1.0 Introduction

A National Workshop on Electronic Waste Management" organized by CPCB/ MoEF/ EMPA / GTZ in New Delhi during March, 2004 emphasized urgency of micro level intervention to tackle the potential problem of e-waste in India. National level study for a "Rapid Assessment" in the major WEEE (Waste electrical and electronic equipments) producing regions / cities of India was also recommended to be undertaken.

A National Working Group was formed in July 2004, headed by Chairman CPCB and consisting of officials/ representatives of MoEF, CPCB, Ministry of IT, regulatory agencies (representatives of SPCBs), NGOs, Industry Associations/Industry (MAIT, TEMA, CETMA, ELCINA, CII), experts in the field and producers both formal & informal. The mandate of the working group was to identify, plan and implement the recommendation related to e-waste handling and management in India. Initiatives taken by working group included planning for inventorization of e-waste in India. This National level study was also proposed to be sponsored by MoEF/CPCB/ EMPA / GTZ for e-waste assessment. Member Secretary MPCB is also nominated as the Member of the special committee appointed by CPCB on e-waste management.

2.0 Background

Mumbai, the financial nerve-centre of India, is also India's largest port city. The Mumbai -Pune industrial belt is one of the manufacturing hubs of the country. As a result, Mumbai is not only the port of import for new and used electronics; it is also home to a large user and manufacturer base, both generating large volumes of e-waste. There is hardly any attention paid to the management of the e-waste generated in this industrial belt which incidentally also houses large number of Info tech parks in New Mumbai and Pune. There is an urgent need therefore to have a well orchestred mechanism on the collection, treatment and disposal of the e-waste. MPCB has identified e-waste as a priority area and has initiated the process to set up a formal workgroup for the Mumbai-Pune region.

MPCB has taken certain initiatives to create awareness among various stake holders on the e-waste and as a part of this exercise carried a feature article in the Indian Express.

A meeting was convened by Dr. D. B. Boralkar, Member Secretary, MPCB on 9th May 2005 to discuss the issues. Meeting was attended, among others, by Mr. Rolf Widmer of EMPA. Opportunities available in Mumbai-Pune industrial belt on e-waste collection, recycling, reuse etc. were discussed.

The Additional Commissioner, Municipal Corporation of Greater Mumbai has communicated to MPCB the Resolution adopted by the Standing committee of MCGM to manage the e-waste. This shows the keenness with which the Municipal Authority is interested in the e-waste management in Mumbai.

In addition, recently the MPCB was contacted by Global Telesystems Limited, a manufacturer of electronic and telecommunications equipments. This was in relation to

their need to dispose e-waste accumulated during manufacturing process, which has until now been stored.

It is necessary that inventorization of e-waste generated in the city is carefully carried out so that further action plan for electronic waste management can be prepared .

There is an urgent need to carry out a "Rapid City e-Waste Assessments" in Mumbai, which is one of the four cities identified under Indo – German ASEM Programme. There is likely hood of the funds being made available for this project. MPCB is awaiting a letter from ASEM/HAWA about the confirmation of this study with fund availability. MPCB is also prepared to fill up the gap of additional funding if any required for this study. With the sanction of funds from ASEM, the work on the project can be taken up immediately. The matter is under consideration of ASEM/HAWA.

3.0 Description of the study

Mumbai Metropolitan Region area will be the study area limits for this Rapid WEEE assessment city study. This area includes Mumbai city as well as its surrounding semi-urban and rural areas. (Detailed information including map in Annexe)

The three components that will be studied as part of WEEE are Personal computer/TV/Mobile phones which will serve as indicator components. The study will trace these components from its origin to its final end of life. For example from the sources where the components are imported unloaded, traded, transported, dismantled, recycled, reused, repaired, processed and disposed.

The study will start from the source of e-waste generation, stockpiling, collection, handling, brokering, processing and production of other items from where there are chances of e-waste generation. These terminologies are described as follows:

Generation & Stockpiling: Different “economic actors” purchase, use and then stockpile or discard electronic waste. These range from manufacturers such as MNC’s to large and small businesses, households, institutions and non-profit organizations.

Collection: There is a wide variety of possible collection alternatives for WEEE. A variety of entities are providing these services including electronics industry, private or non-profit recycling services, and the public sector through the solid waste management and recycling infrastructure.

Handling & Brokering: WEEE are consolidated and made ready for processing. It also includes sorting to determine what equipment can be refurbished or reused as a whole unit and what equipment must be dissembled for commodity processing.

Processing: It includes WEEE usage as feedstock for new production or refurbished for resale. **Outputs** from dismantling activities include scrap commodities such as glass, plastics and metals, which are primary elements of electronic hardware.

