Toxics Link
for a toxics-free world

E-waste: Flooding the City of Joy

The revolution in the field of information and telecommunication technology has led to increasing rates of consumption and the emergence of the new waste stream of electronic waste. Kolkata has been no exception to this trend, with its huge and growing market of electrical and electronic equipments making it also a big generation point for e-waste

E-Waste: Flooding the City of Joy

STUDY ON E-WASTE IN KOLKATA

By

Toxics Link, New Delhi

In Association with

Center for Quality Management, Jadavpur University, Kolkata

E-Waste: Flooding the City of Joy

September 2007

Prof. Sadhan Ghosh, CQMS, JU
Ms. Priti Mahesh, Toxics Link

Toxics Link, New Delhi
H2 Jungpura Extension
New Delhi- 110 014
www.toxicslink.org
info@toxicslink.org

Centre for Quality Management System
Blue Earth Workshop,
Jadavpur University,
Kolkata-700 032
icqesms@vsnl.net

Acknowledgements:

We wish to thank Mr Ravi Agarwal, Director, Toxics Link for providing valuable guidance and support in conducting the assessment and finalisation of the report.

We wish to acknowledge Mr Satish Sinha, Associate Director, Toxics Link for his valuable guidance in conceptualising this study and also for his critical comments and inputs at various stages of the study and the report.

We wish to thank the Information and communication team at Toxics Link for their help in editing and finalising the report.

We would also like to thank all the members of Toxics Link for their continuous support and timely advice. We would also like to thank the team at Jadavpur University, Calcutta for their help in carrying out this study.

Table of Contents

Executive summary

The revolution in the field of information and telecommunication technology has profoundly affected the world in many dimensions. The easy availability and utility of smarter and faster machines has changed the way we live; it has been the reason for significant improvements in economic growth as well. The fast pace of technological development and breakthroughs has led to increasing rates of consumption and dissipation as well. This high consumption pattern of technology led living has led to the emergence of the new waste stream of E-Waste. The toxic nature of this waste, due to the presence of materials like lead, mercury, cadmium etc, makes it a critical issue to be dealt with.

E-waste comprises of entire stream of obsolete or non-reusable electronic and electrical equipments like PCs, phones, televisions, refrigerators, air conditioners, audio devices, digital cameras etc. The UN Environment Programme estimates that up to 50-million tones of e-waste is generated worldwide annually and it is growing at a rate of 3-5% each year. In comparison to the European and American markets, e-waste generation in India is relatively less. This is both due to the late technological surge in the country and the tendency to use products for longer periods. But with the steady growth in income and change in lifestyle, India is fast catching up.

Preliminary studies have estimated that India might be generating around 1.5 lakh tonnes of e-waste annually. This is expected to exceed to 8,00,000 tonnes by 2012. The metropolitan cities like Delhi, Mumbai, Bangalore, Kolkata and Chennai are the major E-waste generators. These cities have also seen mushrooming of E-waste recycling units in the informal sector in the last few years. These units are not only processing the waste generated locally but also receiving the new kind of junk from other smaller cities. The dumping of Electronic waste from developed countries is also an issue of serious concern.

Kolkata, India's eastern regional hub, houses many corporate houses and institutions. The city, with a population of more than 13 million, has got a huge growing market of electrical and electronic equipments and hence is also a big generation point for e-waste. This joint study in the city, by Toxics Link and Centre for Quality Management System, Jadavpur University, is not only an attempt to assess the amount of waste generated locally, but also to track the dumping of such toxins from other parts of the country and the world as well. The study also tries to find out the current recycling practices in the city. The report is a part of Toxic Link's effort to highlight this growing menace.

The study in Kolkata has been carried out through various methods like review of existing literature, structured and unstructured interviews, exploratory surveys and photo documentation. Computer and its peripherals, television and refrigerators were used to represent WEEE in this study. Two methods have been used to assess the quantity of E-waste generated through these electronic products- *Sample survey and Market supply approach*. For the sample survey, different categories of generators were contacted to find out their disposal volumes and methods and for the market supply approach, sales and penetration figures were sourced from the industry associations.

The study estimates that the city is generating around 9,000 tonnes of e- waste from equipments like computers and its peripherals, televisions and refrigerators. The amount of waste generated only from computers and its peripherals is assessed as around 3, 000 tonnes. The quantity is estimated to increase exponentially as the city is going through a surge in computer usage and these machines will soon start coming to the waste stream after their useful life, which is estimated to be around 3-5 years.

The offices, which generate bulk of this waste, are hardly aware of the toxins in these equipments and hence dispose off waste indiscriminately. The study also indicates that the users feel a need for legal framework for e-waste management with producers taking responsibility of the end of life equipments.

Though the city generates around 9, 000 tonnes of WEEE, the waste processed in the city is much more on account of the waste coming from the other centres in West Bengal as well as from outside the state. Informal discussions also reveal that waste from foreign countries has been reaching the city through Khidderpur dock. The existing scrap dealers in the city have taken up the job of processing and recycling of E-waste and acquire waste through tenders and auctions.

The major hotspots for E-waste trade and recycling in and around Kolkata are Chandni Chowk, Princep Street, Maniktala, Phoolbagan, Kadapara, Rajabazar and Howrah. The disposal and recycling in the units, located in these areas, is being done in very rudimentary and hazardous way and pose great risk to both environment and health. The risk is greater as the areas specializing in these activities are densely populated and some of the areas like Princep Street and Kadapara are in midst of residential areas. The workers are hardly aware of the risk associated with the processing and carry out the operations without any safeguards towards health or environment.

Lack of proper legislation on e-waste is a major bottleneck in dealing with this problem. The existing legislation falls short in handling this peculiar waste that has a multi generation point. For a sustainable solution for e-waste management in India, it is essential to have a proper system, which will not only define the recycling standards and methods but will also look at an entire system comprises of collection and storage. It is essential that manufacturers are made responsible for the products that they put in the market through concepts like Extended Producers Responsibility (EPR). Integration of precautionary principle and polluter pays principle can help us in finding a sustainable system.

1.0 Introduction

The electronic industry is the world's one of the largest and fastest growing manufacturing industry. The last decade has seen a tremendous growth in the field of information technology all over the world. The past three years have seen an exceptionally strong growth in the electronic equipment market, with worldwide revenue growing by 11 percent, 8.0 percent and 7.7 percent in 2004, 2005 and 2006, respectively[1]. The strongest growth has been in categories such as PCs, mobile handsets and hot consumer-electronic products such as MP3 players and digital televisions. The global sale of consumer electronics was estimated to exceed all expectations to touch an all time high of $135.4 billion in 2006, which indicates 8% increase from 2005. By the year 2008, sales are forecasted to soar up to $158.4 billion; up by 65% over 2000[2].

E-waste encompasses a broad and growing range of electronic devices ranging from large household appliances such as computers, refrigerators, televisions, air conditioners and personal stereos to small consumer goods like mobile phones, MP3 players. All such electronic and electrical items, on completion of their useful life, are being discarded rapidly and contribute to this huge quantum of waste. The generation of this waste has grown manifold in the last decade and would continue to accelerate at a fast pace.

But just beneath the glamorous surface of the benefits and the wealth created by the information technology revolution looms a darker reality. Vast resource consumption and waste generation are increasing at alarming rates. As a consequence of the growth in the industry, combined with rapid product obsolescence and consumer preference for newer and better products, discarded electronics is now the fastest growing waste stream in the world. The growing quantity of E-waste is beginning to reach alarming proportions and industrialised countries all over the world are just beginning to grapple with the problem. The governments around the world have been forced to address this problem and take measures to find sustainable solution.

Electrical and electronic equipment (EEE) contains a wide variety of components, including some that are considered hazardous. Commonly found components include: printed circuit boards, flame retarded plastics, cathode ray tubes, liquid crystal displays, batteries, mercury switches, capacitors and resistors. These components contain a wide range of hazardous materials such as mercury, lead, cadmium, chromium, CFC's (chloro-fluorocarbons), PCB's (polychlorinated biphenyls), PCN's (polychlorinated napthalenes) and brominated flame-retardants (see annexure1). These substances make up only a small portion of the total weight of EEE, but the potential hazards that even small quantities of these chemicals and metals can cause are serious enough to warrant concern.

The large quantities of e-waste being generated from homes as well as offices have spawned a new industry - the e-waste recycling, which is a lucrative business because these electronics consists of pure metals such as gold and copper. The processing of this waste in India is largely carried out in an informal sector and the operations are primarily rudimentary in nature - mostly backyard operations that causes huge harm to both environment and human

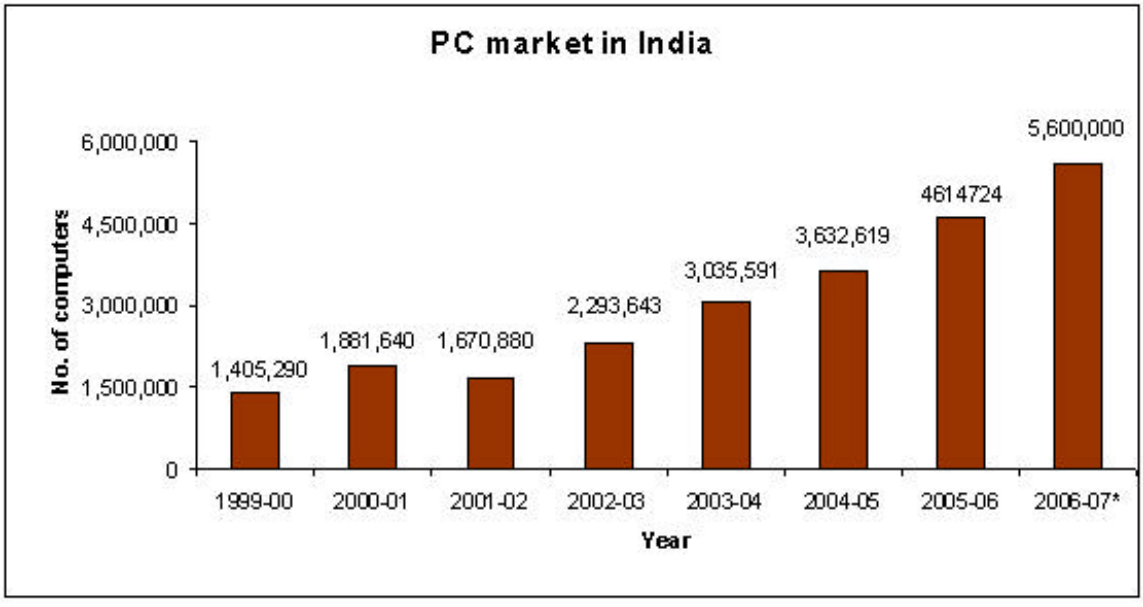
[1] ISuppli Corp, August 2007
[2] Worldwide Consumer Electronics Market (2006), March 2006

health. The informal recycling sector is very well spread out with a vast network of collection, storage, segregation and finally material recovery. Although these operations involve a large section of the population who is today dependent on this trade for their livelihoods, they are also known to employ women and children in different stages of their operation thus exposing them to various toxic processes and endangering their health. These units do not follow any environmental norms and safeguards while processing. The entrepreneurs ignore the proposed hazardous threats to make larger profits and the workers possess very little or no knowledge on toxic issues. Thus, the back yard, make - shift recycling units offloads toxic constituents into the environment. The units flourish and the threat burgeons mainly due to the lack of environmentally unsound recycling processes being practiced in the country as well as the absence of regulations, which need to be strictly implemented.

