operations are carried out by the unskilled employees using the most rudimentary methods to reduce cost. A study by the Basel Action Network (BAN) in partnership with the Toxic Link reveals that e-waste is received and processed in India in similar manner as is done in China, or the condition could be even worse.

The unorganised sector consists of an assortment of small and informal businesses not governed by any stringent health and environmental regulations. Workers face dangerous working conditions as they may be without protection like gloves or masks. Released gases, acid solutions, toxic smoke

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[82] 'Imported e-waste seized by customs officials', *The Times of India*, 20 August, 2010.

[83] Manufacturers' Association for Information Technology or MAIT was set up in 1982 for purposes of scientific, educational and IT industry promotion in India. Deutsche Gesellschaft Fuer Technische Zusammenarbeit or GTZ has been active in India on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). GTZ cooperates with the Central Government and various State agencies with its priority areas for cooperation being sustainable economic development, energy, environmental policy and conservation and sustainable use of natural resources.

and contaminated ashes are some of the most dangerous threats for the workers and for the local environment.[84]

Many workers function from homes to reprocess waste, further exposing themselves, their families and the environment to dangerous toxins. For instance, to extract metals from circuit boards, gas torches are used to heat a board just enough to melt the solder, which separates the metal parts from the boards. Metals are also extracted by soaking the circuit boards in open acid bath followed by manual scrapping to extract copper and precious materials next to open drains. In this sector, the dismantlers extract metals on their own or work with a big trader, earning about Rs. 100/- per day. Two motherboards usually weighing one kilogram cost Rs. 230. A profit of 10 per cent is made after selling the metals.[85]

The circuit board recycling process involves either open burning of the circuit boards or using acid stripping. Both processes first involve removal of the chips, condensers and capacitors from the board. Very often child labour is employed to separate the parts from the circuit boards, utilizing wire cutters and pliers. After some pin straightening, some of the Integrated Circuits (IC) chips and components are sold for reuse. The items that are not worthy of re-use go directly to the open fires to reduce them to metals. Following the chip extraction and burning, the boards themselves are burned in an open pit to retrieve the rest of the metal solder and copper. After burning, the ashes are floated in water to remove lighter ash. Another process involves utilizing nitric acid on the circuit boards to remove gold and platinum. Both methods, open burning and acid baths, are fraught with occupational health risks as well as risks to the people living in the surrounding community.[86]

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84 Ibid. n.59.

85 'IT's underbelly: E-waste recycling hub: Moradabad', *Down to Earth*, vol.19, no.1, May 16-31, 2010, p.24.

86 Ibid n.56, p.25.

The circuit boards are sourced from the computer monitors, CPUs, keyboards, television and remote control sets, radios, cell phones and other electrical appliances. It is estimated that about half the circuit boards used in the appliances in India end up in Moradabad (Uttar Pradesh) also called *Peetal Nagri* or the brass city.[87]

2.4 E-waste economy in the organized sector

In July 2009, organized recyclers formed the e-waste recycler's association but facing stiff competition from the unorganized sectors, they have been able to capture only 10 per cent of the total share of the e-waste market. A problem facing the organized sector is the lack of proper collection and disposal mechanisms and appropriate technologies in the face of a large informal sector. Due to lack of proper collection systems, households and institutions at times end up storing obsolete products in their warehouses or storerooms. Even when these are sold or exchanged, they are refurbished and then resold. Only a small proportion of obsolete electronics products actually find its way into the e-waste processing stream.[88] This is the dilemma facing the 10,000 sq. ft. formal e-waste dismantling unit in Noida (Uttar Pradesh) belonging to the TIC Group India Pvt. Ltd which can process up to 500 tonnes of e-waste annually. But since June 2008, when it was launched, the unit has processed only 200 tonnes. Similarly, the Attero recycling unit in Roorkee (Uttarakhand) is a 35 crore plant which can process 36,000 tonnes of waste in a year although it is getting only 600 tonnes currently. The formal sector also lack refineries for precious metals recovery. Therefore, according to the e-waste recyclers' association formed by organized recyclers in July, 2009, the only way to sustain formal business in the current scenario is the license to import**.**[89] Currently, the Attero recycling unit is the only recognized recycling facility for e-waste in India which has the

[87] Ibid. n.85.
[88] Press Release: 'First MAIT-GTZ, study reveals extent of e-waste challenge. ' <http://www.mait.com/admin/press_images/press77-try.htm>
[89] Ibid. n.85, p.27.

license to import e-waste from the developed countries. Applications from other formal agencies are pending with the Ministry of Environment and Forests, Government of India.

Opinions however differ on the issue of license to import as the only way to sustain formal business in the current scenario. The Toxics Link holds that the aim of e-waste management should be safeguarding environment rather than sustaining businesses. Allowing imports would mean many non-recyclable hazardous materials dumped in our landfills, which should not be allowed. The country generates very large quantities of waste and the critical need was to establish a sound collection mechanism and not permit waste import to sustain capacity utilization of plants[90].

Unlike the informal recyclers, the formal recyclers do not use any chemicals or incinerations and use environmentally sound processes. Clients of the formal recyclers include multinational companies which have to keep up with an environment friendly image and those which do not want their products to enter the grey market and compete with their new products. Unlike the organized sector, the informal dealers refurbish and sell a computer, even if it can be classified as e-waste, with some parts of it in working condition. Selling any part of a computer that is functional would fetch more money than selling it as metal parts. About 10 per cent of the e-waste generated every year is recycled and the remaining is refurbished.

Comparison of the e-waste economy between the informal and formal sectors in the table given below provides a comprehensive insight into the methods, safeguards, capital investments and earnings involved in the e-waste business:[91]

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[90] Comments and Suggestions made by Mr. Satish Sinha, Associate Director, Toxics Link, New Delhi by e-mail dated April 5, 2011 on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat.

[91] Ibid n.85.

Informal	Formal
1. Cathode Ray Tubes' (CRTs) are broken manually to separate its components – glass, metal and copper. The glass, comprising lead, is sold to bakeries or bangle makers. Since it retains heat, the glass goes into the base of ovens. Phosphors, if inhaled, can be toxic. The CRTs are sold to non-branded television makers.	Components of the CRTs are separated by heating in a closed chamber, which sucks out phosphors from the components. They are then crushed in shredder machines. Glass containing lead is sold to the companies that manufacture the CRTs.
2. Circuit boards have gold-plated brass pins, microchips and condensers which are separated by heating. Fumes released during heating are toxic. Gold-plated brass pins are soaked in acid to recover the gold and brass separately. Microchips and condensers are heated in big containers filled with acid to extract metallic parts.	Circuit boards are crushed in shredder machines. They are sent to approved smelters abroad, where after smelting at 1200°C, the metals in the circuit board collect together. Since smelting is carried out in closed chambers at high temperature, it is not hazardous. The metals—lead, copper, nickel, tin, gold, silver, palladium—are then separated by electro-refining.
3. No safety precautions followed. Informal recyclers paid Rs.200-300 daily in Seelampur; Rs. 100-150 in Moradabad.	Protective equipments—gloves, masks, shoes, caps—are provided to employees. Rs. 5,000 per month paid to unskilled workers.
4. Minimal capital investment required. Cost includes price of e-scrap, bribes to transfer it across state borders and set up and run shops, and rent for the workspace.	Investment for a dismantler is about Rs. 30 lakh and for a recycling plant, about Rs. 25 crore.

As e-waste is a cheap source of raw materials while providing employment to many, there are those who advocate recycling e-waste while stressing the need for safe recycling and for setting up of more plants. Commenting on the benefit of safe recycling, the former President of India, Dr. A.P.J. Abul Kalam also said at the inauguration of the Attero Recycling Plant in Roorkee in Delhi in January 2010: "With metal prices rising, recycling will help in sustaining our economy as it is much cheaper than extracting metals from its ore."[92] In this regard, the UNEP report of July 2009 titled "Recycling From E-waste to Resources" has analysed issues related to e-waste including market potential of recycling of e-waste and transfer of innovative technologies for selected 11 countries, including India.[93] It will be discussed in a later chapter.

2.5 E-waste projection and recycling in four major cities

The two main hubs where e-waste is re-cycled in the country are Delhi and Mumbai. The other two major hubs are Hyderabad and Bangaluru which have been the centres of the electronics and information technology industry. They are among the top ten cities in India which have been generating e-waste. Their status as primary centres of the e-waste recycling process - whether it concerns storage, dismantling, recycling, refurbishing, and distribution-has been a predictable fall-out of the electronic industrial growth and development in these cities.

2.5.1 Delhi

A report by the Toxics Link in 2004 found that 70 per cent of electronic waste collected at recycling units in New Delhi was actually exported or dumped by the developed countries. According to the last survey conducted in 2007 on the quantity of waste being produced in Delhi, it was

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[92] 'E-waste causes concern', *The Hindu*, 23 January 2010, <http://www.thehindu.com/thehindu/pp/2010/01/23/stories 2010012350170500.htm>

[93] 'E-waste', Lok Sabha Unstarred Question No. 5449, dated 28.04.2010.

estimated that about 5,000 metric tonnes (MT) of hazardous waste was produced annually. The amount of e-waste generated annually is about 12,000 tonnes. Though not the leading generator, Delhi is the leading processing centre of e-waste in the country. According to the study conducted by the GTZ in 2007, there were about 25,000 workers refurbishing 10,000-20,000 tonnes of e-waste annually. The work takes place in small illegal units where neither regulations nor environment or health safeguards are in place. Due to lack of any facility for proper storage and disposal of such waste, mishaps like the ones that occurred in Mayapuri, where a worker got exposed to the radiation and in Mundka, where a plastic fire broke out, are the kind of risks that the workers face each day. Delhi has the tag of a wholesale scrap market where not only all kinds of waste are brought in but also stored and pre-processed before being sent out to other parts of the country. The Government is in the process of acquiring land in Kanjhawla for the purpose of treating and disposing waste but till such time, waste would continue to be stored at common effluent treatment plants and other generation points, posing a huge risk to those who come in contact with it.[94]

Once e-waste is imported, e-waste dealers in Delhi make bids on the sea-going containers at the inland depot situated at Okhla. The material is taken out, sorted and distributed between various recyclers according to the areas of specialization. Electronic waste in Delhi is mostly processed in Shastri Nagar, Turkman Gate, Seelampur, Mauzpur and Mustafabad. Eastern parts of Delhi like Mandwali are the epicentres of e-waste recycling. Mandawali is known for all its metal work recovery while areas like Bawana and Narela are huge centres for all kinds of recycling and pre-processing work. It is said that only dismantling is done in Delhi. But, as per the reports of the Toxics Link, all the waste created from the pre-processing work gets dumped into the river or *dhalaos* or drains, posing risks to health and environment. The Government's sealing drive and crackdown by the Environment

[94] Neha Lalchandani, 'No facility in city to store, dump hazardous waste', *The Times of India*, 10 April, 2010.

Department over the past few years resulted in major part of the recycling work shifting out to the satellite towns like Muzzafarnagar, Saharanpur, Meerut, etc. There are many factors that contribute to the thriving e-waste recycling business in Delhi - its status as the capital and hence its connectivity to all parts of the country; the many satellite towns around it where several hundreds of small units treat waste; and availability of cheap migrant labour.[95] The e-waste hub on the north-eastern fringe of Delhi, the Seelampur market is also called the largest electronics dismantling market in the country, where over 50 per cent of used computers end up for sale and recycling. Seelampur gets e-waste from across northern India and even as far as Bengaluru. The job of the dismantlers involves getting computers, breaking them into its basic parts and selling motherboards to traders in Moradabad.

Apart from e-waste imports and supply from the neighbouring regions, another source of domestic supply of e-waste is the *kabadiwalas* (waste pickers) who buy scrapped electronics from households. *Auction News*, a bi-weekly journal in Delhi also publishes advertisements on scrap that offices or the Government departments want to auction. When recyclers gather in the offices concerned, auctions are held. In some cases, scrap is sold by inviting tenders.[96]

Since waste processing is illegal in Delhi, the Government does not have an exact estimate of how much waste is produced in the city or how much is brought in for recycling. Even though officials claim that the units have moved out of Delhi, they cannot be sure of the numbers as the work largely takes place in the unorganized sector.

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[95] Neha Lalchandani, "A disaster waiting to happen in waste capital", *The Times of India*, 22 April, 2010.
[96] Ibid. n.85.

2.5.2 Mumbai

Since liberalization began in India, no other industry has performed so well against global competition than the software industry. The Information Technology industry in India originated in Mumbai. Among Indian cities, Mumbai ranks first among top ten cities generating WEEE in India. Mumbai, the financial nerve centre of India, is also India's largest port city. The Mumbai-Pune industrial belt is one of the electronic items manufacturing hubs of the country. As a result, Mumbai is not only the port of import for new and used electronics; it is also home to a large user and manufacturer base, both generating large volumes of e-waste.

The e-waste recycling market exists in a major way in Mumbai. The market of e-waste in Mumbai is not concentrated in a single place, but spread over different areas, each handling a different aspect of recycling. The city has a large network of scrap traders, with the main centres in Kurla, Saki Naka, Kamthipura- Grant Road, Jogeshwari and Malad[97]. In spite of the absence of proper technology, each component is disassembled and recycled or reused in Mumbai. The general practices of recycling of the most complex parts of PCs, for instance, circuit boards and PVC wires by open roasting and acid bath to recover different metals, has not been observed in Mumbai. Most of the WEEE generated in the Pune and Pimpri Chinchwad Region is transported to the Mumbai Metropolitan Region (MMR) for further treatment and distribution.

The items, which require extraction through wet processes are sold to traders from Delhi. Though it is claimed nothing is dumped in open fields, the report prepared by the IRG Systems South Asia under the aegis of the Maharashtra Pollution Control Board (MPCB) acknowledges that the hazards involved in product recycling can cause environmental damage.