Production: Processed commodities or refurbished items come back as new products for sale and consumption by end users. There are many different players and industries involved in this position.

4.0 Goals & Objectives

The objective of the Rapid WEEE Assessment is to identify and quantify the WEEE generation, reuse, recycle and final disposal in different cities in India, adopting uniform approach and methodology. The main objective as follows:

The goal of this study is the qualitative & quantitative analysis of WEEE recycling system in Mumbai Metropolitan Region. The main objectives of this study are as follows:

- To examine the existing WEEE recycling system
- To study the problems/risks posed by the recycling system at present/ future
- To estimate the existing and future quantity of WEEE in the city (study area)
- To evaluate the capacities/capabilities of existing stakeholders and infrastructure for reuse, recycle and disposal of e-wastes
- To analyze the environmental and social sustainability of present system
- To determine the e-trade economics

5.0 Scope of work

In order to execute this assignment, it is essential to establish the WEEE business chain linking different stakeholders to understand the trade economics and associated environmental impacts.

The study shall identify and describe the following:

- The stakeholders
- Their respective geographical distribution in the study area
- WEEE generation cycle

The scope of the work is described in detail in the following paragraphs:

6.0 Identification of stakeholder & establish WEEE Trade chain

The study should include the identification of stakeholders, classification of organization as organized/unorganized sector, further their geographical location should be determined in terms of their operating base coverage.

Some of the major stakeholders whom this study should include are:

1st group:

The Importers, Manufacturers
The distributors, traders, retailers
The consumers – Individual households, Business sector, IT sector, BPO, teaching institutions, Railways, Airlines, Defence establishments, Transport Corporations, etc

2nd group:

The collectors – Scrap dealers, Big Bazaars or malls who are buying the e-waste

The Recyclers – dissemblers, dismantlers, material recoverers,
The Road side vendors/
The authorized/unauthorized Auctioneers, the sellers of the used electronic goods on the footpaths

3rd group:

The Regulatory bodies (MPCB)

The study should also aim at establishing WEEE trade chain using conceptual input output analysis**.** This idea was developed based on "WEEE material flows" through a region and on its way its disintegration and processing in numerous steps until it rejoins the raw streams or ends in a final disposal**.**

7.0 Identification of market systems

A market survey for the evaluation of market information from various sources should be gathered to understand the penetration rate & the replacement rate of the three components.

8.0 Inventorization

Inventory of obsolescence rate of each electronic product (viz. Personal computer/TV/Mobile phones as mentioned in the beginning of this note)using scenario analysis from secondary/market research data. Confirm obsolescence rate from data of primary survey using "tracer technique". Identify a tracer from each product and follow it from the start of dismantling process till its final disposal.

9.0 Analysis of existing WEEE recycling system & quantification of WEEE

This will include description & documentation of each process used in dismantling of an e-product, the location details. Carry out photo documentation and geographical setting of each step. Estimate the quantity of material dismantled at each step. Estimate the quantity of e-waste for a particular year based on market projections & obsolescence rate.

10.0 Environmental impacts of present recycling system

This will include the assessment of local environmental impacts caused to air, water & soil. Determination of the hazardous waste generation, its handling, treatment (if any) & disposal. Identification of eco-friendly technology for the management of the hazardous wastes generated in the processing of e-waste.

11.0 WEEE Trade economics

Trade economics governs the movement of WEEE along the value chain in t he city. Estimate input cost in terms of raw material cost & labor cost. Find out the selling price, operating margin and trade turnover.

12.0 Occupational Health & Safety and Social sustainability

Under this assessment, city team needs to collect information on present treatment and disposal practices being adopted for WEEE in their respective cities. This assessment will be conducted in WEEE handling localities as well as land fill in city which include descriptive and visual proofs so as to ascertain the facts indicated.

The health /social problems faced due to the recycling of WEEE should be assessed.

13.0 Outputs/Deliverables

- Qualitative & quantitative database of the three components
- A report on the existing WEEE management system in MMR
- A manual of suggested improvements to methodology used for similar city studies proposed for other cities.

14.0 Time Frame

This study would be carried out in the time frame of six months starting from September 2005.

15.0 Organizations involved

This city study will be coordinated by MPCB. Technical know-how would be provided for this study from Swiss agency EMPA. MPCB will be assisted by additional resources from Environmental Consultant/s and NGOs in Mumbai as .was done in study completed at Delhi.