1.1 Growth of the market

The personal computer (PC) sales figure in India has been very impressive, showing a huge growth from a mere 14,05,290 in 1999-2000 to 46,14,724 in 2005-06 and is projected to touch 56,00,000 in 2006-07. The expected annual average growth rate in the PC is likely to be 21%. The consumption of PC in top four cities (Delhi, Mumbai, Kolkata and Chennai) grew by 25% in the last year. For the laptop market there is more impressive growth, the sales figure has jumped from 50,954 in 2002-2003 to 4,31,834 in 2005-2006 having registered an astonishing growth rate of 143% in 2005-2006[3].

Figure 1: Growth rate of PC markets in India



*Expected annual growth: 21 per cent
Source: Manufacturer's Association for Information Technology (MAIT)

[3] MAIT-IMRB IT Industry Performance Report

The consumer electronics market is one of the largest segments in the electronics industry in India. With a market size of Rs 15949 crores[4]in 2006, catering to a population of more than 1 billion, the consumer electronics industry in India is poised for strong growth in the years to come. iSuppli Corporation, an industry analyst, in their recent report predicts the Indian audio/video consumer electronics industry will grow to Rs. 27019 crores[5] by 2011, rising at a Compound Annual Growth Rate (CAGR) of 10.0 percent from Rs. 18450 crores[6] in 2007. The growth will be aided by a multitude of factors, including growing consumer confidence due to rising incomes and easy financing schemes that are making purchases possible. Television leads the consumer electronic market, and newer technologies like Liquid Crystal Display (LCD) and Plasma Display Panel (PDP) are gaining popularity.

Domestic consumption is reaching significant size to trigger manufacturing in the electronics sector. iSuppli predicts that domestic manufacturing is going to be a key characteristic of this growth in the years to come. Although electronics production has remained a miniscule segment of overall Indian manufacturing for a long time, the trend is gradually changing.

1.2 Generation of e-waste due to obsolescence

Due to the soaring rates of obsolescence, e-waste produces much higher volumes of waste in comparison to other consumer goods. Electronics goods like television or a stereo were earlier purchased with the expectation that they would last for a decade or more. They were repaired and used for years till they became completely dysfunctional. The dysfunctional or the non-working electronics are now rarely taken to a repair shop, as replacement by new product is now often easier and cheaper. This "throwaway" mindset means growing sales of the electronics equipments resulting in increase in corporate profits, particularly when the electronics industry does not have to bear the financial burden of downstream costs.

A preliminary study by Centre for Quality Management System, Jadavpur University carried out in 2005 revealed that roughly 800 computers are becoming obsolete everyday in India whereas 37 MT of mobile phones will become obsolete in Kolkata alone in the year 2008. These figures will be increased with the increased rate of sale of computers and mobile phone sets and improved technology.

There have been various studies, both at the national level and at city level to assess e-waste. According to a national assessment commissioned by Central Pollution Control Board (CPCB) and carried out by IRG Systems South Asia Private Limited (IRGSSA), India generates around 1,46,000 tonnes of e-waste annually. The study was done in 2004 and the current figure might be much more as the last few years has seen tremendous growth in the telecom and IT industry. A recent study by Toxics Link suggests that Mumbai alone might be generating more than 19,000 tonnes of e-waste annually. This study, done in 2007, only takes in account waste generated through four equipments namely computer, television, washing machine and refrigerator.

[4] USD$3.89 billion
[5] USD$6.59 billion
[6] USD $4.5 billion

In India, it is normal to use computers and related hardware for a minimum of 2-5 years depending upon usage, and hence it is unlikely that the same could be 're-used' or 'recycled' for any component level usage and are disposed off as scrap.

Some organizations instead of purchasing computers lease the hardware from either manufacturers or such hardware leasing agencies and return the computers at the end of the contract period, both in working and non-working conditions. Leasing agencies take out hundreds or thousands of computers at a time and resale them to brokers in the reuse/export markets. The volume of leased computers is huge in comparison to sales of new computers to corporations or organisations. Even the governmental institutes and undertakings are now getting into leasing rather than buying computers.

1.3 E-waste Sources

Electronic waste is generated by three major sectors in India:

- Individuals and small businesses
- Large businesses, institutions, banks and government
- Original Equipment Manufacturers (OEMs)

Individuals and small businesses

Electronic equipment, computers in particular, are often discarded by households and small businesses, not because they are broken but simply because new technology has left them obsolete or undesirable. With today's computer industry delivering new technologies and upgrades to the market about every 18 months, the useful life-span of a personal computer has shrunk from four or five years down to two years. Often new software is incompatible or insufficient with older hardware so that users are forced to buy new machines.

Large Corporations, Institutions, Banks and Government

Large organisations upgrade hardware on regular basis. In India, most organisations upgrade their hardware infrastructure at least in every 3-5 years, and at times much faster due to faster depreciation rate.

In India, there is propensity of attaching value to almost all form of waste. Electronics goods are high price items and hence are not dumped in streets or garbage yard. These are stored in houses or warehouses for a long period, passed on or are sold to scrap dealers. But with time, this practice would change. As we have crossed more than a decade of computer revolution in our country, in near future there can be a sudden increase in amount of computers being discarded and recycled in informal recycling markets. The other consumer electronics might also meet the same fate.

1.4 Methods of e-waste disposals practiced globally

Landfill and Incineration - According to the EPA, in 1997 more than 3.2 million tons of e-waste ended up in U.S. landfills[7]. It is thought that most households and small businesses, that disposes rather than stores their obsolete electronic components, send their material to landfills or incinerators rather than take them to recyclers.

All waste landfills leak. Even the best state- of- the- art landfills are not completely secure and a certain amount of chemical and metal leaching is bound to occur. The situation is far worse for the older or less stringently maintained dumpsites. When disposed of in a landfill, e-waste becomes a conglomeration of plastic and steel casings, circuit boards, glass tubes, wires, resistors, capacitors, and other assorted parts and materials. About 70 per cent of heavy metals (including mercury and cadmium) found in landfills come from electronic discards. These heavy metals and other hazardous substances found in electronics can contaminate groundwater. In 2001, CRTs were banned from municipal landfills in California and Massachusetts because of their recognised hazardous nature.

Municipal incinerators are some of the largest point sources for dioxins in the U.S. and Canadian environments and of heavy metal contamination of the atmosphere. Copper, common in e-waste, is a catalyst for dioxin formation. This is of particular concern as the incineration of brominated flame-retardants and PVC leads to the generation of extremely toxic dioxins and furans and copper makes their formation more likely. Some producers send their e-waste to cement kilns for use as an alternative to fuel. But cement kilns present much the same problems posed by incinerators.

Re-use - Re-use constitutes direct second-hand use, or uses after slight modifications are made to the original functioning equipment. Re-use makes up a small percentage (about 3 per cent in 1998) of the computers that have been discarded by their users. These computers are later sold in very small numbers at some recycling stores or are given to schools, or non-profit organisations. School districts that used to accept older computers though now demand more recent generation computers for training students.

Foreign markets, on the other hand, have such cheap labour forces that they can buy working and non-working old computers, repair them at very little cost, and resell them for a profit. While there are no figures available, the amount of computers being exported for reuse is increasingly significant. While extending the usable life of a computer is a good thing, these older units obviously have a limited life span and will end up as waste sooner or later. Thus, these used computers will also end up as e-waste on foreign shores, often in countries that are least able to deal with them appropriately.

Domestic recycling - All of the current information regarding e-waste recycling point out that most of the e-waste recycling happen in developing countries. Recycling in these countries results in toxic exposures to local workers and the open dumping or burning of toxic residues and wastes in these recycling centres. While the recycling of hazardous materials anywhere creates a serious pollution challenge, it can be a disastrous one in an area

[7] Poison PCs and Toxic TVs, SVTC

of the world where the knowledge of, and infrastructure to deal with hazards and waste is almost non-existent.

Large corporations and manufacturers of new equipment tend to have a much higher rate of electronic waste recycling than individuals and small businesses because EPA regulations apply to much of this sector (unlike households and small business who are basically exempt from regulation). About 75 percent of end-of-life electronic products received by electronics recyclers come from new equipment managers and large-scale users (those with more than 500 employees).

Export to developing countries — According to 'Exporting Harm, The High-Tech Trashing of Asia', a report by The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC), 50-80% of the US E-waste is exported to developing countries under the guise of recycling. There are three primary reasons why e-waste is increasingly flooding Asian countries:

• Cheaper labour costs

• Lax environmental and occupational regulations and not well enforced

• It is legal in the U.S., despite international law to the contrary (US not having ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal), to allow export of hazardous E-wastes with no controls whatsoever

Circuit board recycling - It is likely that the most environmentally destructive recycling overall involves the recovery of various components and materials found on electronic circuit boards.

Solder is also collected by slapping the boards on a hard surface such as a rock and is later melted off and sold. While sometimes fans are placed to blow the toxic lead-tin solder fumes away, the exposure on a daily basis is likely to be harmful to the labourers' health.

Acid stripping of chips - Much of the work to remove chips from circuit boards is done for the ultimate purpose of removing precious metals. According to BAN, a very primitive method like acid bath is still being used for this.

Plastic chipping and melting - The plastic parts of e-waste, and in particular the housings of computers, monitors, and plastic keyboard parts, etc are all sent to recycling sites which process plastics. The casings would lye and decay for while, and then plastics would be chipped into small particles. The colour pigments will then be extracted and a transparent plastic liquid will emerge at the end of the process. Often children are employed for this tedious job.

2.0 Purpose, Scope and Methodology

West Bengal, though a late starter in catching up with the information and technology boom has been taking various initiatives in the last few years to attract the IT industry to the state. Kolkata, one of the major cities in India and capital of West Bengal is the centre of this development and also in the middle of an information technology boom.

Recent studies report that the Indian middle class was expected to touch 583 million by 2025, making India the fifth biggest consumer market in the world[8]. The state and the city, in particular, have also seen sudden growth in the income levels, resulting in increasing consumption patterns. In Kolkata, as with the rest of the metros in India, there has been a remarkable rise in the consumption of electrical and electronic equipment. With increasing prosperity and changing lifestyle, people have sought more convenient ways of doing things. Novel technologies are being introduced on daily basis and which are all set to change the way we live. Items such as computers, televisions, mobile phones and stereos have already become commonplace.

Waste is a by-product of growth and development. The ever-increasing growth rate in terms of technology will put an increase on the new generation waste or e-waste. Though the State has chartered the path to development, it has not taken into account and hence not prepared for the accompanying problems. The IT industry growth and the rise in people's preference for advanced equipments and gadgets have added another dimension to the already existing huge problem of Municipal solid waste in Kolkata. E-waste is now a reality in this largest city of Eastern India. Waste from electrical and electronic equipment (WEEE) is considered to be a critical waste stream because of the potentially hazardous nature of it, the consumption of resources and expected growth. As we move relentlessly towards the information age, society is becoming more and more dependent on electrical and electronic equipment. When such equipment reaches the end of its life or becomes redundant through rapid technological change, a waste problem is created. This process is irreversible; hence there is need to assess the problem and find sustainable solutions.