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[97] Toxics Link, Mumbai: Choking on E-waste- A study on the status of e-waste in Mumbai, 23 February, 2007.

The urgent need to have a well coordinated mechanism on the collection, treatment and disposal of the e-waste in the MMR has been recognized. E-waste has been identified as a priority area by the MPCB and it has initiated certain initiatives to create awareness among various stakeholders on the e-waste. Started in 2009, the project to set up the first plant for scientific recycling of e-waste generated in the region is expected to be operational from 2010. In the first phase of the project, the capacity of the plant would be around 7,500 tonne per annum, which would later be increased. Once the plant is functional, the contractor would establish e-waste collection channel in the region. [98]

As per country level e-waste assessment study, Mumbai generates maximum wastes among all the cities in India. Total electrical and electronic waste generation in Maharashtra is 20270.6 tonnes, out of which Navi Mumbai contributes 646.48 tonnes, Greater Mumbai 11017.06 tonnes, Pune 2584.21 tonnes and Pimpri-Chinchwad 1032.37 tonnes.[99]

2.5.3 Bengaluru

In Bengaluru, the Silicon capital of India, e-waste recycling is a multi-crore market where e-waste is received in Gowripalya and Nayandahalli. The e-waste scrap dealers send the segregated and dismantled e-waste parts to Delhi and Mumbai every alternative day. The e-waste recyclers earn around Rs. 2-3 lakhs a month from selling the dismantled e-waste to Delhi. There are a few recycling centres in Karnataka like e- Wardd, e- Parisara, K.G. Nandini Recyclers, Ash Recyclers, New Port Computer Services India Pvt. Ltd. Recyclers and E-R3 Solutions Pvt. Ltd. in

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[98] 'Mumbai to Start First Re-cycling Plant', *EBR* (*Energy Business Review*), 6 July, 2009 <http://www.energy-business-review.com/>

[99] Report on 'Assessment of Electronic Wastes in Mumbai-Pune Area, prepared by IRG Systems South Asia Pvt. Ltd., New Delhi, Maharashtra Pollution Control Board, Mumbai, March 2007, <http://mpcb.mah.nic.in>

the formal sector. E-Parisara has been encouraged by the Central and State Pollution Control Board which would like it replicated in all major cities in the country. The Boards' initiative attempts to carefully recycle old computers, their components and other e-waste, generated by both IT companies and electronic manufacturers. The centre has equipment to recycle up to three tonnes of waste a day, but is dealing with around one tonne right now. According to the owner, many corporates such as IBM, Tate Elxsi, ABB and Phillips are among its clients. But many major IT firms are yet to send their e-waste or stipulate difficult conditions for not sending their e-waste.[100]

Formal recycling is yet to take up in a big way as business is more profitable in the unorganised sector. The unorganised sector has little incentive to convert into formal recycling centres as both the private and the public sector prefer auctioning their e-waste to informal dismantlers and get good price for it.[101]

According to industry surveys, 8,000 to 10,000 tonnes of e-waste is generated each year by IT firms and electronics manufacturers in and around Bengaluru. While the larger companies have warehouses for storing the waste, others sell them to small-time scrap dealers. The dealers, many concentrated around Mysore Road, often employ women and children to deal with the scrap and remove usable metal. What cannot be used at all is thrown into fields and channels or burned under unsafe conditions. Apart from affecting the

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100 K. Satyamurty, 'Managing e-waste without harming environment', *The Hindu*, 03 April, 2006.

101 Jayashree Nandi, 'Will a Draft Law Reboot e-Mess?' *The Times of India*, New Delhi, 21 May, 2010.

health of the employees of the scrap dealers, air, soil and ground water also get polluted.[102]

Annual e-waste generation in Bengaluru from computer and printer, television and mobile phone is 6743.87 MT. In 2010, the total e-waste projection for Bengaluru with a population of 1.71 crore was 1, 23,593 kgs. including 92, 240 computers, 15,371 televisions and 15,982 mobile phones. In 2013, with a projected population of 1.80 crore, the total e-waste volume is expected to reach 1,30,383 kilograms including 97,310 computers, 16,214 televisions and 16, 859 mobile phones.[103]

2.5.4 Hyderabad

For sometime, Hyderabad has been known as the emerging Silicon capital of India. The annual e-waste generation has been estimated for Hyderabad at 3,263,994 MT from computers, printers, television and mobile phones. The break up is as follows: 3111.25 MT from computers, 86.46 MT from printers, 61.0 MT from televisions and 5.284 MT from mobile phones. In 2010, the total e-waste projection for Hyderabad with a population of 74.42 lakh was 98,163 kgs. including 42,869 computers, 53,581 televisions and 1,713 mobile phones. In 2013, with a projected population of 81.8 lakh, the total e-waste volume is expected to reach 1,07,886 kgs. including 47,117 computers, 58,890 televisions and 1,881 mobile phones.[104]

Most of the e-waste collectors and recyclers only do size reduction (shredding) and segregation. Earth Sense Recycle Pvt. Ltd. and Ramky E-waste Recycling Facility are two formal recycling units in Andhra Pradesh. In mid- 2009, an

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[102] Ibid. n.100.

[103] Report on Inventorization of e-waste in two cities in Andhra Pradesh and Karnataka (Hyderabad and Bengaluru) sponsored by the World Health Organization (WHO), India Country Office, New Delhi; prepared by Environment Protection Training & Research Institute (EPTRI), Hyderabad.

[104] Ibid.

authorized recycler Earth Sense set up recycling facility in Hyderabad in collaboration with e-Parisara of Bengaluru. The facility does size reduction by dismantling, shredding and segregation. After segregation, Earth Sense sends its waste to e- Parisara and in turn it gets exported to Belgium along with its waste for precious metal recovery. Resource recovering facility is available only in Belgium. Although the formal recyclers exist, most of the e-waste finds its way into unauthorized recycling centers or to scrap dealers for quick money. In most of these units, workers are mainly women and children. The report prepared by the Environment Protection Training & Research Institute (EPTRI), Hyderabad under the aegis of the WHO, New Delhi revealed that on an enquiry, the workers stated that there was no health problem but a study needed to be taken up to find the actual pollution load generated and health problems among the workers.[105]

With the fast rate of technological changes and growing dependency on information technology and other modern electronic household items, the quantum of e-waste is set to rise in every electronic item. Since most of the e-waste finds its way to the unorganized sector with profit as the prime motivating factor, e-waste recycling undeniably requires better management and improved working environment guided by strict regulations.

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[105] Ibid.

3

MANAGEMENT OF E-WASTE

3.1 E-waste legislation — an introduction

The issue of electrical and electronic equipment disposal, import and recycling has become the subject of serious discussion and debate among the Government organizations, environmentalist groups and the private sector manufacturers of computers and consumer electronic equipments. The Department-related Parliamentary Standing Committee on Science & Technology, Environment & Forests in its 192nd Report on the 'Functioning of the Central Pollution Control Board (CPCB)', has concluded that e-waste is going to be a big problem in the future due to modern life style and increase in the living standards of people and augmentation of economic growth. The Committee has suggested a more proactive role for the CPCB by stating that it "should conduct studies to make future projections and devise steps to check the menace".[106]

With the progressive stride that the country has made in the information technology sector and the electronic industry, the issue of import of e-waste and its handling and disposal has assumed significance. The issue was brought to the notice of Parliament and Government when on 23 December 2005, a Private Member's Bill on 'The Electronic Waste (Handling and Disposal) Bill, 2005' was introduced in Rajya Sabha by Shri Vijay J. Darda, Hon'ble Member from Maharashtra. The Bill had recognized that while there was no proper law or

[106] Department–related Parliamentary Standing Committee on Science & Technology, Environment & Forests, One Hundred and Ninety-second Report on 'Functioning of Central Pollution Control Board', Rajya Sabha Secretariat, New Delhi, September 2008, Para 12.2.

guideline on the handling and disposal of electronic waste in the country, every home had a number of electronic products. And once these goods became obsolete or discarded, they were either thrown in the garbage or found their way to scrap dealers through the *Kabariwalas* who then dismantled the gadgets, kept what was useful and threw the rest in landfills. Criticizing the improper way of disposal as the electronic products contain many components which are hazardous to health and environment, the Bill called for a regulation of electronic waste disposal before the situation reached alarming proportions. The Bill sought to provide for proper handling and disposal of millions of tonnes of electronic waste being generated by discarded electronic devices by prescribing norms and fixing responsibilities and duties on manufacturers, recyclers and consumers with regard to the disposal of electronic waste and for all matters connected to it. The Bill, however, lapsed in July 2010 with the expiry of the tenure of the hon'ble member in the Rajya Sabha.

In India, the Constitution assigns solid waste management as a primary responsibility to the Municipalities under the Twelfth Schedule.[107] Article 243W empowers the State Legislatures to frame legislations in respect of waste management. The Municipal Solid Wastes (Management & Handling) Rules, 2000 were enacted by the Central Government which came into force from 25 September 2000. Some of the guidelines for handling municipal solid wastes provided in the Schedules are relevant for the management of e-waste and can be used as a model in the e-waste recycling and disposal scheme. The guidelines include organizing house to house collection of waste; proper collection of waste from slums and squatters, hotels, restaurants, office complexes and commercial areas; organizing awareness programmes for segregation of wastes; adopting suitable waste processing technologies; and restricting land filling for non-biodegradable inert waste.

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[107] The Constitution of India, 'Twelfth Schedule', Government of India, Ministry of law & Justice, 2005, p.248

The Rules were examined by the Committee on Subordinate Legislation of Rajya Sabha. In its 186th Report on the said Rules adopted and presented to the Parliament in December 2009, the Committee while expressing concern on the inadequate and ineffective State laws, acknowledged the financial and technological constraints faced by Municipalities in the implementation of the Rules. Moreover, the Committee observed that with increasing urbanization, finding landfill sites was going to get difficult for the ever increasing volumes of solid waste. The concerned Governments had to ensure that in the interest of public health, such landfill sites were located in 'distant isolated places'.[108] The Rules had to provide a safe buffer between landfill sites and human settlement. The Committee also envisaged solid waste management and reprocessing as an integral part of the present and future urban development and renewal schemes and programmes.

It may be mentioned that after the enactment of the Environment Protection Act, 1986, the Central Pollution Control Board (CPCB) was delegated the functions to implement rules on hazardous wastes, bio-medical wastes, municipal solid wastes and plastic wastes. Under the purview of the CPCB, the Division of Hazardous Waste Management has been overseeing the management of e-waste. According to the CPCB, there are 36,165 industries in the country generating about 6.2 million MT hazardous waste every year, of which landfillable waste is 2.7 million MT, incinerable waste 0.41 million MT and recyclable hazardous waste 3.08 million MT.[109] Besides, as per the Department of Commerce, Ministry of Commerce and Industry, Government of India, over 10,000 items, including hazardous items, are imported to India. These items are classified under various heads.

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108 Committee on Subordinate Legislation, Hundred and Eighty-sixth Report on 'The Municipal Solid Waste (Management and Handling) Rules, 2000', Rajya Sabha Secretariat, New Delhi, December 2009, p.21.

109 'E-waste', Lok Sabha Unstarred Question No. 5449, dated 28 April, 2010.

The category 'others' is given to those items that cannot be classified under any head. It is this category that traders often end up misusing to import hazardous waste.

3.2 Regulatory regime for e-waste

While the Municipal Solid Waste (Management and Handling) Rules regulate the disposal of municipal solid wastes in an environmentally acceptable manner and the Hazardous Waste (Management, Handling & Transboundary) Rules define and regulate all aspects of the hazardous waste, there are no specific environmental laws for the management and disposal of e-waste. None of the existing environmental laws has any direct reference to the electronic waste or its handling as hazardous in nature. However, there are several provisions in these laws which have been applied to various aspects of the electronic waste.

3.2.1 The Hazardous Waste (Management and Handling) Rules, 2003

In 1986, India enacted its first comprehensive environmental law, namely, the Environmental (Protection) Act, 1986 (EPA) after the Bhopal Gas tragedy and as a commitment under the Stockholm Conference[110] in 1972. Section 3 of the Environment (Protection) Act, 1986, gives all- encompassing powers of setting standards, laying down procedures and supervision on the Central Government. The Rules under the EPA bestows upon the Union Government comprehensive powers to "take all such measures as is necessary or expedient for the purposes of protecting and improving the quality of environment and preventing, controlling and abating environmental pollution."[111]

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[110] The United Nations Conference on the Human Environment, also known as the Stockholm Conference was the UN's first major conference on international environmental issues and marked a turning point in the development of international environment politics. <http://en/wikipedea.org>

[111] Ibid. n.102, p.20.

In furtherance to the implementation of the objectives of the EPA, the Hazardous Waste (Management and Handling) Rules were enacted in 1989. It was felt that it was essential to have a dividing line between waste and by-product streams. Thus, the Rules had to have a definition of 'waste' or a detailed enumeration to assist classification. It classified hazardous waste into eighteen categories based on constituents present in it and the quantum of generation. These Rules were amended in the year 2000 primarily to bring them in line with the Basel Convention. The amendment made in the Rules in the year 2000 classified the waste by process of waste generation (Schedule-1) and as per their characteristics (Schedule-2). Classification of waste by 'process of waste generation' covers the hazardous wastes generated in the different industrial processes used and process variants. Thus, 44 categories were identified comprising 148 waste streams in Schedule-1 and 79 types of wastes in Schedule-2. The amendment made in the Rules in the year 2003 streamlined the list of processes/ waste streams in Schedule-1, whereby the number of industrial processes generating hazardous waste was reduced from 44 to 36 and the number of waste streams from 148 to 123. The Schedule-2 was essentially left unaltered.[112]

Bringing further amendments to the Hazardous Wastes (Management and Handling) Rules, 1989, the draft amendment Rules, 2002 were notified as "The Hazardous Wastes (Management and Handling) Rules, 2003" on 20 May 2003. Since e-waste or its constituents fall under the category of 'hazardous' and "non-hazardous waste," they have been covered under its purview. As per the Rules, "hazardous waste" is defined as any waste which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or is

[112] Aditya Environmental Services Pvt. Ltd. (AESPL), Inventory of Hazardous Wastes in Maharashtra, sponsored by Maharashtra Pollution Control Board (MPCB), p. 40 <http://mpcb.gov.in/>

likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances.[113]

Under Rule 3, "Definitions", e-waste is defined as Waste Electrical and Electronic Equipment including all components, sub-assemblies and their fractions except batteries falling under these rules. Batteries are regulated by the Batteries (Management and Handling) Rules, 2001.