16.0 Budget

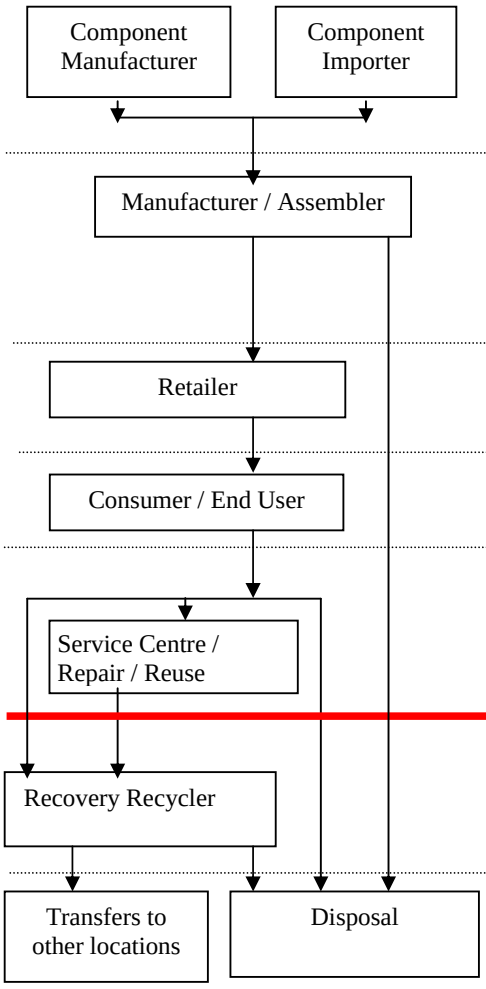
The budget for this study will be provided by GTZ-ASEM. The technical know-how assistance from EMPA will be financed by SECO. MPCB will host the study and facilitate implementation.

Methodology

Different Aspects

Overview / macro information

Industry / Waste Chain



Report compilation and finalisation

Frame work for methodology

- To do a web search and review generic Indian industry / market information and WEEE trends
- To review published industry / market / census surveys
- To discuss with experts (5) about past, present and future industry / market and WEEE trends.

- To identify two or three major components in the device, and their manufacturers / importers.
- To collect data / information on the quantities manufactured / imported from secondary sources.
- To conduct meetings with MMR-based manufacturers / importers (3) and conduct telephonic discussions with major manufactures / importers (3) outside MMR on industry / market and WEEE trends.

- To collect data / information on the quantities produced / assembled from secondary sources (fresh and replacement demand).
- To conduct meetings with major MMR-based producers / assemblers (3) and conduct telephonic discussions with major producers / assemblers (3) outside MMR on industry / market and WEEE trends.

- To conduct meetings with major retailers (5) on industry / market and WEEE trends.
- To obtain information on the competition from the repair / reuse market

- To conduct meetings (5 x 3) with consumers in different income segments (high, medium and low) on the frequency of change and disposal practices.

- To conduct meetings (4 x 3) with service centers across 4 areas that repair and reuse on their businesses and prevailing waste collection systems in their areas.
- To visit their temporary waste storage areas in the vicinity of their service centers.

- To conduct meetings with formal (3) and informal recyclers (6) on their raw material supply markets as well as their final product markets.
- To visit their factory sites (at least, 4) to get an idea of their operations and their waste handling & disposal practices.

- To conduct meetings (3) with MCGM at the headquarters and at the ward level on the extent of WEEE in the dump yards. [Combined for the three types of WEEE]
- To visit BMC dump yards (3) to have discussions with the representative there on WEEE entering [Combined for the three types of WEEE]

- To compile a draft report in line with the agreed structure.
- To revise and finalise draft report in line with the comments given.

Annexure-1: Detailed Methodology

Annexure-1A: Personal Computers (PCs)

Overview / macro information

The following information needs to be obtained from secondary sources and discussions with industry / market experts:

Products & industry

- Product category definitions – Desktops, notebooks and X86 servers – types of monitors – old & new product lines. [*]
- Industry structure – major players – from component manufacture to disposal. [*]
- Current major manufacturers / importers / suppliers, e.g. HCL, HP and IBM

Market information

- Current market segmentation – sales across various product lines, i.e. desktops (includes desktops & X86 servers) and notebooks.
- Current market value in India
- Current market size – India, urban India and MMR. [*]
- Current market growth rate, i.e. in percentage – India and urban India. [*]
- Current market shares across major players
- Branded market Vs gray market – split-up in India as a whole, in urban India and in MMR.
- Buyer / user segments within urban (high, middle and low income groups)
- Market differentiation – first time Vs replacement / upgradation – percentage breakdown relevant to urban India.
- Estimate of the personal computers population base – bulk and individual home installations - in MMR [*]
- Future market projections – total project increase in India, urban markets and MMR in particular. [*]