The domestic generation of E-waste has been on rise in the city, and there has been lot of e-waste coming in for recycling from other states as well. But till date, there has been no study to find out the quantum or the hazards associated with the recycling process in the informal sector in and around the city. The IT policy of the government has also not placed any focus on this aspect. As there is hardly any information available on this, there was a need felt to do an e-waste assessment in the city which will contribute towards advocating for an effective policy on electronic waste management in the State and the country

The research focused mainly on understanding the following aspects:

Assessment of the quantity of WEEE generated in Kolkata

- To identify the sources and trade routes of e-waste
- To identify e-waste hotspots in and around Kolkata
- Assess & document the present e-waste recycling system in the informal sector

[8] http://www.mckinsey.com

- To observe the impacts of e-waste recycling on health, safety and the environment.

The scope of the research is largely limited to the study of personal computers. PCs have been chosen as they contribute largely in total e-waste generated because of the high rate of obsolescence and also because they pose a serious environmental threat in terms of the various hazardous materials it contains.

Based on the ownership figures and obsolescence rate, an estimate was also made for waste being generated from television and refrigerators.

Methodology

The study was carried out through various methods like review of existing literature, structured and unstructured interviews, exploratory surveys and photo documentation. Experiences from earlier studies of Toxics Link in Delhi, Chennai and Mumbai were used to plan the study.

The research was carried out in phases-

1. Review of the existing literature.
2. Structured interviews with the industry (public and private) to assess the amount of waste generated.
3. Exploratory survey with various stakeholders to understand their perspective regarding the issue.
4. Exploratory visits and unstructured interviews with the informal recyclers.
5. Observation regarding the health and environmental impacts
6. Analysis of the information collected.

For the assessment of the amount of waste generated in Kolkata, different categories of generators were contacted to find out about their disposal rates and patterns. Mainly three categories were identified for the study and data collection – a) organizations, b) individuals, namely the students, servicemen, small business holders and the academicians, and c) the recyclers and re-users. Organisations were classified as manufacturing industries, service organizations and the IT Sectors and the manufacturers. One to one interaction was conducted in most of the cases and interviews were based on general questions. From all the users, data on computer and its peripheries disposal were taken. For each individual group, the percentage of users who have knowledge about the toxic contents of a typical desktop computer was also investigated. The users were made aware of the present scenario related to recycling etc. and their opinion was sought regarding possible manner of disposal of computers. They were specifically asked to mention whether the manufacturers, the users, the government, the recyclers should shoulder the responsibility of minimizing hazards related to e-waste.

Exploratory surveys and unstructured interviews were conducted mainly to identify areas where e-waste is recycled. Informal discussions were carried out and emerging trails were followed to investigate the areas of such activities. The recycling areas/units were surveyed to assess the conditions of recycling both from an environmental as well as an occupational health perspective.

Limitations

The concept of e-waste is still at a nascent stage in Kolkata and India as well. Hence, the study has the following limitations-

1. There is a lack of accurate data pertaining to e-waste, thus the assessment figures are approximate estimates based on limited information. The assessment only took into account limited equipments.
2. There is lack of awareness and absence of any policy in most organisations regarding e-waste. Hence, many organisations had no records and no response to questions regarding their end-of-life disposal procedures.
3. E-waste recycling, lately, has received a lot of media attention due to the hazardous nature of the activities. This has made the people in the informal recycling sector very cautious, which made it quite difficult to acquire detailed information about the areas of e-waste recycling and the recycling processes.
4. In most places, we did not receive permission to take photographs.

3.0 Kolkata- Emerging E-waste hotspot

West Bengal has been one of India's fastest growing states in last decade, with a 5.2% growth in per capita net SDP. According to a recent study by Associated Chambers of Commerce and Industry (Assocham), West Bengal saw a 15 percent growth in the State's Gross Domestic Product (GDP) from 2001 to 2004. Over the three-year period (between 1998-99 and 2000-01), it was also ranked as the fifth most attractive destination for investments[9]. The state had identified IT as a priority focus sector to be developed into a growth engine. This focus was reflected in the fact that West Bengal was among the first states to articulate an IT policy, (formalised in 2000) which was followed by a special incentive scheme for IT industry introduced in 2001.

Though a late starter in the field of information technology, at the moment, there are more than 250 IT companies which are providing direct employment to over 50,000 professionals. These companies registered an export earning of over Rs 3,500 crore in the financial year ending March 2007.

West Bengal today is home to most leading names in the IT sector, including TCS, Wipro, IBM, Cognizant, PWC, HCL, Genpac, Skytech, Siemens, etc. The department of information technology has been attracting high-end IT companies; KPOs and BPOs to the state to generate more employment and increase export revenues. The government is also trying to develop satellite IT hubs in towns such as Siliguri, Durgapur, Kalyani, Kharagpur and Haldia. While IT parks on Public Private Partnership model have already been launched at Siliguri and Durgapur, efforts are being made to develop an advanced IT park near the IIT at Kharagpur. The vision is to rank among the top-3 IT States in India by 2010 and contribute 15-20 per cent of the country's total IT revenues[10]. Its GDP in the service sector since 2001 has also grown at a blistering 25 percent. Banking and insurance led that sector with 56 percent growth from 2001 to 2004.

Kolkata, is the biggest and most important commercial point in the eastern part of the country. The informal recycling business has been going on this urban agglomerate for decades. Wastes like plastic, metal, glass etc have traditionally been processed in Kolkata and E-waste has joined this 'elite' group in recent times. As it is an important port city, most of the international trade of the eastern region of India also passes through Kolkata.

3.1 Assessment Of The Quantity Of WEEE Generated In Kolkata On Sampling Basis

A number of international studies have attempted to calculate quantity of Waste from Electrical and Electronics Equipments. The calculation methods practiced by these studies vary widely, with no clear consensus on the most appropriate method to be adopted. There have been also few previous attempts to assess the WEEE in different cities in India. Two basic approaches were used in this study. The first method involves sample survey of the

[9] [9] As per the Central Statistical Organisation (CSO)
[10] http://pd.cpim.org/2007/0624/06242007_buddhadev.htm

generators of waste. The sample was chosen randomly. This method assesses the waste generated by these sample users in a limited period. This figure is then extrapolated to find out the total waste generation in the city. This approach has been used in this study to calculate the waste generated from computer and its peripherals in Kolkata. This method is also useful in identifying change in consumer behaviour due to technology change.

The second method is based on the material flows or market supply approach, which is based on the figures of sales of items of electrical and electronic equipment. The obsolescence rate (different for different equipments) applied to these sales figures gives us theoretical waste generation for each of the selected items. Since the computer sales figure for Kolkata was unavailable, this method could not be used for quantification of computer waste. But for calculation of waste being generated from television and refrigerators, a modification of this method has been used in this report.

Method 1

For assessing waste generating from computer and peripherals, 20 manufacturing companies, 50 service units, and 20 government offices were visited. Our trained field personnel contacted a representative sample of establishments personally and relevant pieces of information on the IT products were collected. More than 1000 household were also contacted for the study. 8 manufacturing units, 30 service units and 5 government organisations responded to the queries. From these users, their disposal patterns and rates for numbers of PCs (including monitor), laptops, UPS, servers, printers, batteries, disk drives and key drives etc were sought. Many of the business houses including government offices declined to provide data as they do not have the same in collated form or they don't have the centralised system of handling the issue.

Responses from all manufacturing units were collected, which gave us an estimation of the waste generated from computers and its peripherals by the surveyed 8 manufacturing units. The survey revealed that the manufacturing units in Kolkata disposed off 200 PCs, 8 servers, 22 printer, 400 keyboards etc in the period of last three years. These were then multiplied with the standard considered weight of these equipments to obtain the waste generated by these 8 units in tonnage. Similar estimations were made for the service units and governments units.

The study reveals that the waste (by weight) generated by the surveyed Manufacturing, Service and Government units are 6, 227 and 32 MT respectively. Around 1500 households were also interviewed to find out their disposal rates and patterns. The waste generated by them was in tune of 10MT. So the total waste generated in last three years by these four segments of users is approximately 275 MT.

Followings is the summary of the data collected on quantity of WEEE (mainly the computers) generated:

Table 1: Waste generated by the Surveyed Units

Sectors Studied	Amount Of E –Wastes	In Weight
1) Manufacturing Sectors (8 Engineering Manufacturing Units responded to the study)	1) Pc Config.286,386,486, 8084,P-I,P-II) -200 Nos. 2) Server --------- 8 Nos. 3) Printer -------- 22 Nos. 4) Cadmium Batteries --------- 190 Nos. 5) Monitor --------- 2 Nos. 6) Optical disk drive --------- 2 Nos. 7) Chart Printer ---------- 5 Nos. 8) Keyboard ------- 400 Nos.	200 X 22 Kg. + 8 x 40 Kg. + 22 X 5KG. + 190 X 4KG + 2 X 10 KG +2 X 2 KG +5X 5KG+ + 400X0.75 KG + = 5,960 KG **= 6 MT**
2) Service Units (30 Service units responded to the study)	1) Pc (Config 286,386,486,8084,P-I,P-II,P-III)-10,200 Nos. 2) Printer -------- 60 Nos. 3) Cadmium Batteries ------ 440 Nos. 4) Monitor --------- 20 Nos. 5) Laptop ---------- 18 Nos. 6) Optical disk drive --------- 2 Nos. 7) Chart Printer ---------- 5 Nos. 8) Keyboard ------- 400 Nos. 9) DMPS ------ 10 Nos. 10) UPS -------- 20 Nos.	10,200 X 22 Kg. + 60 x 5Kg. + 440 X 4KG. + 20 X 10KG + 18 X 2.5 KG +2 X 2 KG +5X 5KG+ 400X0.75 KG + 10X 5 + 20 X 5 KG = 227,184 KG **= 227 MT**
3) Government sectors (5 Government organisations responded to the study)	1) Pc (Config 286,386,486,8084,P-I,P-II,P-III)-600Nos. 2) Printer -------- 60 Nos. 3) Main frame computer --------- 165 Nos. 4) Terminal ------ 200 Nos. 5) Batteries --------- 800 Nos. 6) Monitor ---------- 50 Nos. 7) Laptop ---------- 5 Nos. 8) Optical disk drive --------- 4 Nos. 9) Magnatic tape drive --------- 102 Nos. 10) Chart Printer ------- 8 Nos. 11) Keyboard ------- 250 Nos. 12) DMPS ------ 10 Nos. 13) BMP --------- 450 Nos. 14) UPS -------- 15 Nos.	600 X 22 Kg. + 60 X 5KG. + 165 X 50 KG + 200 X 10 KG +800 X 4 KG + 50 X 10 KG +5 X 2.5 KG +4X 2KG+102 X 8KG + 8X5 KG +250X0.75 KG + 475X 8 = 32,318 KG **= 32 MT**
4) **House holds** (1,500 Residences responded to the study. Feedback mainly collected from College students, professors etc for their own personal computers)	1) Pc (8084,P-I,P-II,P-III,128 MB RAM) – 400 2) Server --------- 8 3) Printer -------- 22 4) Batteries --------- 190 5) Monitor --------- 2 6) Optical disk drive --------- 2 7) Keyboard ------- 360	400 X 22 Kg. + 60 X 5KG. + 8 X 15 KG + 22X5 KG +2 X 10 KG + 190 X 2 KG +360X0.75 KG = 10,030 KG **= 10 MT**

The findings also revealed that some PCs are wasted completely and hence the whole unit is disposed off at one time. But in certain cases, only certain components or peripherals became redundant and hence replaced. The table above shows that peripherals like keyboards are disposed off more frequently. The survey of the units also revealed that the obsolescence rate in most cases was around 3 years.