There are some important features in Schedule 1, 2 and 3 which cover e-waste. *Schedule* 1 defines hazardous waste generated through different industrial processes. Although there is no direct reference of the electronic waste, the "disposal process"[114] of e-waste could be characterized as hazardous processes. The indicative list of these processes is:—

- Secondary production and/or use of Zinc
- Secondary production of copper
- Secondary product of lead
- Production and/or use of cadmium and arsenic and their compounds
- Production of primary and secondary aluminum
- Production of iron and steel including other ferrous alloys (electric furnaces, steel rolling and finishing mills, coke oven and by product plan)
- Production or industrial use of materials made with organo silicon compounds
- Electronic industry

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113 'Hazardous Wastes (Management and Handling) Amendment Rules, 2003', the Gazette of India Extraordinary, Part II, Section -3 - Sub Section (ii), Published by Authority No. 471, New Delhi, Friday, May 23, 2003, Ministry of Environment and Forests Notification, New Delhi, the 20th May, 2003.

114 According to the Hazardous Wastes (Management and Handling) Rules, 2003, Clause 3 (8), "Disposal" means deposit, treatment, recycling and recovery of any hazardous wastes. <http://envfor.nic.in/legis/hsm/so593e.htm>

- Waste treatment processes, *e.g*. incineration, distillation, separation and concentration techniques.

Schedule 2 lists waste substances which could be considered hazardous unless their concentration is less than the limit indicated in the said Schedule. E-waste or its fractions come broadly under this Schedule.

Schedule 3 mentions the list of hazardous waste to be applicable only for imports and exports. It has divided hazardous waste into two parts, A and B. Part A of the Schedule deals with two lists of waste to be applicable only for imports and exports purpose. Export and import of items listed in List A and B of Part A are permitted only as raw materials for recycling or reuse.[115] Electrical and electronic scraps as a hazardous waste are covered under Sl.No. A 1180 in List A and Sl.No. B 1110 in List B. Sl.No. A 1180 is hazardous under the rules whereas Sl.No. B 1110 is not hazardous and is meant for direct reuse and not for recycling or final disposal.

Wastes under List A are not allowed to be imported into the country without the Directorate General of Foreign Trade (DGFT) licence[116]. However, e-waste is often imported in the name of reuse or recycling without any heed to the environmentally sound management of recycling.

3.2.2 The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008

In its endeavour to frame appropriate legislation for e-waste, the Central Government drafted the Hazardous Material (Management, Handling and Transboundary Movement) Rules, 2007 to prohibit transboundary movement of hazardous waste as envisioned by the Basel Convention,

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115 'Guidelines for Environmentally Sound Management of E-Waste, 2008', CPCB, Ministry of Environment and Forests, Government of India, 2008 <www.cpcb.nic.in>

116 The DGFT can grant licence for import of hazardous wastes [Rule 13 (5)] or refuse licence for hazardous wastes prohibited for import or export [Rule 12 (7)]

to which India is a signatory.[117] On 24 September 2008, these Rules were notified as the *Hazardous Wastes (Management, Handling and Transboundary Movement) Rules,* 2008 by the Ministry of Environment and Forests in supersession of the Hazardous Wastes (Management and Handling) Rules, 1989 except in respect of things done or omitted to be done before such supersession.[118] Supersession rules include directions for proper management and handling of hazardous wastes including electrical and electronic wastes. As per these Rules, every person desirous of recycling or reprocessing hazardous waste including electronics and electrical waste is required to register with the Central Pollution Control Board.[119] The units handling e-waste are required to register with the CPCB. The waste generated is required to be sent or sold to a registered or authorized re-cycler or re-processor or re-user having environmentally sound facilities for recovery of metals, plastics, etc.[120] The CPCB has to be satisfied that an applicant for recycling on reprocessing waste is utilizing environmentally sound technologies and possesses, adequate technical capabilities, requisite facilities and equipment to recycle, reprocess or reuse hazardous wastes, before granting registration to such applicants.

Under the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, the Ministry of Environment and Forests is the nodal Ministry to deal with the transboundary movement of the hazardous wastes and

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117 M.P. Ram Mohan, Iti Garg and Gayatri Kumar, 'Regulating e-waste: a review of the international and national legal framework on e-waste, ' in Rakesh Johri, *E-waste: Implications, Regulations and Management in India and Current Global Best Practices*, TERI, The Energy and Resources Institute, 2008, p.170-71.

118 <http://www.indiaenvironmentportal.org.in/files/HAZMAT_2265_eng.pdf>

119 'Rules for Disposal of Hazardous Household Waste', Lok Sabha Unstarred Question No. 1484, dated 15.07.2009.

120 'Generation of e-waste', Rajya Sabha Unstarred Question No. 24, dated 26.07.2010.

to grant permission for transit of the hazardous wastes through any part of India. It has placed import of hazardous waste items under three categories—substances that can be imported with prior approval, free imports under Open General Licence and substances which are prohibited for importing into the country. The first category includes metal and metal-bearing wastes of antimony, lead, galvanic sludge and waste lead acid batteries, whole or crushed. An importer is required to have a licence from the Directorate General of Foreign Trade. The list in the second category comprises materials such as iron, steel and zinc scrap; lead scrap except lead acid batteries; waste of copper and its alloys. The wastes listed in this category are traded under Open General Licence. The third category prohibits import of waste containing mercury, beryllium, arsenic, selenium, thallium, hexavalent chromium compounds, etc. as given in Schedule VI.

Further, the Ministry of Environment and Forests has constituted a Coordination Committee to oversee the implementation of the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008. The Committee consists of the representatives from the Ministry of Finance (Department of Revenue), Ministry of Commerce and Industry (DGFT), Ministry of Shipping, CPCB, selected State Pollution Control Boards and experts.[121]

3.2.3 Guidelines for Environmentally Sound Management of E-waste, 2008

Considering the growing concern on the issue of e-waste, the Government of India has supported several initiatives, particularly the assessment conducted by the CPCB on the management and handling of e-waste which led to the preparation and the publication of the Guidelines for Environmentally Sound Management of E-waste in March 2008.

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[121] 'Trade of Hazardous waste', Rajya Sabha Starred Question No. 119, dated 2.8.2010.

The Guidelines have been formulated with the objective of providing broad guidance for identification of various sources of e-waste and the approach and methodology for handling and disposal of e-waste in an environmentally sound manner. These Guidelines include details such as e-waste composition and recycle potential of items of economic value, identification of possible hazardous contents in e-waste, the recycle, re-use and recovery options, treatment and disposal options and the environmentally sound e-waste treatment technologies.[122]

The Guidelines also emphasize the concept of Extended Producer Responsibility (EPR), a concept on which the Western countries base their disposal practices.[123] The EPR is an environment protection strategy that makes the producer responsible for the entire life cycle of the product, especially for take back, recycle and final disposal of the product. Thus, the producers' responsibility is extended to the post-consumer stage of the product life cycle.[124] The Guidelines state that inclusion of the EPR in the legislative framework would make it a mandatory activity associated with the production of electronic and electrical equipments over a period of time.

Such a move would also oblige the producer to set up collection centers for e-waste either individually or jointly. The CPCB has insisted on putting the onus of enforcement on the State Pollution Control Boards (SPCBs). The State Department of Environment or the SPCB may prescribe more stringent norms as deemed necessary. Apart from publishing the Guidelines on various aspects of the hazardous waste management, the Ministry of Environment and Forests has also provided financial assistance for strengthening the SPCBs for facilitating implementation of the Rules. Financial assistance has also been provided for setting up Common Treatment,

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122 'Disposal of e-waste', Rajya Sabha Unstarred Question No. 1887, dated 07.12.2009.

123 'Disposal of Electronic Waste', Rajya Sabha Starred Question No. 322, dated 19.04.2010.

124 Ibid. n. 109.

Storage and Disposal Facilities for hazardous wastes management. In addition, the Ministry and the CPCB from time to time sponsor training programmes for creation of awareness about the provisions laid down in the Rules.[125]

3.2.4 The draft E-waste (Management and Handling) Rules, 2010

Considering it necessary in the public interest to enable the recovery and/or reuse of useful material from e-waste, thereby reducing the hazardous wastes destined for disposal, and to ensure the environmentally sound management of all types of waste electrical and electronic equipment, the Government introduced the draft E-waste (Management and Handling) Rules, 2010.[126] After inviting objections/ suggestions from the stakeholders, the Ministry of Environment & Forests has finalized the draft modified e-waste (Management and Handling), Rules 2010 in September 2010 and put it on their website. These Rules have not been notified and are likely to come into force *w.e.f.* 1 January 2012 and implemented through the State Governments/State Pollution Control Boards. Meanwhile the Department related Parliamentary Standing Committee on Industry functioning under the jurisdiction of the Chairman, Rajya Sabha, has exclusively taken up the subject of electronic wastes and Medium, Small and Micro Enterprises (MSMEs). It has heard the Secretary, MSME on the draft rules in its Meeting held on 20 December, 2010. It was felt by the Committee that the views of the MSME on the aforementioned rules are important as large numbers of medium enterprises are involved in the management and recycling of e-waste. The report the Committee is awaited.

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125 PIB Press Release,'Hazardous Waste Management Rules', Ministry of Environment and Forests, 22 October, 2008. <http://pib.nic.in/release.asp?relid=44081>

126 Draft 'e-waste (Management and Handling) Rules, 2010', Notification dated 14 May, 2010, Government of India, Ministry of Environment and Forests. < http://moef.nic.in>

3.2.4.1 Responsibilities

According to the modified draft notification put up in the MoEF website in September 2010, the rules shall apply to every producer, dealer, collection centre, refurbisher, dismantler, recycler, auctioneer, consumer or bulk consumer involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components.[127] The responsibilities of the various stakeholders have also been laid down in the Rules. What makes these Rules unique is the application of the singular concept of the Extended Producer's Responsibility.

According to the draft Rules, the producers of electrical and electronic equipments including large and small household appliances, computers, toys, leisure and sports equipments, and medical devices shall be liable for collecting any e-waste generated during manufacture and will have to channelize the same for recycling or disposal. They will set up collection centres for e-waste generated from the 'end of life' products in line with the principle of the 'Extended Producer Responsibility' and ensure that such e-waste is channelized to a registered refurbisher or dismantler or recycler. They have to ensure that all electrical and electronic equipments are provided with a unique serial number or individual identification code for product tracking in the e-waste management system. They shall also finance and organize a system to meet the costs involved in the environmentally sound management of e-waste generated from the 'end-of-life' of its own products and 'historical waste'[128] available on the date from which the rules come into force. The producers will also have to provide contact details of dealers and authorized collection centres to consumers so as to facilitate return of e-waste.[129]

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127 Ibid.

128 According to the draft'E-waste (Management and Handling) Rules, 2010', 'historical waste' means all available e-waste in the market on the date from which these Rules come into force.

129 Ibid. n.120.

Dealers have to make provision for collecting e-waste by providing the consumer a box, bin or a demarcated area to deposit e-waste and ensure the same is transported back safely to the producer or the authorized collection centre. The dealers, refurbishers, dismantlers and recyclers have to get registered with the SPCB or CPCB, whichever may apply, and ensure that the storage, transport, dismantling and refurbishing of e-waste does not cause any adverse effect on health or environment. All the stakeholders have to register with the concerned SPCB or Pollution Control Committee (PCC), maintain records of the e-waste handled and also file annual returns in Form 3 to the concerned SPCB or PCC.

The draft Rules have also clearly stated the responsibilities of the consumers and bulk consumers. They have to ensure that e-waste is deposited with the dealers or authorized collection centres.[130] They may also avail the pick-up or take back services provided by the producers. As per these Rules, any person operating a collection centre, individually or collectively, is required to obtain authorization from the SPCB or PCC concerned. To ensure e-waste management in an environmentally sound manner, they have to make certain that the storage system is secure and that the transportation to the producer, refurbisher or to the registered recycler is safe.[131]

The proposed Rules, for the first time in India, bring in the concept of Extended Producer Responsibility, making manufacturers liable for safe disposal of electronic goods.[132] It requires manufacturers to take back the products after their life is exhausted. It also aims to promote environment friendly designs in the making of electronic products that limit the use of hazardous chemicals like lead and mercury. Manufacturers will

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130 'Centre drafts rules for e-waste recycling', <http://www.thehindubusinessline.com>, 29 April, 2010.

131 'Rules for e-waste management', Rajya Sabha Unstarred Question No. 741, dated 02.08.2010.

132 Press Release: 'The e-waste industry in India: CSE exposes what lies beneath', 18 May, 2010, < http://www.cseindia.org/>

not only be made responsible for setting up collection centres to oversee the process, but have to also ensure that the hazardous products are handled by registered dismantlers or recyclers only in order to control any possible damage to the environment and human health. The draft policy would imply that bulk clients like banks, MNCs and other big companies would have to deposit their e-waste at authorized collection centres instead of selling them to local wholesale scrap shops. They would also have to file annual returns on the quantity of the e-waste disposed.