Product replacement trends

- Replacement frequency - Bulk installations (company policies) and individual home installations - the cycle for an average urban household for PCs - Is it 2-3 years or 4-5 years? [*]
- Estimation of lifetime for branded PCs and "grey" PCs. [*]
- Estimation of lifetime for desktops and notebooks. [*]

Recycling & waste-related

- Post-use component classification – identifying those for reuse, those for recovery and those for disposal – from desktops & notebooks.
- Identification of the recycling chain – auctioneers, middlemen / stockists and those undertaking physical recovery. [*]
- Types of recyclers (reuse and recovery) – in-company (buy-back schemes), formal and informal. [*]
- Methods for recycling (reuse and recovery) [*]
- Environmental impacts of recovery operations [*]
- Types of recovery operations done, e.g. segregation, re-gunning of cathode ray tubes, extraction and burning. [*]

- Estimates of the quantity and market value of the recycling (reuse and recovery) market in general and in specific to MMR. [*]
- Estimates of the percentage and time period for a typical PC to find its way for reuse, recovery and disposal. [*]

Others

- Government policies pertaining to the industry
- Government policies pertaining to wastes generated by the industry [*]
- Census survey information on population and other statistics pertaining to PCs. [*] Note: Possible sources of information:
- Software Technology Park of India (STPI)
- Manufacturers Association for Information Technology (MAIT)
- National Association of Software and Service Companies (NASSCOM)
- IDC India (www.idcindia.com)
- Gartner India
- Dataquest magazine (www.dqindia.com)
- Cyber India Online Limited, a news portal (www.ciol.com)
- PC Quest (www.pcquest.com)
- Company websites, e.g. HCL, HP, IBM and others.
- Express Computers Online (www.expresscomputersonline.com)
- KSPCB for information collected from selected large IT companies on waste generated.]

Component Manufacturer / Importer

The following information needs to be obtained from secondary sources and discussions with component manufactures / importers:

Products & industry

- List of major components in a PC, e.g. colour tube and plastic body
- List of major manufacturers of components
- List of major importers of components
- Estimates of the quantities of components imported / manufactured for use in PCs [*]

Market information

- Estimates of the PCs market size in India across the various segments, i.e. desktops and notebooks

Recycling & waste-related

- Estimates of the quantity and market value of the recycling (reuse and recovery) market in MMR. [*]
- Estimates of the percentage and time period for a typical PC to find its way for reuse, recovery and disposal. [*]
- Best practices for the recycling (reuse and recovery) of the components as recommended by the manufacturers / importers [*]
- Suggestions / recommendations of approaches or schemes that the Indian PC manufacturers / assemblers can adopt to streamline the reuse and recovery of the electronic components. [*]

Manufacturer / Assembler

The following information needs to be obtained from secondary sources and discussions with manufacturers / assemblers:

Products & industry

- List of major manufacturers of PCs in India, e.g. HCL, HP and IBM.
- List of recognized assemblers (gray) of PCs, if any.

Market information

- Estimate of the PC market in India, urban India and MMR.
- Estimate of the breakdown of the market in urban India between first time buyers and replacement buyers.
- Views of major manufacturers on the future PCs markets and projected increase in sales– in India as a whole and in urban India in particular.
- Views of major manufacturers on the assemblers (grey) market, if any, and vice versa – what is the nature of the competition between the branded and gray markets.
- Competition between desktops and notebooks – current and future trends
- Views of major manufacturers about the reuse (used product) market and whether or not major manufacturers face competition from such products in the urban market.

Recycling & waste-related

- Manufacturer's lifetime estimation for branded PCs and gray PCs. [*]
- Manufacturer's lifetime estimation for desktops and notebooks. [*]
- Views of major manufacturers of the problems and opportunities in coordinating organized recycling through buy-back schemes. [*]
- Quantity of waste generated and disposed from the manufacturing facilities directly. [*]
- Views on the major components that have value for reuse and recovery. [*]
- Views on best practices for recovery, wherever it is being practiced. [*]
- Estimates of the percentage and time period for a typical PC to find its way for reuse, recovery and disposal. [*]
- Estimates of the quantity and market value of the recycling (reuse and recovery) market that PCs generate. [*]

Retailer

The following information needs to be obtained from secondary sources and discussions with retailers:

Market information

- Estimate of the PC market size in MMR – branded and gray.
- Estimate of the breakdown between bulk installations (offices) and individual installations (homes).
- Estimate of the breakdown between first time buyers and replacement buyers in MMR. [*]
- Views about how the products from the branded and gray markets compete between each other in MMR.
- Views about whether desktops and notebooks compete between each other, and trends in that regard
- Estimate of the reuse (used PCs resale) market in MMR. [*]
- Views about the reuse market and whether or not new products face competition from such products in the urban market.