3.1.1 Analysis

On the basis of the findings, a calculation of e waste generated in Kolkata through Computer and its peripherals was made.

Table 1 above showed that the amount of E-waste generated by 8 Manufacturing units is approximately 6 MT, meaning each unit is generating around 0.75MT in three years and 0.25 MT annually. As per Confederation of Indian Industry (CII) there are 364 manufacturing units in Kolkata. This means around 90 MT (364*0.25) of E-waste is generated by the manufacturing sector alone. Similar calculations for the service sector and the government organisations revealed that the waste generated by them are approximately 1562 and 213 MT respectively.

For the E-waste generation from households, we have calculated on the basis of the penetration level of computers in the city. According to MAIT-IMRB conducted ITOPS 2006 Pro study (January 2007), the Internet usage in households segment in the top 4 cities of India (Delhi, Mumbai, Kolkata and Chennai) is 18%, which would mean minimum computer penetration also at 18%. Based on census 2001 and the average household size in India, Kolkata has around 2.6 million households. 18% penetration would mean 468000 households with computers. The survey suggested around 10MT of E-waste from 1500 households in three years or 0.0022 MT annually from each household. For 4.68 lakh households, the total generation will be approximately 1030 MT.

Table 2: Total waste generated through computer and its peripherals

	Sector studied	**Wt of e-waste**	**Period of obsolescence**	**No of units observed**	**E waste MT / annum /unit**	**No of actual units exists**	**Total amount generated annually**
1	Manufacturing	6MT	3 Years	8	0.25	364 (as per CII)	91MT
2	Service	227MT	-DO	30	2.52	IT 300 + 320 =620	1,564MT
3	Government org.	32MT	DO	5	2.13	100	213 MT
4	Households	10MT	DO	1500	0.0022	18% of 2.6 million* households =468000	1030 MT
						TOTAL	2, 898 MT

Note:

1. Data on the number of units existing in each sector has been collected from many sources, which are not available at any one place and may have an error factor to 10 per cent.
2. The data received are taken directly from the specific organization. Data on sampling will not give a correct picture but gives an indication of the e-waste generated.

* Population of Kolkata, according to census 2001, is 13,216,546 and the average household size in India is 5.

The amount of accumulated e-waste generated in last three years is 275 MT from nearly 43 organisations who use computer in bigger way. Extrapolating the data for a period of 3 year obsolesce rate and 30,000 individual users and for a number of organisations (620 service organizations and 364 manufacturing organizations & 100 govt organisations) and including other users considering the sale volume per year, the e-waste volume comes to nearly **2,898 MT per year**.

Method 2

To estimate the e-waste from other EEEs, we have used two products – TVs and refrigerators as representatives of consumer electronics. Based on household ownership data that we gathered from CEAMA (The Consumer Electronics and Appliances Manufacturers Association), we use the 'Estimate Method' also known as the 'Consumption & Use Method', which has been previously, used in WEEE estimation in Netherlands as well as UK.

According to the information from CEAMA, the population of colour TVs and refrigerators in Kolkata in 2006 is 3.3 and 0.4 million respectively. Global studies have shown that these two equipments have a 15-year life. Considering the average weight of the TV and refrigerators as 24 and 30 kg respectively, the total wastes generated annually from these are 5280 and 800 MT (Table 3).

Table 3: Waste generated through consumer electronics

Equipment	Ownership	Disposal Rate	Average Appliance Weight	E-Waste quantity per year (MT)
Colour TVs	3,300,000	1/15 years	24	5280
Refrigerators	400,000	1/15 years	30	800
Total				**6,080**

The two representative equipments generate approximately 6080 MT annually. If we compile both figures of waste generate by PCs and by selected household electronic and electrical items the total waste generated in the city is expected to be around **8,978 MT per annum**. (Table 4) This figure is very conservative, as it does not take into account the waste generated from the entire range of electrical and electronic equipments.

Table 4: Total WEEE generation in Kolkata

Equipment	Method used	Quantity (in MT)
Computer and its peripherals	Survey	2898
Other EEE	Market Supply	6080
Total		**8978**

Also the waste processed in the city is much more on account of the waste coming from the other centres in West Bengal as well as from outside the State. Informal discussions with the recyclers suggest there is huge quantity of waste landing here from all corners of the country.

3.2 Awareness on e-wastes

The study results show that only 40 per cent of the people interviewed are acquainted with the term e-waste, while 50 per cent of the people are totally ignorant of any toxic content of a computer. In case of academicians the ratio is slightly higher - nearly 60, but amongst the university students it is 65. For servicemen the ratio is 40:60, while for the business community it is 30:70. All the persons surveyed were made aware of the risks associated with indiscriminate disposal of electronic waste and type of recycling industry that exists in and around Kolkata. Among the choices that were given, the majority preferred to go for buyback / exchange plan. The second choice was to give the obsolete computers to a centralized collection center set up by authorized recyclers. These two options came from 85 per cent of the users. It is to be noted that in both the cases 70 per cent of the users expects returns in exchange money.

On the question of sharing responsibilities of e-waste management, an opinion survey shows that 35 per cent of the respondents put the responsibility with the government, 60 per cent placed the responsibility on the manufacturers and 5 per cent did not have any solution.

The study indicated that most of the users wanted an E-Waste management system to be governed by a structured regulation. This, they felt, would also generate a scope for some business. The study also revealed that the consumers felt that the manufacturers should pay for the disposal procedure and the users must be made more aware on the issues and the ill effects of e-wastes. There should be warnings and instructions by the manufacturer on each of the packages and also should clearly indicate the responsibilities of manufacturer in the process of its disposal. An encouraging 70 per cent of the target group of study opined that the manufacturer should have a clear environment friendly and consumer friendly procedure for the disposal of the computers, which are going under the umbrella of buy-back system.

3.3 Import of E-waste

The study could not find any concrete information on import in Kolkata. The port authorities as well as the people dealing with e-waste were contacted. Though no confirmed details on the mode and quantity could be obtained, the informal sources in the market did reveal that E-waste does land in the Khidderpur port. The import quantity, though not known, is going to increase the load of the waste being recycled in the city.

4.0 E-Waste recycling in Kolkata

In industrialized countries e-waste dumping in landfills is leading to heavy metal contamination of ground water system. However, though different the India the scenario is quite alarming in itself. In a poor and at the same time populous country like India, there exists a huge low cost second hand market for repaired and recycled electronic items. This survey of e-waste in Kolkata has collected data that almost 30 per cent of the volume of total obsolete electronic items is sold in Chandni Market, which plays a key role in e-waste route of Kolkata, only to be reused. The remaining 25 per cent, which can be called as e-waste in the truest sense of the term, as it has lost their identity as electronic items, still contain many valuable resources in terms of costly metals. In Grey street & Phoolbagan some recyclers were found to extract some metals by processes like chemical treatment and burning in a very small way. They were reluctant to give details.

In course of establishing life cycle of the e-waste from the manufacturers via users and various stakeholders to the recyclers, several visits to Dhapa Municipal dumping ground revealed that the amount of visible electronic wastes like computer monitor or PC in the dumpsite could not be found. But many keyboards could be found. Interviews with rag pickers and local dealers led to the conclusion that nothing originating from metal or plastic remains in the dumping ground. Every single item is picked up and a large number of poor people earn a livelihood from these. But those that are not recyclable or reusable are dumped anywhere and everywhere.

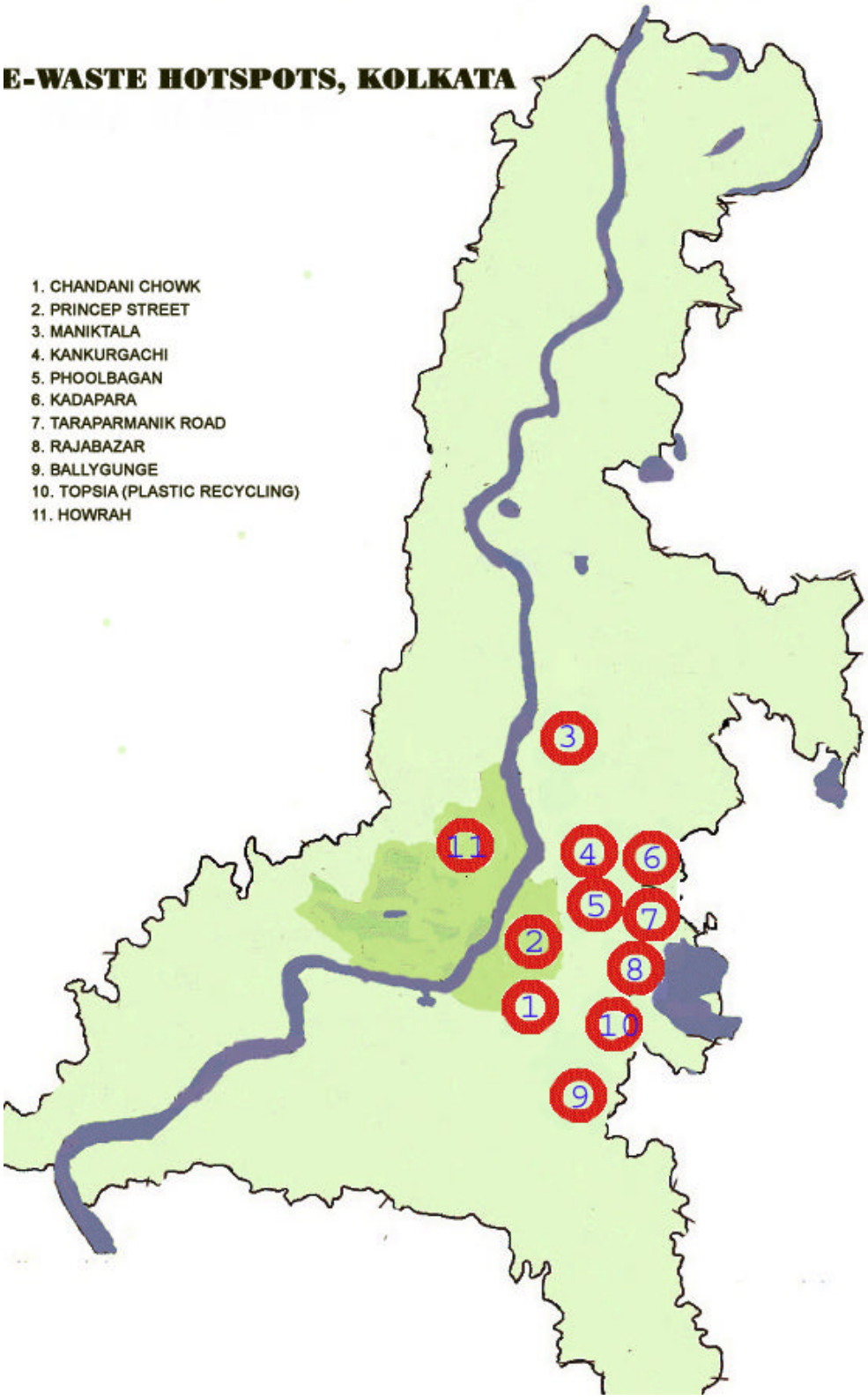
4.1 E-Waste Hotspots

Kolkata city and the neighboring Howrah district have large scrap trade and recycling market and E-waste is just another commodity in the long list of items dealt with.