Notable among other rules is the inclusion of the Chapter on 'Reduction in the use of Hazardous Substances (RoHS)' in the manufacture of Electrical and Electronic Equipment. Under rule 15, every producer of electrical and electronic equipment will have to ensure that, new electrical and electronic equipment does not contain Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated Biphenyls (PBB) or Polybrominated Diphenyl Ethers (PBDE). Such reduction in use of hazardous substances would be achieved within a period of three years from the date of commencement of the new e-waste rules. The rule also provides for detailed information on the constituents of the equipment in the product information booklet. Further, imports or placement in the market for electrical and electronic equipment would only be permitted for those which are RoHS compliant.

However, the MoEF has stated that based on comments received and consultations held with stakeholders on the draft notification of e-waste (Management and Handling) rules, 2010, the final draft e-waste rules shall not apply to dealers and refurbishers. Further, producers have been made responsible for making arrangement of collection of e-waste generated from their end of life products[133].

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[133] Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4/2011-HSMD, dated 19 April, 2011.

3.2.4.2 Criticism of the new draft Rules

However, the new draft Rules on e-waste management framed by the Government has been criticized on several grounds by various environmental groups. First and foremost, it ignores the unorganized and small and medium sectors where 90 per cent of the e-waste is generated. The law currently does not provide for any plan to rehabilitate those involved in informal recycling. The Electronics Industry Association of India (ELCINA) with the support of the Department of Scientific and Industrial Research (DSIR), Ministry of Science & Technology, studied the status and potential of e-waste management in India in February 2009. Their findings held that a symbiotic relationship between the formal and the informal sector was crucial. It said: "The informal sector's role in collection, segregation and dismantling of e-waste needs to be nurtured to complement the formal recyclers as supply chain partners. They should take on the higher technology recycling processes."[134] The collection and segregation and dismantling of e-waste is not hazardous and the processes are efficiently carried out by the informal sector because most of the e-waste can be refurbished and sold as second hand. The extraction of precious metals is the hazardous process, which should be left for the organized sector[135].

Secondly, the Rules also do not detail the business model for collection of e-waste from consumers. The legislations enacted by the Government cover generation, storage, transportation and disposal of hazardous waste but do not propose a streamlined collection mechanism. On the other hand, most countries which have drafted regulations on e-waste have sought the participation and involvement of producers as they are best

134 'IT's underbelly: Tricks of the e-waste trade,' *Down to Earth*, vol.19, no.1, May16-31, 2010; DSIR Annual report 2009-2010; 'New study identifies India's e-waste potential', *Recycling International,* 17 March, 2009.

135 Comments and Suggestions made by Ms. Sunita Narain, Director, Centre for Science and Environment, New Delhi by email, dated February 17, 2001 on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat.

equipped to address the solutions to the complex composition of such products.[136]

The draft e-waste rules, 2011 provide for setting up of collection centres, individually or jointly or a registered society or a designated agency or a company or an association to collect e-waste. This provision can be used by informal sector. As per the responsibility of the producer, they need to set up collection centres and organize a system to meet the cost involved for collection of their end-of-life products in an environmentally sound manner. The producers may adopt different business models for implementation of Extended Producers Responsibility (EPR)[137].

Thirdly, the draft Rules also do not recognize the magnitude of transboundary movement of e-waste under different categories, for example, under the pretext of metal scraps and secondhand electrical appliances.

Fourthly, as per the Ministry of MSME, the MSME sector is mainly affected as producer under the new draft rules, imposing many responsibilities on the producers (MSMEs) in regard to collection, disposal and recycling of e-waste. It has commented that as per the Fourth All India Census of MSMEs (2006-07), there are about 1,11,754 units engaged in IT, Telecom equipment, household appliances, consumer and lighting equipment, monitoring and control equipment in the country, out of which only 27, 415 are registered units and 84, 339 are unregistered units. The average gross output of the registered MSME units ranges from Rs. 80.00 lakh to Rs. 1.00 crore per annum/unit. It is stated that an environmentally sound recycling unit may involve heavy investment because of the technology involved and will be economically viable only when there is adequate turnover of

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136 P. Srisudha, 'Tackling e-waste', *The Hindu,* 28 June, 2009.

137 Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4-2011-HSMD, dated 19 April, 2011.

e-waste processing. Therefore, considering the low scale of operation and locational aspects (of producers and users), it may not be economically viable and physically feasible for each and every producer (MSME) to establish an e-waste recycling unit either individually or collectively, nor will it be feasible for them to set up collection centres individually or collectively.

The Ministry of MSME is of the view that the responsibility of the producers (MSMEs) should be restricted to:

(a) Recycling of e-waste generated during manufacturing of electronic goods, through authorized recyclers, and

(b) Providing information to the consumers regarding authorized e-waste recyclers (at the time of sale of such products in the form of booklets/brochures)[138].

Fifthly, in the new draft rules, landfill remains a form of disposal. The rules define 'Disposal' as any operation that includes physio-chemical or biological treatment, incineration and deposition in secured landfill. The rules state that every dismantler shall ensure that non-recyclable/non- recoverable components are sent to authorized treatment storage and disposal facilities. It will also be the responsibility of every recycler or reprocessor to ensure that the facility and recycling processes are in accordance with the standards laid down in the guidelines published by the CPCB from time to time, and to ensure that residue generated thereof is disposed of in a hazardous waste treatment storage disposal facility. In this regard, the CPCB's Guidelines for Environmentally Sound management of E-waste, 2008 in its 'guidelines for establishment of integrated e-waste recycling & treatment facility' state that plastic, which cannot be recycled and is hazardous in nature, is recommended to

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138 Comments and Suggestions made by the Ministry of Micro, Small and Medium Enterprises, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. MSME File No. RS/e-waste/2010/E & TR, dated 24.02.2011 including Comments and Suggestions made by the MSME on subject 'Management of e-waste' forwarded to Committee on Industry, Rajya Sabha Secretariat *vide* letter No. RS/PSC Meeting/e-waste/2010/E&TR, dated 06.01.2011.

be landfilled in nearby Treatment, Storage and Disposal Facility (TSDF).

The MoEF has commented that flame retardants in plastics can be disposed of through incineration or through co-processing in a cement plant. However, disposal of such plastics in landfill should not be encouraged[139]. Besides, in case lead recovery is low, they can be temporarily stored at e-waste dismantling facility and later disposed in TSDF.[140]

3.2.4.3 Changes effected in the draft E-Waste rules by the Ministry of Environment and Forests

As mentioned earlier, the Department-related Parliamentary Standing Committee on Industry took up the issue of rules concerning E-Waste for discussion in its meeting on 20 December 2010 and it later advised the Ministry of Environment and Forests not to notify the rules till the Committee conveyed the concerns of Micro, Small and Medium Enterprises to the Ministry of Environment and Forests. Following the intervention of the Committee, the Minister of Environment and Forests discussed the E-Waste rules with the Secretary, MSME and a decision was taken that micro and small enterprises, as defined in the MSMED Act 2006, would be exempted from E-Waste rules. However, it was agreed that the exemption would be subject to a study to examine quantum of E-Waste generated and management of E-Waste from micro and small enterprises. The exemption would continue until the study in this regard comes to completion. It is understood that the Ministry of Medium,

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139 Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4-2011-HSMD, dated 19 April, 2011.

140 'Guidelines for Environmentally Sound Management of E-Waste, 2008', CPCB, Ministry of Environment and Forests, Government of India, 2008, < http://www.cpcb.nic.in/latest/27.06.08%20guidelines%20for%20E-Waste.pdf >; See also, Sanjay Jog, 'Ten states contribute 70% of e-waste generated in India', The Financial Express, 13 March, 2008; and <mpcb.gov.in/images/pdf/MPCB_Consent.pdf >

Small and Micro Enterprises would commission such a study and the time taken for this purpose would be six months[141].

3.2.5 Government assistance for Treatment, Storage and Disposal Facilities (TSDFs)—

The Government has taken a number of initiatives to address issues related to disposal of wastes. It encourages setting up of integrated Treatment, Storage and Disposal Facility (TSDFs) for hazardous waste management on Public Private Partnership (PPP) mode in clusters of hazardous waste generating industries. So far 28 TSDFs have been set up. The Ministry of Urban Development is implementing the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) for providing assistance to the State Governments/ Urban Local Bodies for various projects including solid waste management.[142]

On the basis of proposals received from the States, the Centre has provided financial assistance to the State Pollution Control Boards for setting up of integrated TSDFs. The financial assistance disbursed from 2007 to 2010, State-wise and year-wise is as follows:[143]

Year	State	Amount (in lakhs)
2007-2008	Tamil Nadu	Rs. 80.00
2007-2008	Andhra Pradesh	Rs. 80.00
2007-2008	Maharashtra	Rs. 96.64
2008-2009	Maharashtra	Rs. 160.00
2009-2010	Maharashtra	Rs. 2.40 crore

141 Status note on E-Waste (Management and Handling) Rules, 2011, Ministry of Micro, Small and Medium Enterprises, Government of India.

142 'Disposal of waste', Lok Sabha Unstarred Question No. 650, dated 28.07.2010.

143 'Assistance to States for Disposal of Wastes', Lok Sabha Unstarred Question No. 6519, dated 05.05.2010.

Year	State	Amount (in lakhs)
2009-2010	Uttar Pradesh	Rs. 80.00
2009-2010	Kerala	Rs. 80.00

To offset any possibility of the amount allocated for setting up of the TSDFs getting diverted for other activities or projects, a Memorandum of Understanding (MoU) is signed between the Ministry of Environment and Forests, State Pollution Control Board and the entrepreneur before release of financial assistance for setting up of TSDF. One of the conditions of the MoU is to constitute a committee to monitor progress of the facility. Further release of financial assistance is made only on submission of audited Utilization Certificate and physical progress report by the respective State Pollution Control Board.[144]

3.3 The international experience

3.3.1 The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is the most comprehensive global environmental agreement on hazardous and other wastes. It was signed by 173 countries on 22 March 1989 and entered into force on 5 May 1992. It was basically created to prevent the economically motivated dumping of hazardous wastes from richer to poorer countries, which had resulted from a tightening of environmental regulations and a steep rise in the cost of hazardous waste disposal in industrialized countries. In the first decade (1989-1999), the Convention was primarily devoted to three agenda:[145]

[144] 'Hazardous Waste Management', Rajya Sabha Unstarred Question No. 4033, dated 03.05.2010.

[145] 'Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal', <http://www.basel.int/convention/basics.html>

- setting up a framework for controlling the 'transboundary' movement of hazardous wastes, that is, the movement of hazardous wastes across international frontiers;

- developing the criteria for 'environmentally sound management' (ESM); and

- putting into place a 'control system' based on prior written notification.

The 1999 Ministerial Declaration adopted at the Fifth Conference of the Parties (COP-5) set out the agenda for the current decade (2000-2010), laying special emphasis on two areas:

- building on the transboundary framework by emphasizing full implementation and enforcement of treaty commitments;

- minimization of hazardous waste generation.

It was on the 10th Anniversary of the Basel Convention on Hazardous Wastes in December 1999 that the Government Ministers assembled in Basel, Switzerland adopted a declaration on the environmentally sound management of hazardous wastes. The declaration which emphasized the urgent need to reduce the generation of hazardous wastes-both in terms of quantity and hazardousness- represented a major shift toward cleaner production and capacity building and strengthening especially in the developing countries. In view of that, the declaration sought to guide the activities of the Convention in specific areas, as follows:[146]

- active promotion and use of cleaner technologies and production methods;

- further reduction of the movement of hazardous and other wastes;

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146 UNEP News Release, 'Ministers Call for Cleaner Production Methods as they Set Priorities for Next Decade of Basel Convention on Hazardous Wastes', 14 December, 1999, <http://www.unep.org/>

- the prevention and monitoring of illegal traffic;
- improvement of institutional and technical capabilities— through technology when appropriate — especially for developing countries and countries with economies in transition;
- further development of regional and subregional centres for training and technology transfer; and
- enhancement of information exchange, education and awareness-raising in all sectors of society.

3.3.1.1 Compliance and Implementation

The Basel Convention contains specific provisions for the monitoring of its implementation and compliance. A number of articles in the Convention oblige the Parties to take appropriate measures to implement and enforce its provisions, including measures to prevent and punish conduct that breach the Convention.

3.3.1.2 Scheme to Control the Movement of Hazardous Waste

One of the guiding principles of the Basel Convention is that, in order to minimize the potential threat to human health and environment, hazardous wastes should be dealt with as nearly as possible where they are produced. Therefore, under the Convention, transboundary movements of hazardous wastes or other wastes can take place only upon prior written notification by the State of export to the competent authorities of the State of import and transit. Each shipment of hazardous waste or other waste must be accompanied by a movement document from the point at which a transboundary movement begins to the point of disposal. Hazardous waste shipments made without such documents are, therefore, illegal.[147]

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[147] 'Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal', <http://www.basel.int/convention/basics.html>

3.3.1.3 Technical Assistance Offered by the Convention

In order to assist countries as well as interested organizations and private companies, etc. to manage or dispose of their wastes in an environmentally sound way, the Secretariat of the Basel Convention cooperates with national authorities in developing national legislation, setting up inventories of hazardous wastes, strengthening national institutions, assessing the hazardous waste management situation, and preparing hazardous waste management plans and policy tools. It also provides legal and technical advice to countries in order to solve specific problems related to the control and management of hazardous wastes.

3.3.1.4 Training in the Management and Minimization of Hazardous Wastes

An integral part of implementing the Basel Convention is building the capability to manage and dispose of hazardous waste. To this end, the Basel Convention has established Regional Centres for Training and Technology Transfer in several countries which include China, India and Indonesia in Asia. The Centres provide guidance on technical and technological issues as well as advice on enforcement aspects of the Convention. They also encourage the introduction of cleaner production technologies and the use of environmentally sound waste management practices.[148]

3.3.1.5 Other important highlights of the Basel Convention

After coming into force, there have been several important milestones in the history of the Basel Convention which briefly include—

- The 1995 Ban Amendment which called for prohibiting exports of hazardous wastes for any purpose from countries listed in a proposed new Annex VII to the Convention *i.e.* Parties that are members of the EU

[148] Ibid.