Recycling & waste-related

- Replacement cycle for an average PC. Is it 2 years or 3 or 4 years? [*]
- Retailer's lifetime estimation for branded PCs and gray PCs. [*]

- Retailer's lifetime estimation for desktops and notebooks. [*]
- Estimates of the quantity and market value of the recovery market that PCs generate. [*]

Consumer / End User

The consumers / end users range from large volume / multiple installations to single installations. The large volume consumers / end users are software companies and business processing organisations (BPOs), whereas the single installations are those in individual homes. The following information needs to be obtained from secondary sources and discussions with consumers / end users.

Bulk installation

- Frequency of replacement [*]
- Methods for discarding / disposal – is physical destruction undertaken? [*]
- Views on preferences between desktops and notebooks – current and future trends. [*]
- Views on purchases from branded, gray and used PCs market

Single installation

- Frequency of replacement – 2 or 3 or 4 years? – across different income segments. [*]
- Views on exchange schemes and their level of attractiveness
- Views on upgrading to new technology, i.e. better chip / faster processing capacity.
- Views on purchases from branded, gray and used PCs market, particularly in the middle and low-income segment. [*]
- User's lifetime estimation for branded PCs and gray market PCs. [*]
- User's lifetime estimation for desktops and notebooks. [*]
- Disposal practices adopted for old PCs, i.e. store in the attic or donation or exchange scheme or give-away or junk in the dustbin. [*]

Service Centre / Repair / Reuse

There are two types of service centres: (a) company-owned and (b) local. Both these have to be covered. The following information needs to be obtained from secondary sources and discussions with service centres for repairs and reuse.

Service scenario

- Estimate of the number of PC service centres in MMR.
- Views on the viability of repair taking into consideration the cost of new components and new PCs.
- Estimate of the number of PCs that received for repair – percentage of those that are returned after proper repair – percentage of the remaining that can be stripped for components, used for recovery and finally disposed. [*]

Recycling & waste-related

- Estimate of waste quantity, i.e. old PCs and components, sold annually and the price obtained for them in the different service centres. [*]
- Estimate of waste quantity likely to be generated from all the service centres in MMR. [*]
- Disposal practices adopted for old PCs and components, e.g. use of middlemen or junk in the dustbins. [*]
- Information on whether or not the old PCs and components go outside of MMR. If so, what is the extent and why? [*]

- Visual inspection of the storage area of old, unusable PCs and components to determine whether segregation is done. [*]
- Information on good practices and bad practices of the recovery recycling that is being done elsewhere in MMR. [*]

Recovery Recycler

This covers auctioneers, scrap dealers / agents (large & small) and those involved in the physical recovery operations. The following information needs to be obtained from secondary sources and discussions with recovery recyclers – both formal and informal recyclers:

Raw material sourcing

- Different sources of their raw material, i.e. unusable PCs and components - only domestic or imported waste as well – rejects from the hardware manufacturing units, discards from software companies / BPOs and discards from individual installations – possible breakdown among the various sources. [*]
- Trends in the availability of their raw material for resource recovery[*]

Recovery operations

- Components of a PC that have the maximum potential for reuse and for recovery.
- Types of recovery operations done, e.g. segregation, re-gunning of cathode ray tubes, extraction and burning – what are the materials that are retrieved? [*]
- Environmental impacts of these recovery operations[*]
- Good practice and bad practice information on the methods and operations adopted. [*]
- Views on the size of the recovery operations – medium and small [*]
- Information on the financial viability of these recovery operations. [*]

Final recovered products

- Different final applications of their produce. Good and bad practice information associated with those methods and operations. [*]

Recovery market information

- Estimate of the size of the recovery market based on unusable PC sets and components in MMR. [*]
- Information on whether or not the unusable PCs and components after recovery go outside of MMR. If so, which locations? To what extent and why? [*]

Disposal [Combined for all three types of WEEE]

The following information needs to be obtained from secondary sources, visit to the dump yards and discussions with representative-in-charge of the dump yards:

- Estimate of the quantity of WEEE received in the particular dump yard. [*]
- Estimate of the total quantity of WEEE reaching all the dump yards in MMR. [*]
- Information on whether rag pickers are collecting WEEE in these dump yards.
- Information on which of the wards in MMR receives more of WEEE - why? [*]

Annexure-1B: Televisions (TVs)