The Key areas in and around Kolkata (Fig1) dealing with E-waste recycling and the related processes are:

- Chandni Chowk
- Biplabi Anukul Chandra Street (Princep Street)
- Maniktala
- Phoolbagan
- Kadapara
- Rajabazar
- Bajrang Bali (Howrah)
- Ghusuri (Howrah)
- Topsia (Plastic Recycling)
- Grey Street.

Figure 2: Map of Kolkata- E waste hotspots



4.2 Recycling Industry Structure- Generation of waste and supply chain

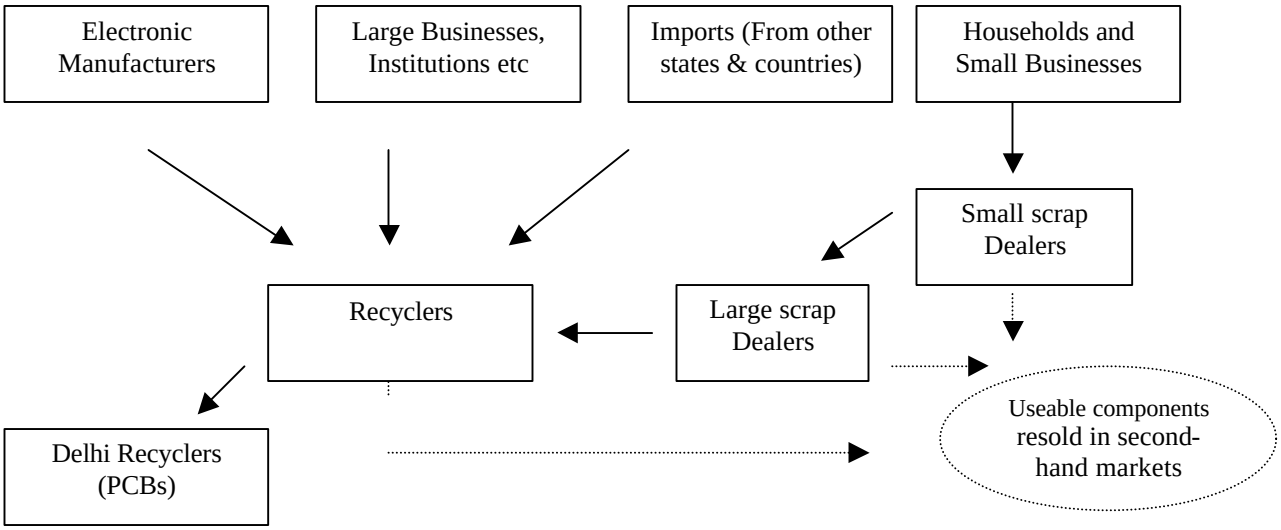
For years, the *kabadiwala*, going on his cycle from home to home collecting waste, has been the symbol of recycling in India. Paper, plastic, glass, metal- whatever could be recycled was sold to this mobile trash collector.

As our cities and consumerist aspirations have grown, the 'use-and-throw' attitude of urban India has also intensified manifold. Every year, technological advancements increase redundancy and decrease prices of various goods, particularly electronic and electrical.

Therefore, the contents of the *kabadiwala's* sack have slowly changed. These days, it includes E-waste too – from old transistor radios to even defunct CPUs and computer monitors!

The increasing stream of E-waste coming out of companies and households has also given birth to a fledgling organized sector in recycling. The need of proper aggregation and disposal of a wide variety of e-waste has given rise to increasingly specialized players. *(Fig 2)*

Figure 2:Kolkata's E-Waste: Sources & Users Matrix



Kolkata, being one of the major cities in India and the capital of West Bengal, is an important commercial hub. All major industries, banks, public sectors have large presence in Kolkata and are experiencing growth being fuelled by the rapid pace of digitisation and computerization. This has made the city one of the major generators of electronic and electrical waste in the country and also one of its' main recycling hubs. Like most other cities in the country, the primary sources of E-waste in Kolkata are large businesses & institutions, both private and the public. In the absence of any environmentally sound and organized management system in the city, obsolete and used electronics goods are being recycled by

the recyclers who obtain such goods through the process of auctions and tenders and also through negotiated prices from individual households.

Smaller businesses and households sell their E-waste mainly to their local kabadiwalas. If the goods are in reasonable shape, they may be able to exchange them for new products with electronics retailers. From here, products that are in good shape are resold, either in toto or as parts, in the Chandni Chowk area in Central Kolkata. If not, they reach the large scrap dealers.

The large scrap traders, through primarily aggregators and resellers, sometimes also engage in direct recycling activity at their shops.

Some of the recyclers in the market confirmed that they also buy e-waste, both from outside the state of West Bengal and from outside the country. For the former, they keep a look out for tender / auction advertisements in national dailies and travel to different parts of the country to pick up lots. States like Maharashtra, Orissa and Madhya Pradesh top their list for such purchases.

According to sources in the market, apart from the national sources, a small amount of e-waste is imported and arrives at the Khidderpur dock. Sources also claim that imported computer scrap parts land in Vishakapatnam in large quantities these days and a part of these also finds its way to Kolkata for recycling.

A small amount of manufacturing waste comes in from electronic / electrical goods manufacturers. Some companies in the newly developed IT areas of the city contribute towards this. With the IT sector growing in this state, especially in the Kolkata city, this waste is only going to increase in the coming time.

Sources of E-waste in the recycling market

- **Local Generation**
- **Manufacturing Waste**
- **Intra and inter state**
- **Imports**

After re-saleable goods and parts are all removed, the recyclers process the remaining e-waste. Some of these are small-scale recyclers, such as those in Princep Street, right behind the second hand and parts market at Chandni Chowk. Others have large godowns in clusters in areas like Kankurgachi, Phoolbagan, Kadapara, Maniktala and in the neighbouring town of Howrah. (*See Kolkata E Waste – Hot Spots*)

A unique feature to Kolkata E-waste recycling is that there are hardly any exclusive E-waste recyclers or traders. Most of the businessmen involved in this are mixed scrap dealers and hence deal with all kinds of waste like furniture, metal scrap etc. The probes also revealed that there are hardly any new recyclers who have come into the market to take this up. The existing players who were already in the recycling business have added another product range and taken up E-waste recycling.

According to market sources, there are around 400-500 units working with this kind of waste.

4.3 E Waste in Kolkata: Sample Recycling Processes

- Dismantling of CPUs and other computer peripherals like keyboard, printers etc..
- Dissembling of monitor to extract components like glass and metal
- Surface heating of PWB to extract components.
- Stripping and burning of PVC wires and cables to extract copper
- Regunning of Cathode Ray Tube (CRT).
- Shredding of plastic
- Recovery of gold from pins
- Recycling of fluorescent lights
- Extraction of various components from transformers.

Most of the activity in Kolkata involves physical dismantling by basic tools and bare hands. The CPUs, monitors, printers and other heavy goods like refrigerator, washing machines are all manually taken apart. The components, which are saleable, are sold in the second hand market and the remaining components are further dismantled for mainly extraction of metals. Some of the other valuable materials like glass, plastic etc are also extracted and the remaining unsold waste is just dumped in the nearby areas. This finally ends up in the municipal waste.

For example, in monitors firstly the plastic cover or casing is detached. The picture tube or the CRTs are then separated and sold for regunning, which are mainly then used in local television manufacturing. The other valuable materials like copper from the yoke and circuit boards are also removed. In case of defective CRTs, they are broken down further and glass is sold in the market and frame is dumped in the municipal dump.

For copper and aluminum extraction from different types of wires, two different kinds of methods are used- Manual stripping of wires by bare hands and open burning. For manual stripping, tools like knives and pliers are used to cut and pull the plastic casing. Apart from the metal extracted in this process, the plastic is also sold in the market. The recyclers resort to open burning of wires when it is not possible to strip them to extract copper. The wires are put on fire in the open space and the metal is recovered from it. The value of the copper thus extracted is around 30-40 rupees less than the type extracted through stripping.

For the gold extraction from the pins, the process is unknown as it is done clandestinely. The areas of such operations as well as method used could not be traced.

Note: Some of the more complicated processes, such as extraction of precious metals from Printed Circuit Boards are not done in Kolkata. Most PCBs are sold to dealers from Delhi, which is a hub for this particular acid-bath recycling process.

4.4: Closer look at the hotspots

Chandni Chowk – Kolkata's E-Waste Repository: At the front-end of this busy commercial area in the heart of the city is a big market for second-hand electronic goods. Located in Central Kolkata, this market has almost everything electronics can offer - from a CPU to a computer monitor, from a DVD drive to a capacitor.

The main street is lined up with hawkers who sell a variety of items from temporary stalls at rock-bottom prices. There are around 25 shops that sell second hand components for computers and other electronic goods like TVs, audio systems, mobile phones etc. Shop owners get bulk of their junk from small offices that sell their discarded computers, printers and other computer peripherals. A lot of material also comes from the scrap dealers and recyclers who sell working components in this market.

The clientele here includes lab technicians, low-cost PC assemblers and electronics hobbyists like college students. There are 30-odd repair shops on the street and they too use the second hand parts that reach the market.

Second- hand Working Component	Price Approx. (In Rupees)
Monitor (Colour)	800
Monitor (B/W)	150
CPU	600
Picture Tube	250

The scrap dealers prefer to identify all such assemblies, which are fully functional and sell them off to prospective buyers. In case the assemblies are not functional and cannot be disposed of as such, the serviceable components are broken down and disposed off and the rest of the waste is sold to the final stage recyclers for extraction of raw materials. Small scale recycling happens in places like Princep Street right behind Chandni Chowk.

Princep Street: This residential area, right behind the Chandni Chowk market, is a busy recycling area. Heaps of everything from big electronic parts like a transformer to small bunches of wires can be found in the by lanes. Labourers work all day here, extracting value out of everything possible. Copper extraction by burning of the PVC seething is another process, which is widely followed in all these areas. Burning of thin copper wires is more often on Sundays, when the market is closed and the State Pollution Control Board and local police are unlikely to visit.

Kankurgachi, Phoolbagan, Kadapara, Maniktala: Recyclers who deal with conventional scrap have been historically based in these areas. These units are usually open godowns with huge piles of goods ready to be broken down. Temporary workers are hired on a need-only basis to break down E-waste. The processes being used are rudimentary and usually involve little more than hammering to extract saleable materials.

These areas also have a few lead battery recycling units. The working conditions in these units are appalling and the methods used to break open the batteries and remove the lead plates very hazardous. Women and children are mainly involved in these operations. There is hardly any precaution taken for safeguarding against the harmful effects of lead or the acid spilled in the process.

Tara Pramanik Road- In the narrow bylanes of this residential area near Girish Park in Central Kolkata, one can find many small copper melting units. They process copper from various sources, including electronic waste. Typically, units are very small, with no ventilation. Often, one corner of the room houses the furnace where the copper materials are burned down and the corner just across it serves as the kitchen for the labourers! (*see picture*)

Rajabazar- Rajabazar is a semi-commercial area with shops that deal with electronics and electrical products. Refrigerators, washing machines, cables are broken down quite openly in this area. This area is also known for its aluminum melting units. The conditions of these units are also very similar to the ones in Tara Pramanik road.