(European Union), OECD (Organisation for Economic Co-operation and Development), and Liechtenstein to all other Parties to the Convention. The Ban Amendment has not yet entered into force as it has to be ratified by three fourths of the Parties who accepted it. As of now, it is considered to be morally binding. The United States is the only OECD country which has neither ratified the original Basel Convention nor the Basel Ban Amendment.

- Classification and Characterizations of Wastes by the Technical Working Group of the Basel Convention in 1998 into specific lists of hazardous or non-hazardous wastes, which were later adopted by the Parties to the Convention, thereby clarifying the scope of the Convention.
- The Protocol on Liability and Compensation, adopted in December 1999, which established rules on liability and compensation for damages caused by accidental spills of hazardous waste during export or import or disposal.
- The Compliance Mechanism, adopted at the Sixth Conference of Parties (COP6) in December 2002, which promoted the identification, as early as possible, of implementation and compliance difficulties encountered by Parties such as dealing with illegal traffic, or meeting reporting obligations.
- The Ministerial Statement on 'Partnerships for Meeting the Global Waste Challenge' adopted at the Seventh Conference of Parties (COP7) in 2004 which called for the reduction of the impacts of hazardous wastes on human health and the environment; and promoted a fundamental shift in emphasis from remedial measures to preventive measures such as reduction at source, reuse, recycling and recovery.
- The Eighth Conference of the Parties (COP8) on Basel Convention in Nairobi in November 2006, which convened a high-level "World Forum on E-wastes".

- A new 10 year vision unveiled at the Seventh Session of the Open-ended Working Group (OEWG 7) of the Basel Convention on 14 May 2010 which laid greater emphasis on highlighting the links between waste management, the achievement of the Millennium Development Goals and human health and livelihoods. Developing global recycling guidelines for used computers and support for furthering the objectives of the Ban Amendment to the Convention which prohibits the export of hazardous waste from developed countries to developing countries was one of the key outcomes of the Convention.[149]

Achim Steiner, Executive Director of the UNEP, under whose auspices the Basel Convention was adopted, has been quoted earlier saying that "Like the climate change treaties, the Basel Convention promotees clean technologies and processes that minimize unwanted by-products. It provides the tools and incentives we need to both empower and motivate the producers and consumers of goods that generate hazardous wastes to pursue innovative solutions. In this way, the Convention also advances sustainable development and the UN's Millennium Development Goals."[150]

An overview of the Basel Convention indicates that any country exporting hazardous wastes must obtain the prior permission of the importing country. Besides, a permit detailing the contents and destination of the wastes must accompany the cargo throughout its voyage. In other words, the Convention mandates the exporting country to notify the importing countries of the incoming hazardous waste. In the case of an illegal trade, the responsible exporter is obliged to take back the wastes and pay the costs of damage and

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149 UNEP Press Release, 'Old ships and Obsolete Computers Part of Major Transition for Global Waste Management', Geneva, 14 May, 2010, <http://www.unep.org>

150 UNEP Press Release, 'Basel Conference addresses Electronic Wastes Challenge', 27 November, 2006 <http://www.unep.org/>

clean up. Initially, the Basel Convention had not highlighted the issue of e-waste although there were rules for recycling and export of hazardous wastes from developed countries to the developing countries. However, the World Forum on E-wastes held at Nairobi had finally brought the issue into primary focus. It was stated in the Conference that some 20 to 50 million metric tonnes of e-waste were generated worldwide every year, comprising more than 5 per cent of all municipal solid waste. When the millions of computers purchased around the world every year become obsolete, they leave behind a huge quantity of lead, cadmium, mercury and other hazardous wastes. The Forum, therefore, underlined the fact that the global consumer goods revolution, in addition to its many benefits, was generating massive quantities of end-of-life computers and other obsolete electronic equipment detrimental to public health and environment.

In fact, to reiterate some figures, in the US alone, some 14 to 20 million PCs are thrown out every year. In the EU, the volume of e-waste is expected to increase by 3 to 5 per cent a year. Developing countries are expected to triple their output of e-waste by 2010. Similarly, the use and disposal of mobile phones—which like PCs barely existed 20 years ago is increasing considerably. In fact, the use of mobile phones has grown exponentially. By 1970s there were handful of users. It went up to 1.76 billion by 2004 and by 2008 the numbers stood at 3 billion. However, it is noteworthy that in 2002, during the Sixth Conference of the Basel Convention**,** leading cell phone manufacturers collaborated and launched the Mobile Phone Partnership Initiative (MPPI) to develop and promote the environmentally sound management of end-of- life mobile phones.[151]

Keeping in view the new waste streams that are

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[151] 'Information Note: Mobile Phone Partnership Initiative', Basel Convention, UNEP, <http://www.basel.int/pub/leaflets/leafMPPI.pdf>

consecutively created with new technological developments, the Parties to the Basel Convention, have further endorsed the expansion of the technical guidelines on the environmentally sound management of mercury wastes. Mercury can be released from a number of products that contain mercury, including electrical applications (*e.g.,* switches and fluorescent lamps), laboratory and medical instruments (*e.g.,*clinical thermometers and barometers), batteries, etc , the exposure to which has been found to leave a detrimental impact on health. With the renewed interest in the environmentally sound management of transboundary movement of waste, the UNEP organised the first negotiating session of the Inter-Governmental Negotiating Committee (INC 1) on a Globally Legally Binding Instrument on Mercury in Stockholm, Sweden, from 7-11 June, 2010.[152]

3.3.2 The Bamako Convention

The Bamako Convention or the Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes was adopted by the twelve nations of the Organization of African Unity at Bamako, Mali in January, 1991, and came into force in March, 1999.[153]

The Convention aims to protect human health and environment from dangers posed by hazardous wastes by reducing their generation to a minimum in terms of quantity and/or hazardous potential. All Parties are obliged to prohibit the import of all hazardous wastes, for any reason, into Africa from non-Contracting Parties (article 4.1). The categories

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[152] 'First Session of the Inter-Governmental Negotiating Committee to prepare a global legally binding instrument on Mercury', 7-11 June, 2010, IISD Reporting Services, Earth Negotiations Bulletin, Vol. 28, No.1, 7 June, 2010, < http://www.iisd.ca/vol28/enb2801e.html>

[153] 'Bamako Convention', International Maritime Organisation, 09 December, 2005, < http://www.imo.org>

of wastes listed in Annex I to the Bamako Convention, a waste possessing any of the characteristics listed in Annex II to the Bamako Convention, as well as any waste considered to be hazardous by the domestic laws of either the state of import, export, or transit are considered hazardous wastes for the purposes of the Bamako Convention. It is clear from the provisions of the Bamako Convention that the dumping of radioactive wastes, industrial wastes, sewage and sewage sludge is prohibited. The Bamako Convention places the duty on the Parties to monitor their respective waterways to ensure that no dumping occurs. Each State Party has to report annually to the Secretariat. [154]

The need to sign the Bamako Convention arose from the failure of the Basel Convention to prohibit trade of hazardous waste to the less developed countries, and from the realization that many developed nations were exporting toxic wastes to Africa. This impression was strengthened by several prominent cases. One important case, which occurred in 1987, concerned the import of 18,000 barrels of hazardous waste into Nigeria from the Italian companies Ecomar and Jelly Wax, which agreed to pay local farmer Sunday Nana $100 per month for storage. The barrels, found in storage in the port of Lagos, contained toxic waste including polychlorinated biphenyls. Their eventual shipment back to Italy led to protests closing three Italian ports.[155]

What differentiates the Bamako Convention from the Basel Convention is that the former uses a format and language similar to that of the Basel Convention, but which is much stronger in prohibiting all imports of hazardous waste. Additionally, it does not make exceptions on certain hazardous wastes like those for radioactive materials made by the Basel Convention.[156]

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154 Ibid.

155 Bamako Convention, Wikipedia, <http://en.wikipedia.org/wiki/Bamako_Convention>

156 Ibid.

3.3.3 The Rotterdam Convention

Like the Bamako Convention, the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Chemicals and Pesticides in International Trade regulates trade in hazardous wastes but contains no commitment to reduce their use and release. Adopted in September, 1998, the Rotterdam Convention came into force in February, 2004. As of July, 2007, it had 73 signatories and 117 Parties. As on date there are 140 parties. India had acceded to the convention on 24 May 2005. It is a multilateral treaty to promote shared responsibilities between exporting and importing countries in protecting human health and environment from the harmful effects of hazardous chemicals. The Convention promotes exchange of information among Parties over a broad range of potentially hazardous chemicals that may be exported or imported. A key goal is to provide technical assistance for developing countries and countries with economies in transition to develop the infrastructure and capacity necessary to implement the provisions of the Convention.[157]

The Rotterdam Convention calls on exporters of hazardous chemicals to use proper labeling, include directions on safe handling, and inform purchasers about known restrictions or bans. Parties can decide whether to allow or ban the import of chemicals listed in the treaty, and countries exporting chemicals are obliged to make sure that producers within their jurisdiction comply with the directions and rules.[158] The Parties have nine months to prepare a response concerning the future import of the chemical. The response can consist of either a final decision— to allow import of the chemical, not to allow import, or to allow

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[157] 'Introduction to the Rotterdam PIC Convention', IISD Reporting Services, <http://www.iisd.ca/process/chemical_management-picintro.html> <http://www.pic.int/home.php?type=t&id=63>

[158] 'Rotterdam Convention', Wikipedia, <http.//en.wikipedia.org./wiki/Rotterdam_Convention>

import subject to specified conditions- or an interim response. Decisions by an importing country must be trade neutral, that is, apply equally to domestic production for domestic use as well as to imports from any source. The Convention requires each Party to notify the Secretariat, provided jointly by the FAO and UNEP, when taking a domestic regulatory action to ban or severely restrict a chemical.[159]

Apart from the principle of Prior Informed Consent, the Rotterdam Convention highlights another principle of the Basel Convention which deals with transparency and Environmentally Sound Management (ESM) of hazardous substances. Among the 40 chemical substances covered under the Convention, mercury compounds, polybrominated biphenyls (PBB), polychlorinated biphenyls (PCB) are also substances that are found in e-waste.

3.3.4 Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union

Among all the existing laws on wastes, a way forward has been heralded by the European Union. The European law which implements the Basel Convention in its Directives prohibits all exports of hazardous wastes from the EU members to the developing countries.[160]

The Waste Electrical and Electronic Equipment (WEEE) Directive is the European Community directive (2002/96/EC) on waste electrical and electronic equipment which, together with the Restriction of Hazardous Substances (RoHS) Directive (2002/95/EC), became European Law in February, 2003 setting collection, recycling and recovery targets for all types of electrical and electronic goods. The WEEE Directive obliged the twenty-five EU member states to transpose its provisions into national law by 13 August, 2004.

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159 'The Rotterdam Convention', Simultaneous Extra-ordinary Meetings of the Conferences of the Parties to the Basel, Rotterdam and Stockholm Conventions, Bali-Indonesia, 22-24 February, 2010, < http://excops.unep.ch>

160 'UNEP Responds to Abidjan Hazardous Wastes Crisis', <http://www.unep.org/>, Geneva, 8 September, 2006.

By August, 2005, all member states except Malta and the UK had transposed at least framework regulations.[161]

In May, 2001, the EU Parliament approved a directive that required producers of electronic gazettes to take responsibility—financial and otherwise—for the recovery and recycling of e-waste. Recognizing the scope and urgency of e-waste problem, the European Union has taken the lead in addressing it by proposing an ambitious system of the Extended Producer Responsibility (EPR). The EPR has been defined as "an environmental protection strategy to reach an environmental objective of a decreased total impact from a product, by making the manufacturer of the product responsible for the entire life cycle of the product and especially for the take back, recycling and final disposal of the product".[162]

3.3.4.1 Obligations of the Producer under the WEEE

The WEEE Directive imposes most of the obligations on the producer of the electrical and electronic equipments (EEE). Article 4 of the WEEE Directive requires the producer to design the products in such a way that will facilitate dismantling and recovery. In addition, the producer is required not to prevent, through specific design features or manufacturing processes, the e-waste from being reused unless it is compromising the environment and/or safety requirements. Under Article 5 (3), the producer is obliged to collect waste electrical and electronic equipment at its end of life. The treatment of the EEE, when handed over to a facility for de-pollution, dis-assembly, shredding, recovery, or preparation for disposal, has to be the 'best available treatment' which includes the removal of all fluids and, in accordance with Annexe II to the WEEE Directive, the

161 Wikipedia, 'Waste Electrical and Electronic Equipment Directive', <http://en.wikipedia.org/>

162 UNEP, *E-waste: Volume I: Inventory Assessment Manual,* Division of Technology, Industry and Economics, International Environmental Technology Centre, Osaka/Shiga, 2007, p. 43.

removal of certain substances, consumables and components from any separately collected WEEE. Article 7(1) obliges the producers to set up a recovery system either individually or by joining a collective system. The responsibility for collection, recovery and the financing thereof are governed by two parameters. If a product or so-called 'historical waste' was put on the market on or before 13 August, 2005, then the product is a business-to-consumer (B2C) product and the responsibility has to be borne by the producer according to his market share, while the user has to take care of a business-to-business (B2B) product. If the product was put on the market after the date, then the producer is responsible for his individual (waste) product. Finally, Article 12(1) requires the member states to draw up a register of producers. The producers of the EEE have to register in the country where they are based and have to report in the registers the sales volume and the volume of collected and recovered products.[163]

3.3.4.2 Restriction of Hazardous Substances (RoHS) Directive

As a legislative initiative to solve the problem of huge amounts of toxic e-waste, a Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment, namely 2002/95/EC, commonly referred to as the Restriction of Hazardous Substances Directive or RoHS was adopted in February 2003 by the European Union. The RoHS Directive came into force with effect from 1 July 2006, and is required to be enforced and become law in each member state. The Directive restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment.[164]

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163 Tzvi Levinson, Christina Folman, and Julia Lietzmann, 'E-waste legislation in the European Union and the Basel Convention' in Rakesh Johri, *E-waste: Implications, regulations and management in India and current global best practices, TERI, New Delhi,* 2008*, pp.* 153-58.