Overview / macro information

The following information needs to be obtained from secondary sources and discussions with industry / market experts:

Product & industry

- Product category definitions – B&W and Colour TVs – types of colour TVs – old & new product lines. [*]
- Industry structure – major players – from component manufacture to disposal. [*]

Market information

- Current market segmentation – sales across various product lines
- Current market value
- Current market size – India, urban India and MMR. [*]
- Current market growth rate, i.e. in percentage – India and urban India. [*]
- Current major manufacturers / importers / suppliers
- Current market shares across major players
- Buyer / user segments – urban and rural, and within urban (high, middle and low income groups)
- Market differentiation – first time Vs replacement / up gradation – percentage breakdown relevant to urban India.
- Current market penetration in urban India in percentage, i.e. no. of televisions per 100 people and estimation of the number of TVs in MMR based on the population numbers. [*]
- Estimate of the TV population base in MMR [*]
- Cable and Satellite (C & S) subscribers in MMR - comparison of number of TVs with the subscriber base – extent of C&S penetration in the TV population in MMR.
- Existence of a gray (assembled, not recycling) markets in TVs, both in India and in MMR – what percentage of the total TV market? [*]
- Future market projections – total project increase in India, urban markets and MMR in particular. [*]

Product replacement trends

- Replacement cycle for an average urban household. Is it 1-2 years or 3-4 years? [*]
- Estimation of the lifetime of a typical TV. [*]

Recycling & waste-related

- Post-use component classification – identifying those for reuse, those for recovery and those for disposal. [*]
- Identification of the recycling chain – middlemen, stockists and those undertaking physical recovery. [*]
- Types of recyclers (reuse and recovery) – in-company (buy-back schemes), formal and informal. [*]
- Methods for recycling (reuse and recovery) [*]
- Environmental impacts of recovery operations [*]
- Types of recovery operations done, e.g. segregation, re-gunning of cathode ray tubes, extraction and burning.[*]
- Estimates of the quantity and market value of the recycling (reuse and recovery) market in general and in specific to MMR. [*]
- Estimates of the percentage and time period for a typical television to find its way for reuse, recovery and disposal. [*]

Others

- Government policies pertaining to the industry
- Government policies pertaining to wastes generated by the industry [*]
- Census survey information on population and other statistics pertaining to TVs.

[Note: Possible sources of information:
- Consumer Electronics and TV Manufacturing Association (CETMA)
- Company websites, e.g. Samsung, LG, Sony, Philips, Akai, Videocon, Aiwa, Onida, BPL, National Panasonic, Videocon and Thomson.
- National Readership Survey 2005
- Indian Center for Market Research, ICFAI [http://icmr.icfai.org/]

Component Manufacturer / Importer

The following information needs to be obtained from secondary sources and discussions with component manufactures / importers:

Products & Industry

- List of major components in a TV, e.g. tube (colour & B&W) and plastic body
- List of major manufacturers of components, e.g. Samcor India and BEL Taloja
- List of major importers of components
- Estimates of the quantities of components imported / manufactured for use in TVs. [*]

Market information

- Estimates of the TV market size in India across the various segments.

Recycling & waste-related

- Estimates of the quantity and market value of the recycling (reuse and recovery) market in MMR. [*]
- Estimates of the percentage and time period for a typical television to find its way for reuse, recovery and disposal. [*]
- Best practices for the recycling (reuse and recovery) of the components as recommended by the manufacturers. [*]
- Suggestions / recommendations of approaches or schemes that the Indian TV manufacturers can adopt to streamline the reuse and recovery of the electronic components. [*]

Manufacturer / Assembler

The following information needs to be obtained from secondary sources and discussions with manufacturers / assemblers:

Products & Industry

- List of major manufacturers of TVs in India.
- List of assemblers (gray) of TVs, if any.

Market information

- Estimate of the TV market in India, urban India and MMR.
- Estimate of the breakdown of the market in urban India between first time buyers and replacement buyers.
- Estimate of market penetration in urban India in percentage, i.e. no. of TVs per 100 people. [*]
- Views of major manufacturers on the future TV industry and projected increase in sales – in India as a whole and in urban India in particular.
- Views of major manufacturers on the assemblers (gray) market, if any.
- Views of major manufacturers about the reuse market and whether or not major manufacturers face competition from such products in the urban market.