Grey Street : The study team has observed some two tiny units on road side who cleans some parts of e-wastes in acids and by burning for extracting metals. The effluents are disposed off in municipal drains. Of course, those are tiny units without any permanent set up.

Howrah (including Bajrangbali and Ghusuri) - The adjoining town of Howrah has much bigger units dealing with all kinds of waste including E-waste. Though it is well known that there are several units processing hazardous waste here, no one was willing to speak about it.

According to a source, lot of PVC wire burning for copper extraction happens on the banks of the Ganga. Those involved in this work are aware of its illegal nature and hence burning mostly takes place in the evenings to avoid public attention.

Most people in this business are aware of the pollution problems and the units have to regularly bribe the authorities to run their businesses.

4.5 Salient features of e-waste recycling in Kolkata

Low Cost:

The informal recycling trade is another reflects the urban poverty in India and Kolkata. Most workers who are engaged in this trade are poor with hardly any skill sets. These workers like most urban poor have very meager subsistence and take on this trade on account of unavailability of other means of livelihood. They are mostly locals and migrants who come in from the neighboring state of Bihar. The availability of cheap labour makes recycling a profitable business in Kolkata. In most of the areas visited, one can see people of all ages involved in this. The labourers earn between around 120-150 rupees daily depending on their experience in dealing with this kind of waste. Labourers, including women and children are routinely involved in these operations. They generally work on contract basis from 9am to 6pm, six days a week and are paid daily or weekly.

Rudimentary recovery processes:

The traders/recyclers dealing with WEEE in Kolkata are not just e-waste recyclers. Most are mixed scrap dealers and recyclers. One of the reasons cited for this is that the flow of e-waste scrap is irregular and therefore not solely sufficient to ensure economic survival.

This lack of specialisation translates into very basic and crude processes and low efficiency in recovery of value from recyclable e-waste. Hammers, screwdrivers, pliers, chisels and makeshift furnaces are the tools of trade among Kolkata's recyclers.

Lack of knowledge of health/environmental hazards:

The mixed nature of scrap processed also means the workers are largely unaware of the risks unique to breaking down of e-waste. A whole range of such processing is done in the dark lanes of the recycling areas in Kolkata (*see E-Waste in Kolkata: Sample Recycling Processes*) Workers recovering glass by hammering CRTs or heating PCBs to remove capacitors are a common sight on the pavements around the Chandni Chowk area. Materials considered non-salvageable is simply dumped in the streets or in municipal garbage dumps.

Young children below 14 years of age are often employed in stripping PVC wires for copper extraction. Thin wires are burnt to melt the plastic coating in several of the narrow lanes leading to residences in the area. Most of the burning activity takes places on Sundays when the market is closed, to avoid trouble from the State Pollution Control Board and local police.

In Princep Street (now known Biplabi Anukul Chandra Street) just behind Chandni Chowk, one can also find piles of fluorescent tubes. End-use and manufacturing waste arrives here at around Rs. 2/- per kg. The unbroken tubes are sold to factories at around Rs. 3/- per kg, to be cut and made into smaller tubes. The broken ones are crushed and sold to glass factories for around a rupee a kilo. These are used in the manufacture of glass bottles. Aluminum is also recovered and sold, currently at around Rs. 100/- per kilo.

Here too, there is no awareness regarding the mercury hazard in breaking down these tubes and hence no precautions are taken to safeguard the workers.

No precautionary safeguards like gloves and masks are used during any of the recycling processes. Bare hands do the extraction of components and metals.

5.0 Conclusion and recommendations

Kolkata is one of largest E-waste generating city in the country. Being the hub of the eastern region of India, it is also one of the major recycling centres. Though the city processes a large amount of WEEE, there is no formal recycling centre in the city and most of these hazardous waste is being processed in the informal sector where there is no precautions taken for either occupational exposure to the materials or for the damage caused to the environment. The state has also not looked at any system for the collection, treatment, reuse, recycling and final disposal of the e-waste from various sources. In absence of any regulation, this inadequacy has resulted in compounding the problem of E-waste.

The estimated amount of E-waste generated in the city is only a part of this enormous problem. The waste being brought in for recycling from various parts of the country further complicates this growing problem. Though during this study no information could be obtained regarding the import of such hazardous waste, this aspect cannot be completely ignored. Kolkata, an important port in the eastern part of the country, must be also recipient of illegal imports of E-waste, which is taking place in all the major ports of India.

The study has also highlighted the lack of awareness at all levels from manufacturers to the consumers. Lack of environmentally safe and socially responsible disposal of e-waste has left us in little doubt that there is a need for regulation and a sustainable system to manage this critical waste. Green purchasing policies by bulk users can also contribute in a large way.

The industry, which is actively participating in finding a solution to the e-waste problem in European countries, has till now not taken any initiative in this direction in India. They can contribute in a major way by designing products with less hazardous materials and also by products take back programs. Extended producer responsibility (EPR), where the producers take responsibility of equipments when it is discarded is the most effective method for sustainable E-waste management.

Recycling sector has also given an indication that this problem can be converted into an opportunity. With the growing middle class and their growing need for technologically advanced products, generation of such waste is only going to increase in the coming future. The recyclers in the city, with very small capacity, have shown that there is much to be gained from this. But the state machinery needs to act as a watchdog and ensure safe, effective, hazard free, recycling and recovery. There is huge scope for development of infrastructure to effectively manage this waste and the states needs to put system in place and create incentives for it. Organised, eco-friendly recycling can generate employment and also be a source of revenue to the state.

Key Findings

- Kolkata generates roughly 9,000 tonnes of WEEE annually. This figure includes computers and its peripherals, television and refrigerators. This is a conservative estimate as several other electronic and electronic equipments like mobile phones;

washing machine, DVD players, MP3 players and air conditioners etc have not been included in this estimation. Around 3000 tonnes of waste is generated only from computer and its peripherals.

- Kolkata is the hub of commercial activities in the eastern part of the country and hence almost all major companies; banks have their presence in the city. This is one of the main reasons for the substantial E-waste generation.

- There is very little awareness among the consumers in the city regarding the hazards of improper disposal of EEE.

- Kolkata has a thriving informal E-waste recycling trade. The existing large network of mixed metal scrap dealers are now finding E- waste as another major source of scrap.

- The quantity of E-waste being traded and recycled in the city might be much more than the domestic generation of 9,000 tonnes as the city traders also bring in waste from other states like Maharashtra, Orissa and Madhya Pradesh etc through tenders and auctions. Unofficial sources also claim that E-waste is being imported and lands up in the Khidderpur dock.

- The major hotspots for E-waste trade and recycling in and around Kolkata are Chandni Chowk, Princep Street, Maniktala, Phoolbagan, Kadapara, Rajabazar and Howrah.

- Components like Printed Circuit Boards (PCBs) are sent to Delhi for recycling, mainly for copper extraction.

- The methods used for dismantling and recycling E-waste are very crude and have no norms for occupational or environmental safety. Open burning of wires.

Key Recommendations

- There is an urgent need for enabling regulation to manage E-waste. A comprehensive legislation based on the basic principles of the environmental justice- 'precautionary principle' and 'polluter pays' should be the overriding principles guiding this.

- An EPR framework, in which the industry takes responsibility of the products put in the market, should be a major component of the proposed system.

- Ban imports of WEEE

- The system should utilise the strengths of the existing resources in collection and segregation.

- The government should look at providing incentives to encourage infrastructure development for environmentally sound recycling.

- A regulation on cleaner material usage can help in promoting sustainable production.

References

1. www.toxicslink.org
2. Scrapping the Hitech Myth, Toxics Link, 2003
3. Mumbai: Choking on E-Waste - A study on the status of e-waste in Mumbai, Toxics Link, 2007
4. Exporting Harm, The High-Tech Trashing of Asia, The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC), 2002
5. ITOPS 2006 Pro study, MAIT-IMRB, January 2007
6. www.computertakeback.com
7. http://www.e-waste.in/
8. www.greenpeace.org
9. www.mait.com
10. http://www.uneptie.org/pc/pc/waste/e_waste_faq.htm
11. http://www.e-waste.in/
12. http://svtc.etoxics.org/site/PageServer
13. http://www.ban.org/

Annexure 1

Hazards of e-waste

Although it is less known, e-waste contains many toxic substances (such as lead and cadmium in 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 (PCBs) in older capacitors and transformers; and brominated flame retardants on printed circuit boards, plastic casings, cables and Polyvinyl Chloride (PVC) Cable insulation that release highly toxic dioxins and furans when burned to retrieve copper from the wires. E-waste contains over thousand different substances, many of which create serious pollution upon improper disposal.

Due to the hazards involved, disposing and recycling e-waste has serious legal and environmental implications. When computer waste is dumped in landfill or incinerated, it possesses significant contamination problems. Landfills leach toxins into groundwater and incinerators emit toxic air pollutants including dioxins. Likewise, the recycling of computers has serious occupational and environmental implications, particularly when the recycling industry is often marginally profitable at best and often cannot afford to take the necessary precautions to protect the environment and worker health.

Lead - The negative effects of lead are well established and recognized. Lead causes damage to the central and peripheral nervous systems, blood systems, kidney and reproductive system in humans. Effects on the endocrine system have been observed and its serious negative effects on children's brain development are well documented. Lead accumulates in the environment and has high acute and chronic effects on plants, animals and micro-organisms. The main applications of lead in computers are glass panels and gasket (frit) in computer monitors (3-8 pounds per monitor), and solder in printed circuit boards and other components.

Cadmium - Cadmium compounds are toxic with a possible risk of irreversible effects on human health, and accumulate in the human body, particularly the kidneys. Cadmium occurs in certain components such as SMD chip resistors, infrared detectors, and semiconductor chips. Cadmium is also a plastic stabilizer and some older cathode ray tubes contain cadmium.

Mercury - Mercury can cause damage to various organs including the brain and kidneys, as well as the foetus. Most importantly, the developing foetus is highly susceptible through maternal exposure to mercury. When inorganic mercury spreads out in the water, it is transformed to Methyl Mercury in the bottom sediments. Methyl mercury easily accumulates in living organisms and concentrates through the food chain, particularly via fish. It is estimated that 22 per cent of the yearly world consumption of mercury is used in electrical and electronic equipment. It is used in thermostats, sensors, relays, switches (e.g. on printed circuit boards and in measuring equipment), medical equipment, lamps, and mobile phones and in batteries. Mercury, used in flat panel displays, will likely increase as their use replaces cathode ray tubes.

Hexavalent Chromium/Chromium VI - Chromium VI is still used as corrosion protection of untreated and galvanized steel plates and as a decorative or hardener for steel housings. It easily passes through cell membranes and is then absorbed— producing various toxic effects in contaminated cells. Chromium VI can cause damage to DNA and is extremely toxic in the environment.

Plastics including PVC - Plastics make up 6 to 7 Kg. of an average computer. The largest volume of plastics (26 per cent) used in electronics has been Poly Vinyl Chloride (PVC). PVC is mainly found in cabling and computer housings, although many computer moulding are now made with the somewhat more benign ABS plastics. PVC is used for its fire-retardant properties. As with many other chlorine-containing compounds, dioxin can be formed when PVC is burned within a certain temperature range.