164 Wikipedia, 'Restriction of Hazardous Substances Directive', <http://en.wikipedia.org>

In order to prevent the generation of hazardous waste, the RoHS Directive requires the substitution of various heavy metals, namely lead, mercury, cadmium, hexavalant chromium and brominated flame retardants like poly-brominated biphenyls (PBB) or poly-brominated diphenyl ethers (PBDE) in new electrical and electronic equipments put on the market since 1 July, 2006.

In brief, the WEEE Directive obliges a producer of electronic equipment to be responsible for the product at the end of its consumer life. The RoHS Directive takes a step further by requiring manufacturers to phase out the use of hazardous substances in the production of electrical and electronics equipment by 2008.[165]

3.3.4.3 Communication on the use of the Precautionary Principle

On 2 February, 2000, the European Commission adopted the communication on the use of the Precautionary Principle as a central tenet of its policy. This Principle would form part of a structured approach to the analysis of risk as well as risk management. It is primarily aimed at building a common understanding of how to assess, appraise, manage and communicate risks which science is not yet able to evaluate fully and, at the same time, avoid unwarranted recourse to the precautionary principle, as a disguised form of protectionism.[166] Application of this Principle would help prevent the use of some high risk products in electrical and electronic equipments to some extent.

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165 The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC), *Exporting Harm. The High-Tech Thrashing of Asia*. 25 February, 2002.

166 Europa Press Release, 'Commission adopts Communication on Precautionary Principle', Brussels, 02 February, 2000. <http://eropa.eu/rapid/press Releases>

3.3.4.4 Comparative WEEE/E-waste management in Switzerland and India

Framing of regulations and their implementation is an important aspect of the WEEE/E-waste recycling. An example of the role of regulations related to the e-waste management in the context of a developed and a developing country has been reported in a comparative WEEE/E-waste case study of Switzerland and India.[167]

Switzerland is one of the most technologically advanced countries with one of the highest per capita income in the world. As per 2004 estimates, it has an installed base of 3.15 million computers, with 99% household having refrigerators and 96% households having TVs. Switzerland ranks seventh on the 2005 Environmental Sustainability Index and has a score of 1.39 for environmental governance. It is the first country in the world with established formal WEEE/E-waste management system, where legislation on E-waste management was introduced in 1998. This legislation is based on the principle of the Extended Producer Responsibility (EPR).

India is one of the fastest growing economies in the world, where the penetration of consumer durables is substantially lower than that of the developed countries, but is experiencing exponential increase in demand since the last decade. It ranks 101st on the 2005 Environmental Sustainability Index and has a score of 0.10 (66th Rank) for environmental governance. E-waste is partially covered under the existing environmental regulations, but these do not stipulate the management and handling of e-waste generated within the country.

In Switzerland, there is control at every stage or phase of the WEEE/ E-waste trade. In India, control is virtually non-existent, though existing environmental regulations partially control e-waste trade till the stage of the EEE (Electrical and Electronic Equipment) manufacturers and importers. This difference gets reflected in low

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[167] Ibid. n.162, p.43.

environmental governance score. It also reflects that e-waste gets recycled in an unregulated manner in the unorganized sector which leads to uncontrolled emissions into the environment. At the same time, it gives a different socio-economic and occupational health and safety dimension to the e-waste trade.[168]

3.3.5 Government regulations on e-waste management in China and USA

3.3.5.1 US Policy and Law

The U.S. Government and the U.S. manufacturers have claimed that the European Union's environmental and health protections constitute "unnecessary barriers to trade, particularly due to the ban on certain materials, burdensome take-back requirements for end-of-life equipment and mandated designs."[169] United States Environment Protection Agency (EPA) initiated a green National Electronics Action Plan (NEAP)[170] in 2005 in order to address environmental concerns arising out of the entire life cycle of electronics, including design, operation, reuse, recycling and disposal of equipment. Unlike the European Directives, the NEAP focuses mainly on computers, televisions and cell phones. Instead of emphasizing on the principle of the Extended Producer Responsibility, the EPA places responsibility for products on a broader group of entities, including manufacturers, retailers, users and disposers. The US is involved in a number of initiatives and programmes aimed at reducing e-waste. For instance, the US, Canada and Mexico are the members of the North American Pollution Prevention Partnership, which focuses on clean electronics in North America.

However, the US Government has not yet ratified the Basel Convention and the Ban Amendment. There is also no federal

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168 Ibid. n. 150, pp. 43-44.

169 Ibid. n. 165, p.43.

170 It is a Resource Conservation Challenge (RCC) 2005 Action Plan and one of the National Priority Areas (Green Initiatives-Electronics) identified by the Environment Protection Agency for the RCC. For further reading go to < *http://www.epa.gov/osw/rcc/index.htm*>

legislation in place prohibiting or regulating e-waste generation, disposal and export. Several States in the US such as California, Massachusetts, Maine and Minnesota have taken the initiatives, which have imposed strict and effective regulations on design, manufacture, reuse, recovery and disposal of e-waste. California has promulgated the Electronic Waste Recycling Act of 2003, which is considered landmark legislation for e-waste regulation and management.[171] Electronic waste in California can neither be disposed of in a landfill nor be exported overseas. Unlike the EU regulations, the Californian law establishes the system of shifting the financial burden of recycling of e-waste on the consumer. The most significant provision of the regulation is the electronic waste recycling fee, which is to be collected at the point of sale of certain products. The fee ranges from six to ten dollars.[172] The Act requires the retailers to remit these fees to the Board of Equalization (BoE). This fee system became effective from 1 January, 2005. The law further lays down proper and fair procedure for distribution of recovery and recycling payments to qualified entities, covering the cost of electronic waste collection and recycling. It recommends environmentally preferred purchasing criteria for state agency purchases of certain electronic equipment. The California Integrated Waste Management Board (CIWMB) and the Department of Toxic Substances Control (DTSC) have adopted several regulations to implement the Act in the most effective manner.[173] Colorado legislation requires education programmes that address the electronic waste problem. A law in the state of Washinghton which took effect in January, 2009 requires

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171 M.P. Ram Mohan, Iti Garg and Gayatri Kumar 'Regulating e-waste: a review of the international and national legal framework on e-waste' in Rakesh Johri, E-waste: Implications, regulations and management in India and current global best practices, TERI, New Delhi, 2008, p.178.

172 Wikipedia, 'Electronic Waste in the United States', <http://en.wikipedia.org> Last modified: 16 October, 2010.

173 Ibid. n. 171, pp. 178-79.

manufacturers of electronic goods to pay for recycling, and establishing a statewide network of collection points. The programme, called E-Cycle Washington is managed by the Department of Ecology and the Washington Materials & Financing Authority. Till 2008, seventeen States have producer responsibility laws in some form or the other. In all, 35 States in the U.S. have or are considering electronic waste recycling laws.[174]

3.3.5.2 Legislation in China

Electronic waste in China has gained world-wide attention as a serious environmental issue. Guiyu in Guangdong Province is the location of the largest electronic waste site on earth. Chinese laws are primarily concerned with eliminating the import of e-waste. China has ratified the Basel Convention as well as the Basel Ban Amendment, officially banning the import of e-waste. In October, 2008, the Chinese State Council also approved a draft regulation on the management of electronic waste with the objective of promoting the continued use of resources through recycling and monitoring the end-of-life treatment of electronics. Under the new regulations, the consumer is required to recycle electronic products. It also requires the recycling of unnecessary materials discarded in the manufacturing process.[175]

The Restriction of Hazardous Substances (RoHS) in China, officially known as the 'Administrative Measure on the Control of Pollution Caused by Electronic Information Products' is a Chinese Government regulation to control certain materials, including lead. It was jointly promulgated by the seven Government Departments and administrations of the People's Republic of China (PRC) in February, 2006 and became effective from 1 March, 2007.[176]

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[174] Ibid. n. 172.

[175] Wikipedia, 'China RoHS', <http://en.wikipedia.org/wiki/China_RoHS> Last modified: 09 October, 2010.

[176] Ibid. n. 171, p.180.

According to Article 1 of the Administrative Measure, it was formulated on the basis of the legal and administrative laws of the 'Law of the People's Republic of China on Promotion of Clean Protection', the 'Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste', etc., in order to control and reduce environmental pollution caused by the discarded electronic information products, promote manufacture and sale of low pollution electronic information products, and protect environment and human health.[177] All items shipped to China now have to be marked as to whether the items contained in the box are compliant or non-compliant. The Electronic Information Products (EIP) logo or other label is used to mark parts and assemblies that do not contain acceptable amounts of substances identified by the regulations, and those that are environmentally safe. Units which contain hazardous substances are marked with the EIP logo including an Environment Friendly Use Period (EFUP) value in years. EFUP is the period of time before any of the RoHS direction's restricted substances are likely to leak out, causing possible harm to health and the environment. [178]

There are currently six substances considered environmentally hazardous by the Chinese RoHS Directive (Article 3 of Chapter 1), namely lead, mercury, cadmium, hexavalent chromium, poly-brominated biphenyls, poly-brominated diphenyl ethers and other toxic or hazardous substances or elements set by the state.[179] Hong Kong's Waste Disposal Ordinance bans the import of batteries and cathode rays. Currently, there is no legislation in place to bar the entry of other electronics into the ports of Hong Kong.

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177 'Administrative Measure on the Control of Pollution Caused by Electronic Information Products', 28 February 2006 (English Translated Version), Ministry of Information Industry of the People's Republic of China (No.39), <http://www.esimcom.com/esimv3/priv/administrativemeasure.pdf>

178 Ibid. n.163.

179 Ibid. n.165.

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CONCLUSION

4.1 E-waste—an environment and public health hazard

All types of waste are not only imported but generated in India-hazardous industrial waste, municipal solid waste and e-waste. The quantum of wastes generated over the past several years have posed an ever increasing threat to environment and public health. Over eighty-eight critically polluted industrial zones have been identified by the CPCB. Pollutants from such zones contaminate water bodies and rivers and even pollute the ground water in many places. Studies have also shown that crops are contaminated through industrial effluents but the scale of such an impact has yet to be identified.[180]

As far as e-waste is concerned, it has emerged as one of the fastest growing waste streams world wide today. The sheer amount of electronic equipments reaching end-of-life poses a huge challenge. Computers and electronics equipments are designed without giving sufficient attention to the aspects such as downstream impacts, and the ease of recycling. Thus, their dismantling is also extremely labour-intensive. As long as electronic products continue to contain an assortment of toxic chemicals and are designed without recycling aspects, they would pose a threat to environment and public health at their end-of-life. As electronic products are currently constituted, e-waste recycling operations in any country will generate polluting residues and emissions.[181] Toxics Link has reported that India has over 1.38 million obsolete computers with manufacturers adding

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[180] Ravi Agarwal (Toxics Link), 'A policy? Rubbish', *Hindustan Times*, New Delhi, 04 May, 2010.

[181] The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC), *Exporting Harm. The High-Tech Thrashing of Asia*, February 25, 2002, p.3 & p.12.

about 1,050 tonnes of electronic scrap every year. It is currently estimated that India produces some 3.8 lakh tonnes of e-waste annually. E-waste now forms over 70 per cent of landfills. When developing countries like India start tightening and enforcing stricter legislation on transboundary movements of e-waste, developed countries may find it harder to avoid the issue of recycling and disposal through export. However, in March, 2010, in the journal titled *Environmental Science and Technology*, author Eric Williams, Assistant Professor in Arizona State University, wrote, "Trade bans will become increasingly irrelevant in solving the problem (of e-waste)". He argues that a complete ban on export of used and end-of-life electronics to developing countries would fail to solve the problem because the developing world would generate more used and end-of-life electronics than the developed countries as early as 2017. Additionally, by 2025, the developing world would generate twice the amount of electronic scrap as what will come from the developed nations.[182]

Considering the future scenario, it is imperative that the safe management of waste is done in an organized manner with sufficient resources and sustainable recycling technologies on the one hand and effective legislations and monitoring mechanisms on the other. In Delhi, in the wake of the Mayapuri radiation leak incident, the government had issued guidelines and advisories to all heads of hospitals, medical centres, diagnostic centres and medical labs using radioactive equipment and consumables for their safe disposal, as per the directives of the Atomic Energy Regulatory Board (AERB) under the Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987, and the Atomic Energy (Radiation Protection) Rules, 2004. Ironically, under the AERB directives, the rules prescribing detailed guidelines regarding medical exposure, potential exposure, personal

[182] Institute of Scrap Recycling Industries Inc. (ISRI),'Electronics Recycling', <http://www.isri.org/>

monitoring, quality control and even appointing radiation workers and radiological safety officers already exist. The incident highlights the need to have a clear cut disaster protocol and to implement effective regulation and monitoring mechanism to ensure that the rules are adhered to.[183] It also calls for the regulatory infrastructure to allow for the protection of workers and community rights. There has to be sufficient rights for citizens to take legal recourse for damages caused to their health, environment and property.