Recycling & waste-related

- Views of major manufacturers of the problems and opportunities in coordinating organized recycling through buy-back schemes. [*]
- Quantity of waste generated and disposed from the manufacturing facilities directly. [*]
- Views on the major components that have value for reuse and recovery. [*]
- Views on best practices for recovery, wherever it is being practiced. [*]
- Estimates of the percentage and time period for a typical television to find its way for reuse, recovery and disposal. [*]
- Estimates of the quantity and market value of the recycling (reuse and recovery) market that TVs generate. [*]

Retailer

The following information needs to be obtained from secondary sources and discussions with retailers:

Market information

- Estimate of the TV market size in MMR. [*]
- Estimate of market penetration in MMR in percentage, i.e. no. of televisions per 100 people. [*]
- Estimate of the reuse (used TVs resale) market in MMR. [*]
- Views of major retailers about the reuse market and whether or not new products face competition from such products in the urban market. [*]

Recycling & waste-related

- Estimate of the breakdown between first time buyers and replacement buyers in MMR. [*]
- Replacement cycle for an average MMR household. Is it 1-2 years or 3-4 years? [*]
- Estimates of the quantity and market value of the recovery market that TVs generate. [*]

Consumer / End User

The following information needs to be obtained from secondary sources and discussions with consumers / end users:

- Views of the frequency of replacement cycle across different income segments, i.e. high, medium and low income. Is it 1-2 years or 3-4 years? [*]
- Views on exchange schemes and their level of attractiveness
- Views on upgrading to new technology, e.g. flat screen.
- Priority given to TVs in relation to other consumer electronic items such as refrigerators, microwave ovens and washing machines.
- Views on purchases from gray and used TVs market, particularly in the middle and low-income segment. [*]
- Disposal practices adopted for old TVs, i.e. store in the attic or exchange scheme or give-away or junk in the dustbin. [*]

Service Centre / Repair / Reuse

There are two types of service centres: (a) company-owned and (b) local. Both these have to be covered. The following information needs to be obtained from secondary sources and discussions with service centres for repairs and reuse.

Service scenario

- Estimate of the number of service centres in MMR.
- Views on the viability of repair taking into consideration the cost of new components and new TVs.
- Estimate of the number of TVs that received for repair – percentage of those that are returned after proper repair – percentage of the remaining that can be stripped for components, used for recovery and finally disposed. [*]

Recycling & waste-related

- Estimate of waste quantity, i.e. old TVs and components, sold annually and the price obtained for them in the different service centres. [*]
- Estimate of waste quantity likely to be generated from all the service centres in MMR. [*]
- Disposal practices adopted for old TVs and components, e.g. use of middlemen or junk in the dustbins. [*]
- Information on whether or not the old TVs and components go outside of MMR. If so, what is the extent and why? [*]
- Visual inspection of the storage area of old TVs and components to determine whether segregation is done.
- Information on good practices and bad practices of the recovery recycling that is being done elsewhere in MMR. [*]

Recovery Recycler

The following information needs to be obtained from secondary sources and discussions with recovery recyclers – both formal and informal recyclers. This covers both the scrap dealers / agents (large & small) and those involved in the physical recovery operations:

Raw material sourcing

- Different sources of their raw material i.e. waste TV sets and components, only domestic or imported waste as well. [*]
- Quantity of wastes from TV manufacturing factories reaching recovery recycling.
- Trends in the availability of their raw material [*]

Recovery operations

- Types of recovery operations done, e.g. segregation, re-gunning of cathode ray tubes, extraction and burning. [*]
- Environmental impacts of these recovery operations[*]
- Good practice and bad practice information on the methods and operations adopted. [*]
- Views on the size of the recovery operations – medium and small [*]
- Information on the financial viability of these recovery operations. [*]

Final recovered products

- Different final applications of their produce. Good and bad practice information associated with those methods and operations. [*]

Recovery market information

- Estimate of the size of the recovery market based on waste TV sets and components in MMR. [*]
- Information on whether or not the old TVs and components after recovery go outside of MMR. If so, which locations? To what extent and why? [*]

Disposal [Combined for all three types of WEEE]

The following information needs to be obtained from secondary sources, visit to the dump yards and discussions with representative-in-charge of the dump yards:

- Estimate of the quantity of WEEE received in the particular dump yard. [*]
- Estimate of the total quantity of WEEE reaching all the dump yards in MMR. [*]
- Information on whether rag pickers are collecting WEEE in these dump yards.
- Information on which of the wards in MMR receives more of WEEE - why? [*]

Annexure-1C: Mobile phones

Overview / macro information

The following information needs to be obtained from secondary sources and discussions with industry / market experts:

Products & Industry

- Industry structure – major players – from product importers, retailers, service providers, users, service centres and disposal. [*]
- Product category definitions – GSM and CDMA – B&W and colour - Price range. [*]