Brominated Flame Retardants (BFRs) - BFRs are used in the plastic housings of electronic equipment and in circuit boards to prevent flammability. More than 50 per cent of BFR usage in the electronics industry consists of tetrabromobisphenol A (TBBPA), 10 per cent is polybrominated diphenyl ethers (PBDEs) and less than 1 per cent is polybrominated biphenyls (PBB).

Barium - Barium is a soft silvery-white metal that is used in computers in the front panel of a CRT, to protect users from radiation. Studies have shown that short-term exposure to barium has caused brain swelling, muscle weakness, damage to the heart, liver, and spleen. There is still a lack of data on the effects of chronic barium exposures to humans. Animal studies, however, reveal increased blood pressure and changes in the heart from ingesting barium over a long period of time.

Beryllium - Beryllium is a steel-grey metal that is extremely lightweight, hard, a good conductor of electricity and heat, and is non-magnetic. These properties make beryllium suitable for many industrial uses, including, electronic applications such as computers. In computers, beryllium is commonly found on motherboards and 'finger clips' as a copper beryllium alloy used to strengthen the tensile strength of connectors and tiny plugs while maintaining electrical conductivity. Beryllium has recently been classified as a human carcinogen as exposure to it can cause lung cancer. The primary health concern is inhalation of beryllium dust, fume or mist.

Printer Cartridge Toners - One of the ubiquitous computer peripheral scraps and post consumer e-waste is the plastic printer cartridge containing black and colour toners. The main ingredient of the black toner is a pigment commonly called, carbon black - the general term used to describe the commercial powder form of carbon. Inhalation is the primary exposure pathway, and acute exposure may lead to respiratory tract irritation. The International Agency for Research on Cancer has classified carbon black as a class 2B carcinogen, possibly carcinogenic to humans. Little information exists on the hazards of coloured toners. Some reports indicate that such toners (cyan, yellow and magenta) contain heavy metals.

Phosphor and additives - Phosphor is an inorganic chemical compound that is applied as a coat on the interior of the CRT (Cathode Ray Tube) faceplate. Phosphor affects the display resolution and luminance of the images that is seen in the monitor. The hazards of phosphor in CRTs are not well known or reported. In general, CRT's phosphor coating is extremely toxic. While breaking a CRT, the glass fragments are to be very carefully cleaned up. The phosphor coating contains heavy metals, such as cadmium, and other rare earth metals, e.g. zinc, vanadium, etc. as additives. These metals and their compounds are very toxic. This is a serious hazard posed for those who dismantle CRTs by hand.

Recycled materials

Recycling in the informal sector involves physical dismantling of parts by hammer, chisel, and screwdriver and often by bare hand. The immediate objective of most of the operations involved in dismantling is the rapid separation of primary materials.

The following materials were observed being separated for further recycling:

- **Material containing copper:** Printer and other motors, wires and cables, CRT yokes.
- **Steel:** Including internal computer frames, power supply housings, printer parts, etc.
- **Plastic**: Including housings of computers, printers, faxes, phones, monitors, keyboards etc.
- **Aluminium**: Printer parts, etc.
- **Printer Toner**: From spent toner cartridges
- **Circuit Boards**: These come from many applications including computers, phones, disc drives, printers, monitors, etc.
- **Valuable reusable processors and chips:** for resale
- **Other chips and connectors containing gold**: for acid processing
- **Solder: (lead/tin base)** for resale
- **Toner Sweeping**
- **CRT Cracking and Dumping**

It is extremely likely that due to the presence of PVC or brominated flame retardants in wire insulation, the emissions and ashes from such burning at higher temperature (higher than 500 degree Celsius) will contain high levels of both brominated and chlorinated dioxins and furans - two of the most deadly persistent organic pollutants (POPs). It is also highly likely that cancer-causing polycyclic aromatic hydrocarbons (PAHs) are also present in the emissions and ash.

Annexure 2

Impact of e-waste on health and environment

Disposal of e-wastes is a critical problem faced in many regions across the globe. If WEEE is discarded with other household garbage, the toxics contained in those pose a threat to both health and vital components of the ecosystem. There are number of channels through which e-waste goes to the environment. E-waste that is land filled produces contaminated

leachates, which eventually pollute the groundwater. Acids and sludge obtained from melting computer chips, if disposed on the ground causes acidification of soil, leading to contamination of water resources. Incineration of e-wastes can emit toxic fumes and gases, thereby polluting the surrounding air.

Improper recycling and recovery methods can have major impacts on the environment. Crude forms of dismantling can often lead to toxic emissions, which pollute the air and thereby also expose the workers to the harmful materials. The most dangerous form of recycling and recovery from e-waste is the open-air burning of Circuit boards (made of plastic) in order to recover copper and other metals. Extraction of metals through acid bath method or through mercury amalgamation also contributes to environmental degradation. The toxic emissions from open air-burning affects both the local environment and broader global air currents and are also health hazard.

The toxic materials present in the equipments can be environmental as well as health hazard. Mercury will leach when certain electronic devices, such as circuit breakers are destroyed. Not only does the leaching of mercury poses problems, the vaporization of metallic mercury and dimethylene mercury, both part of Waste Electrical and Electronic Equipment (WEEE) is also of concern. The same is true for polychlorinated biphenyls (PCBs) from condensers. When brominated flame retardant plastic or cadmium containing plastics are land filled, both polybrominated dlphenyl ethers (PBDE) and cadmium may leach into the soil and groundwater. It has been found that significant amounts of lead are dissolved from broken lead containing glass, such as the cone glass of cathode ray tubes, gets mixed with acid waters and are a common occurrence in landfills.

The rapid growth and faster change in modules of computers, cell phones and consumer electronics becomes major issue that enhances the amount of e-waste generation. But improper handling and processing of e-waste create following problems for the environment:

a) Potential Air Pollution – Carbon mono-oxide, carbon di-oxide, metal fumes, acid fumes etc.
b) Potential Water Pollution from battery, and effluent from recycling process like metal sludge, plastics, cadmium etc.
c) Health Hazard from Potential Air Pollution and problem on skin for those who are involved in recycling
d) Soil Contamination from metal sludge, cadmium etc.

Annexure 3

Case-studies

A. Detailed case-study of State Electricity Board

West Bengal State Electricity Board (WBSEB) is primarily a power trading organization, involved in Generation, Transmission & Distribution of Electricity to all its consumers throughout its jurisdiction. Information Technology as such is not our core area but acts as a support service. We are utilizing it mainly as an important tool for our business development. In-depth knowledge on IT products is not up to that desired level to resolve the highly complicated E-waste problem. Still we are very much concerned with the problem and extending ourselves to the permissible extent, at least in identifying and quantifying the problem.

Computerisation in WBSEB, started in early nineties, with a very slow pace, when Information Technology was practically at its infant stage. Since then more than a decade has passed and now IT has spread its wings to almost all-important areas of activities in this organisation. Initially the Technical model was based on Host Based architecture with dumb terminal to operate L&MV energy billing at Salt Lake. Later on, in 1998 – 99, Host Based systems was converted to Client Server Model. Board took a massive computerization program under World Bank finance scheme. At present, 100 per cent energy bills are computerized and many other application packages are running in our system. Moreover, all important supply stations will be coming under IT environment very soon, under modernization scheme.

It is needless to mention that in IT field every thing is changing in neck-break speed, be it Hardware or Software. The PCs & peripherals, which was purchased long back, has become obsolete and outdated due to their old age. On the other hand due to increase in consumer base day by day, size of database is increasing progressively. This has resulted in very slow output from different old IT equipments.

From prima facie reports it is seen that many IT Items have either become totally obsolete or beyond efficient / economic utilization. A tentative list of such items, as collected, is as follows: -

Obsolete Items

sl no	Item	Specification	Quantity (nos)
1	Server	Intel 386 PCL	1
2	Client PC	Intel 486 with Win 3.1 O/S	3
3	Server	Intel 486, 33 MHZ clock speed & 32MB RAM	4
4	Server	Pentium-Pro with 100MHZ clock speed & 64MB RAM	3
5	Server	HCL– Meteor 55pt with 66MHZ Clock Speed & 64 MB RAM	7
6	DMP	EPSON DFX-5000+ High speed	1

7	DMP	NEC P 6300i	5
8	Dumb Terminal	HCL – VT 100	80
9	Other IT items	Line driver, Modem, plotter etc.	LS

Note – Based on the original purchase price, total cost of such items comes to the tune of Rupees 50 lakhs.

Low performing items

Sl no	Item	Spec	Quantity (nos)
1	Server	Altos 900, Pentium- with 166 MHZ Clock Speed and 64 MB RAM	17
2	Client PC	1GB Disk Space, 16 MB RAM and 150MHZ Clock Speed.	169
3	Client PC	2 GB Disk Space, 166 MHZ Clock and 16 MB RAM.	
4	Client PC	CMOS 2 GB, 16 MB	860

Note – Based on the original purchase price, total cost of such items comes to the tune of Rupees 400 lakhs.

From these type of old equipments, we are facing the following problems:-

- Very slow output due to slow processor speed & low capacity RAM
- Replacement of defective spares is not easily available in the market.
- Service providers are reluctant to take up AMC contract.
- Manufacturers have dropped these items from their production bay.
- Incompatibility of modern S/W with old hardware.
- Poor Hard Disk capacity, which creates space shortage problems.

Considering all the above problems, computers of WBSEB, installed at different sites have been grouped into following categories:

Category A – Usable without repair

Category B –Usable after permissible repairing cost.

Category C – Scrap

Working group

To take complete stock of the situation, a comprehensive computer census was planned throughout the Board. Accordingly a working group has been formed to undertake this important activity, consisting of members from amongst various disciplines [Engineering, Personnel & Finance]. This group will formulate a solution towards optimum utilization of these IT items.

B. Case-studies of large users of computers

This information was collected directly from the companies through a questionnaire and structured interviews.