4.2 Need for stringent health safeguards and environmental protection laws in India

Environmental activists opine that environment protection laws in India are not stringent enough to address the issues relating to either domestic waste or imports of hazardous waste including e-waste. We do not have appropriate technology to ascertain the quantum and quality of wastes in the imported items. For instance, it has been reported that the problem of toxic waste imports cannot be addressed properly as none of the Indian ports (except the Jawaharlal Nehru Port at Nhava Sheva) has scanners to detect the actual contents of the consignments.[184] There are expectations that the proposed E-waste (Management and Handling) Rules, 2010 will lay down explicit laws concerning e-waste and systematize various aspects of the e-waste recycling sector.

The Government has consulted various non- governmental organizations (NGOs) in the process of developing a dedicated set of rules, which would govern the management and handling of electronic and electrical waste. Draft rules on e-waste management were jointly proposed and submitted to the Government by the Manufacturers' Association for Information Technology (MAIT), Deutesche Gesellschaft

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[183] 'New radioactive waste disposal rules issued', *The Hindu*, 04 May, 2010.

[184] Radha Venkatesan, 'Is India a Global Thrash Can?', *The Times of India*, 24 April, 2010.

Fuer Technische Zusammenanfeit (GTZ), Greenpeace and Toxics Link in September, 2009.[185] It is necessary that the legislation is clear in laying down the responsibility of every shareholder in the management of waste—from the producer to the consumer and the recycler. Besides, any legislation to be effective requires clear specification of the mechanisms to carry out each function.

Strategies have been proposed for the effective management and handling of e-waste in the country, many of which are already in force or in consideration in the EU countries and other developed countries like the U.S. and Japan.

Considering the rapid growth of generation of e-waste, the MoEF has proposed to notify separate Rules on e-waste under the Environment (Protection) Act, 1986. The salient features of the proposed Rules in brief, provided by the MoEF, are as given below:[186]

(i) The concept of Extended Producer Responsibility (EPR) has been enshrined in the proposed Rules.

(ii) The rules propose to extend producers' responsibility to the post-consumer stage of the product life cycle and fix their responsibility for collection of end of life products and to ensure that such wastes are channelized for safe handling. In addition, Producers are required to finance, and organize a system to meet the costs involved in the environmentally sound management of e-waste generated from the 'end of life' of their own products and the historical waste available on the date from which these rules come into force.

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185 'Rules on e-waste management by March', *The Hindu* 20 December, 2009.

186 Government of India, Ministry of Environment & Forests, O.M. No. 23-4/ 2011- HSMD, dated 19 April, 2011 re. Comments and Suggestions on the Draft Backgrounder entitled, 'e-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat.

(iii) Producers, as necessary, can designate agencies to set up an effective take back system for all electrical and electronic equipment at the end of their life.

(iv) The threshold limits prescribed in EU RoHS Directive, which is globally accepted standard for the hazardous substance used in manufacture of electrical and electronics components have been adopted.

(v) Rules also provide for granting authorization and registration by the State Pollution Control Board or the Pollution Control Committee concerned, to a persons/agency engaged in collection or dismantling or recycling of e-waste; provided that the applicant possesses appropriate facilities to handle e-waste safely. This is to ensure management of e-waste in an environmentally sound manner.

(vi) Collection Centres, which are being run by individuals/ jointly or by agencies will be required to take authorization from respective State Pollution Control Boards/Committees and file annual return thereafter providing details of e-waste collected. Dismantlers and recyclers will have to obtain authorization and registration from the concerned State Pollution Control Board and file annual return regarding e-waste handled by them.

4.2.1 Extended Producers Responsibility (EPR)

The principle of the Extended Producers Responsibility (EPR) which underlines the current framework of the draft e-waste rules may be an innovative step in the management of e-waste in the country. The concept of EPR aims to place full responsibility of collection of end-of-life electronic products and their safe disposal on to the producers. They would have to ensure that the polluting products will be recycled in an environmental friendly manner by refurbishes,

dismantlers or recyclers. It would require the producers and dealers to collect e-waste by providing the consumer a box, bin or a demarcated area to deposit e-waste. It has been suggested that major municipal corporations should take the responsibility of collecting e-waste directly from consumers to be handed over to a recycler. Every dismantler and recycler would also have to be registered with the Government to ensure compliance. However, apprehensions have been expressed by some quarters that EPR may be difficult to implement. The practicability of such a measure has to be examined carefully in a country like India where it would be difficult to track electronic products which may be sold several times by more than one customer after using those products for some time. For instance, it may be impossible for a producer in India to keep track of an electrical or electronic item which he/she might have sold to a customer from the southern part of our country and who in turn might dispose it off to somebody else residing in another distant region. Even the Ministry of MSME has commented that it may not be practically feasible for the producers to collect the e-waste generated at the end of life of the electrical and electronic products, because the consumers may be located in different parts of the country, not known to the producers.[187]

In this regard, it has been suggested that almost all major electronic brands have service centres all across the country and these can be used as collection points. The incentive, that a customer gets to give an old electronic good for recycling would be key to its success. Moreover, many dismantlers are organizing themselves and have often tried to enter into tie-ups with the organized recyclers for carrying out precious metal recovery. However, no such tie-ups have taken place so far because the organized recyclers are awaiting approvals on import licenses for easier access to e-waste.[188]

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[187] Government of India, Ministry of Micro, Small and Medium Enterprises, File no. RS/e-waste/2010/E & TR dated 24.02.2011 re. Comments and suggestions on the draft backgrounder on 'e-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat.

[188] Comments and Suggestions made by Ms. Sunita Narain, Director, Centre for Science and Environment, New Delhi by email dated February 17, 2011 on the draft backgrounder titled 'e-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat.

Notwithstanding the suggestions mentioned above, the most toxic and polluting segments of the electronics industry, namely, the manufacturing and the disposal have mostly migrated to the developing countries. Therefore, it needs to be ensured that the producer responsibility or take-back programme is not used to justify the transboundary movements of wastes. As per the Hazardous Wastes Rules, 2008, import of such wastes for disposal is not permitted in the country. Import of e-waste by traders is also not permitted. Further, import of e-waste is permitted to actual users in the country with permission of MoEF and licence issued by Directorate General of Foreign Trade (DGFT) for reuse or recycling or reprocessing only.

The draft e-waste rules are applicable to the e-waste generated from IT and telecommunication equipment and Consumer electrical and electronics i.e. Television sets (including LCD & LED), Refrigerator, Washing Machine, Air-conditioners. Based on the experience in implementation of EPR from the above products, the rules would be reviewed for including other categories of e-waste. As per the draft e-waste rules, the Municipal Authorities are required to take responsibility of collection of e-waste generated from the orphan products.[189]

4.2.2 Import of e-waste under license

According to the Toxics Link, the import of e-waste should not be allowed as we currently do not have the infrastructure

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[189] Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'e-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4/2011-HSMD, dated 19 April, 2011.

to even deal with the domestically generated e-waste. It would only lead to the country becoming a waste dump of the globe with serious health and environment impacts.[190] Yet, there are others who call for adequate safeguards to restrict the import of used electrical and electronic equipment in the country and ensure that imported wastes are reprocessed by the companies under license to import e-waste and not re-sold again.

As per the Exim Policy of Ministry of Commerce's (Handbook of Procedures Vol. 1 2009-14), import of second hand computers including personal computers/laptops and refurbished/reconditioned spares is restricted. However, the import of second hand computers including personal computers/laptops and computer peripherals including printers, plotters, scanner, monitor, keyboards and storage units as donations by certain categories of donors was permitted earlier. Directorate General Foreign Trade (DGFT) published a Public Notice dated 13.5.2010, wherein this provision has been deleted. [191]

As per The Hazardous Wastes Rules, 2008, units involved in e-waste recycling are required to obtain authorization and registration from the State Pollution Control Board concerned. Directions have been issued to all Central/State Government to handover e-waste generated in their premises to authorized and registered recyclers.[192]

4.2.3 Producer-public-government cooperation

The Basel Convention has promoted the concept of developing partnerships with industry, the public sector and civil society for reducing hazardous wastes at source and

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[190] Comment by Satish Sinha, Toxics Link, in his review of the draft paper 'e-waste in India' in a letter dated April 5, 2011.

[191] Ibid. n. 186.

[192] Ibid. n. 189.

promoting their recycling and re-use. Signatories to the Convention can also take advantage of the Convention's expanding series of technical guidelines for the environmentally sound management of specific kinds of wastes.[193] For instance, the United Nations Environment Programme's International Environmental Technology Centre (IETC) has produced two manuals on WEEE/e-waste to assist the member countries to develop the inventories and e-waste management system. According to Abhishek Pratap Singh from Greenpeace, bringing local bodies and community organizations into the task of collection of e-waste is as important as coordination and incorporating very specific targets. Formal recycling is just growing as an emerging industry. Shri Ram Ramachandran, President, All India e-waste Recyclers Association has pointed out that it would be necessary to take up collection and segregation in a careful manner as, at times, the value of the recovered items after recycling could not cover even the transportation costs. Capital investments in setting up of proper e-waste recycling facilities are still insufficient in India due to which most of the recycling projects are in the testing stage. Therefore, if the e-waste recycling sector is organized, the Small and Medium Enterprises (SMEs) can come into the picture to earn good revenues and also to assist the Government in achieving its recycling goals. The SMEs can develop mechanisms for segregation of recyclable wastes while ensuring that such wastes reach the relevant parties and are not dumped in landfills or illegal dump sites.[194]

As per the information of the Central Pollution Control Board, there are 23 registered e-waste recycling units in operation having recycling capacity of about 90,000 MT per annum. The Ministry of Environment and Forests is

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[193] UNEP Press Release, 'Basel Conference addresses Electronic Wastes Challenge', 27 November 2006 <http://www.unep.org/>.

[194] 'Creating Best out of (e) Waste', SME Trends: A Commerical Report, *Business Standard*, New Delhi, 8 September 2010.

implementing a Central Sector Scheme entitled "Creation of Infrastructure for Management of Hazardous Substances", which has been revised to incorporate provisions for providing financial assistance for setting up of integrated e-waste recycling facilities on a Public Private Partnership model.[195]

4.2.4 Awareness programme

The new draft rules put the onus of creating awareness of the hazardous constituents of e-waste and its management on the producers. The awareness among the consumers regarding hazardous constituents of e-waste can be created through active propaganda in print & electronic media and strong extension programmes. The awareness through media may not be feasible by the producers individually. This task may have to be taken up by agencies like Municipal Bodies/State Pollution Control Boards/ Central Pollution Control Board.[196] Nevertheless, Government needs to undertake a massive awareness programme to encourage e-waste collection for safe disposal and recycling. A partnership among all stakeholders is vital for the success of the process.

The State of Tamil Nadu has made the first move to come up with a separate e-waste policy in the country and the policy of collection of electronic waste by community- based organizations (CBOs). However, activists and organizations await specific details. It has been reported that once the rules are in place, key stakeholders including manufacturers, pollution control boards, local bodies, and the Electronics Corporation of Tamil Nadu Limited (ELCOT), would be apprised of their roles. The Government would also take up a massive awareness programme to tell consumers of the huge quantities of e-waste they are accumulating, and suggesting responsible means of getting rid of them.[197]

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[195] Ibid. n.189.

[196] Ibid. n.187.

[197] Shyam Ranganathan and Ramya Kannan, 'Tamil Nadu frames separate e-waste policy', *The Hindu,* 16 May, 2010.

The MoEF provides financial assistances for conducting trainings, workshops, conferences on issues related to waste management including e-waste through industrial associations, CPCB, SPCBs and reputed institutions.[198]

4.2.5 Choosing safer technologies and cleaner substitutes

Two of the most toxic compounds that are found in the components of e-waste are the Polybrominated biphenyls (PBB) and Polychlorinated biphenyls (PCB). Significantly, the new draft rules on e-waste management have, among others, covered these compounds. Owing to stringent standards prevailing in the developed countries, most companies in these countries have moved to adopt safer technologies for producing electronic items devoid of toxic metal oxides. For instance, mercury substitutes are being used in batteries and medical equipments in the developed countries. Digital thermometers, digital thermostats or other devices using mercury substitutes are becoming widely popular. The largest consumer of mercury is the chlor-alkali industry which can switch to the membrane cell process. The chlor alkali industry uses the process of electrolysis of sodium chloride solution. Several products can be produced depending on the method used. Similarly, liquid gallium or gallium alloy which has very low quantities of metal oxides is utilized for a variety of applications.

Producers need to comply with threshold limits for the use of certain hazardous or toxic substances in electronic equipment. While green design products and grant of incentives can be encouraged, it is said that such reduction in the use of toxic metal oxides can be achieved within a few years from the date of commencement of the rules. For effective e-waste management, it is necessary to quantify and characterize this waste stream, identify major waste generators and assess the risks involved. A scientific, safe and environmentally sound

[198] Ibid. n. 186.

management system, including policies and technologies, needs to be developed and implemented. It is, therefore, pertinent for the Government to keep an inventory of all e-waste and also the stock of hazardous metals like mercury so that their trade and use can be regulated.

As per the draft e-waste rules use of six hazardous substances namely Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated biphenyls or polybrominated diphenyl ethers in manufacture of electrical and electronic equipment are listed in Schedule 1. These hazardous substances have been suggested to be reduced within a period of two years from the implementation of the aforesaid rules. Mercury base processes in chlor-alkali industry will be phased out by 2012.[199]

4.2.6 Monitoring of Compliance of Rules

The State Pollution Control Boards or Committees responsible for grant of authorization, monitoring compliance of authorization and registration conditions can take action against violations of rules. On the other hand, the Central Pollution Control Board (CPCB) can monitor the compliance of conditions stipulated for granting registration. In this regard, as per the draft e-waste Rules, producers, dismantlers, recyclers & collection centres, are required to seek authorization and registration from the State Pollution Control Board (SPCB) concerned and file annual returns. SPCBs are required to submit annual reports to CPCB. CPCB will consolidate the information received from all SPCBs and submit an annual report on e-waste management, along with its recommendations, to the Ministry.[200]

4.2.7 Effective regulatory mechanism strengthened by manpower and technical expertise

According to the Report of the Prof. M.G.K. Menon Committee set up by the Supreme Court on Hazardous Wastes,

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199 Ibid.

200 Ibid.

77 per cent of Chairpersons and 55 per cent of Member Secretaries in different State Pollution Control Boards were not qualified enough to hold the posts. In its 192nd Report, the Department-related Parliamentary Standing Committee (DRPSC) on Science and Technology, Environment and Forests underlined the need for qualified Members in the Boards of the Central Pollution Control Board and the State Pollution Control Boards. The Committee was informed that the key posts in these Boards were being manned by officers of the Indian Administrative Service or bureaucrats who neither possessed the necessary capabilities and expertise in properly managing and planning pollution control activities nor had enough time to pay attention to these activities for obvious reasons. The trend had led to virtual relegation and replacement of technically capable persons by people with inadequate knowledge. The Committee observed that it was a very disturbing trend and called for its redressal.[201] E-waste management along with other wastes management, as recommended by the DRPSC, rightly require stronger regulatory mechanism and further strengthening of the Central and State Boards both in terms of manpower and expertise.[202] The MoEF has initiated the strengthening of capacity building for CPCB and SPCBs both in terms of man power and infrastructure.[203]

4.2.8 Reduction of waste at source

With nearly 94 per cent of the materials extracted for manufacturing durable products becoming waste before the product is manufactured, reducing waste at source can clearly promote economic and industrial competitiveness. Many other social and

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[201] Department-related Parliamentary Standing Committee on Science & Technology, Environment & Forests, *192nd Report on Functioning of Central Pollution Control Board, Rajya Sabha* Secretariat, September, 2008.

[202] Ibid. The other problems and wastes mentioned by the DRPSC were hazardous waste management, industrial pollution, bio-medical waste, plastic waste, mercury waste, increase in mining activities, solid waste management, ever growing air pollution, and growing number of vehicles.

[203] Ibid n. 1816.

economic benefits of sound waste management include job creation, skills development and reduced clean-up and public health costs.[204]

There is a need for setting out incentives and tools for minimizing the generation of wastes, treating wastes as nearly as possible in the place where they were generated, and minimizing international movements of hazardous wastes. Reducing wastes at source would reduce the financial incentives that drive the illegal trade that inspired the adoption of the Basel Convention.[205]

Moreover, even if there are so-called state-of-the-art hazardous waste recycling facilities in the country, these make adverse impact on environment and health of workers due to release of toxins and harmful emissions. It is risky and polluting business even in optimal conditions. The ultimate answer is to minimize the generation of hazardous waste, not recycle them.[206]

In this regard, the MoEF is promoting the 3 R Concept (Reduce, Reuse and Recycle) for Hazardous Waste Management.[207]

4.3 Investment Opportunities

Clean technologies today offer big investment opportunities covering areas such as LED lighting, water purification, recycling of e-waste, food-processing, wind power, solar power and second generation bio-fuels. It is said that pursuit of energy might involve $10 billion in India. With India expected to produce around 1 million tonne of e-waste by 2012 up from the current level of 440,000 tonnes per annum, the business of recycling e-waste alone is a billion dollar opportunity.[208] The retrieval of components including

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[204] UNEP Press Release, 'Basel Conference addresses Electronic Wastes Challenge', 27 November 2006 <http://www.unep.org/>

[205] Ibid.

[206] Ibid.n. 181, p.11.

[207] Ibid. n.186.

[208] Peerzada Abrar, 'Digging money out of e-waste', *The Economic Times,* New Delhi, 1 October, 2010.

precious metals and spare parts for re-use provides a potential source of revenue.

It is interesting to note that the UNEP and United Nations University's Report titled "Recycling – from E-waste to Resources" has classified India along with China "as having a significant potential for the introduction of pre-and end-processing technologies with a strong support in capacity building in the informal sector."[209] The Report observes that the market potential of innovative recycling technologies is defined through the critical volumes, which can justify the transfer and installation of technologies in order to manage e-waste in the most sustainable way. Hence, having a market potential doesn't necessarily mean that an operation can be run in a self-sufficient way. Technology transfer has to be addressed taking into account a broader vision. E-waste recycling does not simply mean installing or transferring state-of-the-art, environmentally sustainable and effective technologies in a country. Any effort for solving the e-waste problem or, in other words, sustainable recycling of e-waste will always demand for an appropriate framework, including a proper collection network, and a financing scheme.[210]

With regard to the market potential of innovative end-processing technologies, the Report observes that there is no integrated smelter for non-ferrous metals concentrating on scrap from e-waste alone. Due to the large volumes and high investments needed to establish a state-of-the-art facility, this technology can only have a market potential where high volumes can be accessed from a whole region and/or through favourable trade routes. Also, the possibility of integrating the e-scrap into existing primary non-ferrous metals smelter facilities by upgrading the operation could be a favourable factor from a regional perspective. Taking into account a possible

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[209] UNEP & United Nations University, *Recycling- From E-waste To Resources,* Sustainable Innovation and Technology Transfer Industrial Sector Studies, July, 2009, p.59.

[210] Ibid, p.51.

growth of e-waste volumes in the next ten years, China and/or India has a mid-term market potential for integrated smelters for the Asian region.[211] However, lack of dedicated legislation dealing with e-waste, unclear application of the Basel Convention, high level of corruption in law enforcement, undefined roles and responsibilities of stakeholders, low technologies and skills, poor logistics and vulnerable business and financing conditions are identified as barriers for the transfer of e-waste technology to India.[212]

4.4 Recognising the Unorganized Sector in India

Currently, there are 23 formal recycling and reprocessing units having environmentally sound management facilities which are registered with the Central Pollution Control Board (CPCB) located in Andhra Pradesh, Karnataka, Maharashtra, Haryana, Rajasthan, Tamil Nadu, Uttar Pradesh and Uttarakhand. The formal units perform collection, segregation, shredding and resource recovery employing automated, semi-automated or manual operations for the recycling of e-waste. Some of the viable recycling facilities in the formal sector are the Attero Recycling Plant in Roorkee, Uttarakhand, E-Wardd and E-Parisara in Bengaluru and Earth Sense in Hyderabad.[213]

That the e-waste sector can be made into a viable business model is indicated by a Bengaluru-based successful conglomeration of 70 informal recyclers –*kabariwalas*- called the Harit

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211 Ibid. p.53.

212 Ibid. p.65-66.

213 Other recycling and re-processing units registered with the MoEF/CPCB are Ramky E-waste Recycling Facility (Ramky Engineers Ltd.) in Andhra Pradesh; Ash Recyclers, Unit-II, New Port Computer Services (India) Private Limited, Surface Chem Finishers,E-R3 Solutions Pvt. Ltd. and Ash Recyclers, Unit-I in Karnataka; Eco Recycling Pvt. Ltd., Hi-Tech Recycling India (P) Ltd. in Maharashtra; Greenscrape eco Management Pvt. Ltd. in Rajasthan; Trishyiraya Recycling India Pvt. Ltd., TES AMM Private Ltd., Global E-waste Management and Services (GEMS), Victory Recovery & Recycle Technologies India Pvt. Ltd., Ultrust Solutions (India) Pvt. Ltd., INAA Enterprises in Tamil Nadu; TIC Group India Pvt. Ltd. in Uttar Pradesh and Jhagadia Copper Ltd. in Gujarat. There are also two other e-waste recyclers in Gujarat namely, MCT Enviro Infrastructure Ltd. and E-process House. <http://www.cpcb.nic.in/divisionsofheadoffice/hwmd/e-waste,pdf>

Recyclers Union.[214] There is a concern that the new draft regulations may enable only the registered big investment companies to recycle e-waste with an aim to control illegal trade and accompanying pollution. However, it is the unorganized sector which is currently handling more than 90 per cent of the e-waste generated in the country. The Centre for Science and Environment, an NGO infact apprehends that ignoring the informal sector may actually make the implementation of draft rules ineffective.[215] There is a concern that organized business could well lead to more and more waste being imported into the country, only to be outsourced to the poorest and the most unorganized for reprocessing. Such concerns can be dispelled if the informal or unorganised sector is upgraded to provide a support system for the integrated recycling and treatment and disposal facilities. It would enable to bring the unorganised sector in the mainstream of activities while ensuring environmental compliances. In fact, the UNEP Report on "Recycling – from E-waste to Resources" recognizes that the informal/ unorganized collection system has been rather efficient in countries like India because the daily informal collectors can penetrate each community and city to collect waste from house to house. They are flexible with working hours and location; they pay a reasonable price to the consumers and are in charge of all the transportation work. This brings not only income to the informal collectors but contributes to the high collection rate without putting pressure on the consumers. Any future formal collection system has to take advantage of the "distributed informal collectors".[216]

Meanwhile the Manufacturers' Association for Information Technology (MAIT) has embarked on a new MAIT-EU initiative, which is a four year project beginning 2010 until

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214 'New e-waste rules ignore unorganized waste', *The Pioneer*, New Delhi, 19 May, 2010.

215 Ibid.

216 Ibid.n.209, p.57.

2014.The project envisages upgrading the skills of the informal e-waste recycling sector, for proper handling of e-waste, creating linkages between the informal and formal recyclers to minimize metal extraction/processing in the informal sector and to set up collection centres for proper channelization of e-waste for processing. Four cities including Delhi, Kolkata, Pune and Bengaluru have been identified for the purposes of the project.[217]

Further, for ensuring e-waste management in an environmentally sound manner, any person engaged in collection, dismantling or recycling of e-waste can obtain authorization from the SPCB or Pollution Control Committee concerned provided that applicant possesses appropriate facilities to handle e-waste safely. However, for dismantling and recycling, registration with concerned State Pollution Control Board/Committee is also required. As per the draft e-waste rules, collection centres can be set up individually or jointly or a registered society or a designated agency or a company or an association to collect e-waste. These provisions would provide the informal sector an opportunity to be involved in the e-waste management system.[218]

While many products in the global economy are leaving an international trail of toxic waste, Ravi Agarwal of Toxics Link says that any solution must be based on fundamental approaches such as the precautionary or polluter-pays principles, which are recognized even in international laws. According to him, new types of wastes, untried technologies to handle waste, and unsafe industrial processes should not be permitted and measures such as making industries accountable, strengthening local initiatives, and refusing waste from other countries should be taken.

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217 'Committee on e-waste', MAIT Annual Report 2009-10: A Review, p.14, <http://www.mait.com>

218 Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat O.M. No. 23-4/2011-HSMD, dated 19 April, 2011.

Putting the problem of e-waste management in India into perspective, Sunita Narain of the Centre for Science and Environment has said:

> "We need to think how we can build a new waste-managers model. Instead of thinking of replacing small, cost effective garbage collectors with big business, how can policy legalise, regulate and even pay for this trade to happen, not out of sight, but under our noses? But more importantly, how each company and each consumer must be made to pay a price —cess for recycling and disposal— so that we begin to bear the burden of cleaning up the mess we create, because of our consumption."[219]

It has also been suggested that in the circumstances, the Government may consider imposing a cess on Electrical & Electronic products to meet the cost of common e-waste recycling units to be set up either in the Government sector or in private sector with Government assistance. Alternatively, the Municipalities or Civic agencies may be assigned the overall responsibility for the setting up of processing units, operationalisation and coordination of the e-waste management, as has been proposed by the Ministry of Environment & Forests in the draft Plastic Waste (Management & Handling) Rules 2010.[220]

In conclusion, the IT Sector has been playing a leading role in the growth of the Indian economy, which is emerging as one of the fastest growing economies in the world. The huge size of the domestic market coupled with the large

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219 Sunita Narain, 'A different waste model', <http://www.business-standard.com/india/>, 21 May 2010.

220 Ibid. n. 187.

consumer base will continue to increase the consumption patterns resulting in generation of huge quantities of waste. The unmanageable desire for comforts and wealth in the name of industrialization or technological progress and the resultant generation of waste were the things that the Father of our Nation, Mahatma Gandhi had warned the 'Europeans' against in 1938. He wrote:

> "The incessant search for material comfort and their multiplication is such an evil and I make bold to say that the Europeans themselves will have to remodel their outlook, if they are not to perish under the weight of the comforts to which they are becoming slaves."[221]

But, today, every consumer in India may as well heed this warning. Gandhi was critical of industrialism for the fact that the impetus behind it was 'greed' and not 'philanthropy' to save labour.[222] Given that a certain degree of physical harmony and comfort is necessary, he had said that:

> "A technological society has two choices. First, it can wait until catastrophic failures expose systemic deficiencies, distortions, and self-deceptions. Secondly, a culture can provide social checks and balances to correct for systemic distortion prior to catastrophic failures."[223]

The future scenario has, indeed, presented both challenges and opportunities in terms of minimizing wants, managing e-waste as well as developing cleaner and more sustainable products. It is, therefore, important that viable solutions are found to address the problem of the e-waste involving skilled manpower from the informal sector of the economy and the

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[221] *The Collected Works of Mahatma Gandhi*, Publications Division, Ministry of Information & Broadcasting, Government of India, Vol. 52, 28 April—01 July, 1931, p.9.

[222] Ibid. Vol.54, 13 October, 1931— 8 February, 1932, p.84.

[223] TN Khoshoo and John S Moolakkattu, *Mahatma Gandhi and the Environment*, The Energy and Resources Institute, New Delhi, TERI Press, 2010.

use of appropriate technology. Besides, the urgent need for evolving sound policy and robust regulatory mechanism for safe and sustainable e-waste management can hardly be over emphasized. More importantly, the cardinal principles of accountability, transparency and sustainability need to be incorporated in any policy or regulation on e-waste to ensure its proper implementation.

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3. Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4/2011-HSMD, dated 19 April, 2011.

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