Case study –1

COMPANY NAME	HCL Infosystems	
DATA COLLECTED	Name of clients	Number sold in last 3 years
	State Bank Of India	3000-4000
	Bank Of Rajasthan	300-400
	Union Bank	200-300
	Allahabad Bank	1000-1200
	Uco Bank	1500
	UBI	2000-2500
	Bank Of India	500
	Exide Industries	-
	CESC	-
	Balmer Lawrie	-
DISPOSAL METHODOLOGY	NA	
RECYCLING PROCESS	Used as support system	
OUTPUT OF RECYCLING	NA	
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA	
REMARKS	In the process of buy back they take old computers & there by contribute in the process of recycling.	
CONTACT ADDRESS	Jhau Tala Road. Opp- Ice skating Rink	

Case study – 2

COMPANY NAME	CESC LTD
DATA COLLECTED	No dumped devices at present
DISPOSAL METHODOLOGY	1) Mainly go for buy back scheme. 2) Empty cartridges are taken by sweepers
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA

OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	In the process of buy back they clear their inventory, not posing any serious threat to the environment.
CONTACT ADDRESS	**-**

Case study – 3

COMPANY NAME	Coal India LTD
DATA COLLECTED	100 pcs dumped Configuration - 386,486,8084,8088 & P-I Printers
DISPOSAL METHODOLOGY	Buy back and replacement
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	In the process of buy back they take old computers & there by contribute in the process of recycling.
CONTACT ADDRESS	**-**

Case study - 4

COMPANY NAME	UCO Bank
DATA COLLECTED	100 pcs dumped Config- P-I, P-II.
DISPOSAL METHODOLOGY	No buyback. Donate to schools or training centers. Auction out the devices in non-working conditions.
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	The persons who are buying from auctions may act as middle men & sell those items to places where metal extraction may take place
CONTACT ADDRESS	-

Case study –5

COMPANY NAME	Balmer Lawrie LTD
DATA COLLECTED	100 pcs, servers, printers, batteries disposed in last 3 yrs
DISPOSAL METHODOLOGY	Batteries go for buyback. Other devices are sold as scraps by calling

	tenders
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	Got the rough idea about the end-use process of those devices, like extraction of metals at steel plants or selling the dismantled parts at places like Chandni market.
CONTACT ADDRESS	-

Case study 6

COMPANY NAME	Central Bank of India
DATA COLLECTED	5-6 pcs , printers
DISPOSAL METHODOLOGY	Buyback, selling to staffs at predetermined price, selling scraps by calling tenders
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	In the process of buy back they take old computers & there by contribute in the process of recycling.
CONTACT ADDRESS	-

Case study 7

COMPANY NAME	State Bank Of India
DATA COLLECTED	No rough estimate
DISPOSAL METHODOLOGY	Buyback Stand alone computers are donated
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	In the process of buy back they take old computers & there by contribute in the process of recycling. Feedback obtained may be used for reference.
CONTACT ADDRESS	Samriddhi Bhavan,1, Strand Road, Kolkata-700001

Case study 8

COMPANY NAME	Satcom
DATA COLLECTED	15 PCB & HPA Dumped
DISPOSAL METHODOLOGY	Batteries go for buyback

RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	In the process of buy back they take old computers & there by contribute in the process of recycling.
CONTACT ADDRESS	Ground Floor, SDF Building, Sector V, Salt lake

Case study 9

COMPANY NAME	Greenwave Healthcare Technologies
DATA COLLECTED	Inventory nil
DISPOSAL METHODOLOGY	PCs are under AMC, Servers & Printers are self look altered First given technical support, then finally go for replacement by US counterpart
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	Maximum usage is obtained by up gradation of the machines
CONTACT ADDRESS	First Floor, SDF Building, Sector V, Salt lake

Case study 10

COMPANY NAME	Amb Computer Integrated Engineering Pvt. Ltd
DATA COLLECTED	Laptops – 2. Monitor (Philips) – 2 PCs – 7 (P-I, P-II, P-III)
DISPOSAL METHODOLOGY	Buyback
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	In the process of buy back they take old computers & there by contribute in the process of recycling.
CONTACT ADDRESS	Module 208, SDF Building, Sector V, Salt lake

Case study 11

COMPANY NAME	Interra Technologies
DATA COLLECTED	PCs – 30-35 (P-I, P-II – 400 MHz, 128 MB Ram, P-III) Batteries – 10 - 15

DISPOSAL METHODOLOGY	Batteries go for buyback. Obsolete computers go for training
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	A comparatively new office, no major disposals yet.
CONTACT ADDRESS	3rd floor, SDF Building, Sector V, Salt lake

Case study 12

COMPANY NAME	Eastern Railways – PRS Department
DATA COLLECTED	Disposals since 1986 Terminal with keyboard – 400 DMP – 450 VAX Servers – 2 Optical Disc Drive – 2 Chart Printers(LNP) – 12 Magnetic Tape Drive – 2
DISPOSAL METHODOLOGY	Sent to Belur scrap yard
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	No
CONTACT ADDRESS	-

Case study 13

COMPANY NAME	Eastern Railways – Commercial Claims Computer Cell
DATA COLLECTED	PCs – 10 (486 – 1 Server & 9 Clients) Printer – 10 (Chart printers) UPS – 1 (5 KV)
DISPOSAL METHODOLOGY	Dumped
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	PCs are dumped due to unavailability of proper disposal technique
CONTACT ADDRESS	Old Koilaghat Building, Strand Road, Kolkata-700001

Case study 14

COMPANY NAME	United Bank of India
DATA COLLECTED	For last 3 years. PCs – 60 DMPs – 10
DISPOSAL METHODOLOGY	Dumped
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	Still not figured out any disposal scheme
CONTACT ADDRESS	-

Case study 15

COMPANY NAME	Bank of India
DATA COLLECTED	For last 3 years. PCs – 14 Servers - 2 DMPs – 7
DISPOSAL METHODOLOGY	Buyback
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	Bank of India is presently thinking of a scrap management process in all its branches. Bowbazar branch and Salt lake Branch are identified as the hub where the scraps from all other branches are to be stored. Process begins in a month or two.
CONTACT ADDRESS	Zonal Office, 5, B.T.M. Sarani, Kolkata-700001

Case study 16

COMPANY NAME	Ontrack Systems
DATA COLLECTED	PCs – 12-15 (Celeron & P-III, below 1 Ghz) Server – 1 (P-III) UPS – 4 Printer – 2
DISPOSAL METHODOLOGY	Buyback High configuration PCs when become obsolete are sent to corporate office at Ekdalia Rd
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	In the process of buy back and reuse at other office they avoid the disposal.

CONTACT ADDRESS	Electronics Complex, Sector –V, Salt Lake

Case study 17

COMPANY NAME	Calcutta Telephones – IT Dept.
DATA COLLECTED	PCs – 300 (P-I,P-II) Mainframe Computers – 2 Magnetic Drives – 50 - 100
DISPOSAL METHODOLOGY	Buyback Sold as scrap by tenders
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	Referred to Calcutta Telephones Disposal Dept. for further information
CONTACT ADDRESS	Terity Bazar

Case study 18

COMPANY NAME	Calcutta Telephones – Disposal Dept.
DATA COLLECTED	Gave Address of Scrap dealer: Vaishnav Enterprise 295/2B APC Road, Kolkata-700009 Ph: 9330877206
DISPOSAL METHODOLOGY	Buyback Sold as scrap by tenders
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	No
CONTACT ADDRESS	Tody Mansion

Case study 19

COMPANY NAME	Indian Airlines Ltd.
DATA COLLECTED	No estimate
DISPOSAL METHODOLOGY	Sent to Indian Airlines S&P, NTA
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	Referred To S&P, NTA, DumDum.
CONTACT ADDRESS	Central Avenue

Case study 20

COMPANY NAME	Eastern Railways Scrap yard
DATA COLLECTED	Terminal – 165 Printer – 250 Keyboard – 138
DISPOSAL METHODOLOGY	Sold as scrap by calling tenders Rest dumped
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	Normally bought by local dealers who sent them to small scale casting shop for extraction.
CONTACT ADDRESS	Belur

Case study 21

COMPANY NAME	Allahabad Bank
DATA COLLECTED	NA
DISPOSAL METHODOLOGY	NA
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	Working on the project of scrap management
CONTACT ADDRESS	Head Office, 2, N.S. Road, Kolkata-700001

Case study 22

COMPANY NAME	Kolkata Stock Exchange
DATA COLLECTED	Disposals in last 5 yrs: - PCs – 50 Server – 1 Printers – 10
DISPOSAL METHODOLOGY	Buyback scheme is followed
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	No major disposals as operation does not require high configuration PCs
CONTACT ADDRESS	Dalhousie Square

Case study 23

COMPANY NAME	B.M. Birla Heart Research Centre

DATA COLLECTED	Disposals in last 5 yrs: - PCs – 4-5 (286, PI) Printers – 2 UPS – 1 (5KV)
DISPOSAL METHODOLOGY	Presently dumped
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	By the next financial year another 40 – 45 dumped terminals will be scrapped.
CONTACT ADDRESS	Ekbalpore, D.H. Road, Kolkata

Case study 24

COMPANY NAME	Kothari Medical Centre
DATA COLLECTED	Disposals in last 5 yrs: - Dumped terminals – 12 Line Drivers – 34 Terminal Server – 1 PCs – 20
DISPOSAL METHODOLOGY	Buyback, donation
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	NO proper disposal scheme yet
CONTACT ADDRESS	Ekbalpore, D.H. Road, Kolkata

Case study 25

COMPANY NAME	Youth Centre
DATA COLLECTED	Disposals in last 3 yrs: - PCs – 30 Keyboard + Mouse – 300 Printers – 6 (DMP + Deskjet) Presently in the inventory:- PCs – 10 Monitor – 5 Keyboard & Mouse - 100
DISPOSAL METHODOLOGY	Sent away without any economic gain
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	These materials are delivered to the small scale casting works for extraction of the metal components

CONTACT ADDRESS	Moulali

Case study 26

COMPANY NAME	Punjab National Bank
DATA COLLECTED	PCs – 20 (stand alone)
DISPOSAL METHODOLOGY	Presently dumped
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	No disposal scheme yet
CONTACT ADDRESS	Visa House, Park Street, Kolkata

Case study 27

COMPANY NAME	Metro Railway
DATA COLLECTED	Server – 1 (Wipro) Disc – 14 Magnetic Drives – 200 UPS – 4
DISPOSAL METHODOLOGY	Sent to Metro Rilway Scrap Yard, Jessore Road, Patipukur
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	No information of what happens next
CONTACT ADDRESS	Metro Bhavan, Chowringhee Road

Case study 28

COMPANY NAME	Indian Airlines (S&P)
DATA COLLECTED	No information
DISPOSAL METHODOLOGY	Disposed through MSTC
RECYCLING PROCESS	NA
OUTPUT OF RECYCLING	NA
OUTLET OF DISMANTLED PARTS/ RECYCLED MATERIALS	NA
REMARKS	-
CONTACT ADDRESS	NTA, Dumdum

C. Case-study on disposal /recycling

COMPANY NAME	Zara Casting Works

MATERIAL COLLECTION	Collects materials like computers, parts of ac machine, refrigerator, etc. from middlemen who actually collects these as scraps from various offices.
PROCESS DETAILS	Aluminium extraction mainly takes place over here. A certain amount of aluminium scrap is melted to obtain 98 per cent solid Al and remaining 2 per cent waste. This waste is again melted to obtain 50 per cent of it as solid Al and the remaining as final waste.
OUTPUT	Casted aluminium pieces
WASTE	I per cent of total
DISPOSAL OF WASTE	Thrown away
SIZE OF UNIT	Small
NUMBER OF CLUSTER OF SUCH UNITS	15
REMARKS	Extraction of Aluminium is taking place in a crude way without any concern regarding pollution and with no proper mechanism for handling the exhaust gas. Workers are aged from 12 – 18 yrs.
CONTACT ADDRESS	Rajabazar, opposite Science college

Toxics Link

for a toxics-free world

DELHI

H2 (Ground Floor), Jungpura Extension, New Delhi 110 014.

T: 91-11-24328006, 24320711 *F:* 91-11-24321747 *E:* tldelhi@toxicslink.org

CHENNAI

8, Fourth Street, Venkateswara Nagar, Adyar, Chennai 600 020

T: 91-44-24914358, 24460387 *E:* tlchennai@toxicslink.org

MUMBAI

Garage No 2, Plot No 4, Baba Nanak Sahib Cooperative Housing Society Ltd.

Laxmi Colony, RC Marg, Chembur, Mumbai 400 074

E: tlmumbai@toxicslink.org

www.toxicslink.org

SPLASH!