Market information - mobile

- Current market segmentation – sales across various product lines
- Current market value
- Current market size – India and MMR. [*]
- Current market growth rate, i.e. in percentage in India and in urban India – has the urban India market saturated? [*]
- Market differentiation – first time Vs replacement – percentage breakdown – is it 80:20 or 70:30? – changing trends in the split between first time and replacement.- Lifetime of a typical mobile handset. Is it 6 months or 1 year or 2 years ? [*]
- Current major companies / importers / suppliers, e.g. Nokia, Samsung and Motorola - market shares across these companies.
- Gray market size – India and MMR – comparison with the regular market – trends in the gray market, i.e. increasing or shrinking – price differentials vis-à-vis products of the regular market.
- Future of the mobile phone industry – market trends – total projected sales increase in India in general and MMR in particular. [*]
- Future plans to establish manufacturing of mobile phones in India, e.g. Nokia, LG Electronics, Alcatel, Ericsson and Motorola.

Market information - subscribers

- Major service providers in MMR, their market shares and total subscriber base in the current month [*]
- Monthly increase in the subscriber base in India and in MMR.
- Buyer / user segments in MMR – high, middle and low income groups
- Current market penetration in urban India in percentage, i.e. no. of mobile phones per 100 people and derived estimation of the number of phones in MMR based on the population numbers. [*]
- Future of the mobile phone subscriptions – market trends – total projected increase in India in general and MMR in particular. [*]

Recycling & waste-related

- Post-use component classification – identifying those for reuse, those for recovery and those for disposal. [*]
- Identification of the recycling chain – middlemen, stockists and those undertaking physical recovery. [*]
- Types of recyclers (reuse and recovery) – in-company / retail (exchange schemes), formal and informal. [*]
- Methods for recycling (reuse and recovery) [*]
- Types of recovery operations done, e.g. segregation, extraction and burning. [*]

- Environmental impacts of recovery operations [*]
- Estimates of the quantity and market value of the recycling (reuse and recovery) market in general and in specific to MMR. [*]
- Estimates of the percentage and time period for a typical mobile phone to find its way for reuse, recovery and disposal. [*]

Others

- Government policies pertaining to the industry
- Government policies pertaining to wastes generated by the industry [*]
- Census survey information on population and other statistics pertaining to mobile phones [*]

[Note: Possible sources of information:
- TNS India's annual CellTrack survey
- Indian Cellular Association
- Manufacturer company websites, e.g. Nokia, Motorola, Samsung, Alcatel, and Ericsson
- Service providers websites, e.g. BSNL, Bharti (Airtel), Hutch, Spice MTNL, Reliance Infocomm and Tata Teleservices (Tata Indicom)
- National Telecom Survey Report
- Voice and Data magazine (http://www.voicendata.com/)
- Telecom Regulatory Authority of India (TRAI)
- Cellular Operators Association of India (COAI)
- Snapshots' India Mobile Phone Services 2005 report
- Comprehensive Information on Indian Cellular Phone Industry – (http://www.india-cellular.com/)
- Indian Center for Market Research, ICFAI (http://icmr.icfai.org/)
- International Business Strategies (www.internationalbusinessstrategies.com)]

Manufacturers / Importers

The following information needs to be obtained from secondary sources and discussions with manufacturers / importers:

Products & industry

- List of major companies / importers of mobile phones, i.e. Nokia, Samsung and Motorola.

Market information

- Estimate of the mobile phone market in India, urban India and MMR.
- Estimate of the breakdown of the market in urban India between first time buyers and replacement buyers. [*]
- Estimate of market penetration in urban India in percentage, i.e. no. of mobile phones per 100 people. [*]
- Views of major companies on the future mobile phone industry and projected increase in mobile phone sales and users – in India as a whole and in urban India in particular.
- Views of major companies on the gray market and the competition from this market.
- Views of major companies about the reuse market and whether or not major players face competition from such products in the urban market.

Recycling & waste-related

- Views of major companies of the problems and opportunities in co-ordinating organized recycling through buy-back schemes. [*]
- Views on the major components in a typical mobile phone that have value for reuse and recovery. [*]
- Views on best practices for recovery. [*]
- Estimates of the percentage and time period for a typical mobile phone to find its way for reuse, recovery and disposal. [*]
- Estimates of the quantity and market value of the recycling (reuse and recovery) market that mobile phones generate. [*]

Retailer

Retail outlets selling mobile phones

The following information needs to be obtained from secondary sources and discussions with retail outlets selling mobile phones:

- Current market size in MMR. [*]
- Current market growth rate in MMR – has the MMR market saturated? [*]
- Market differentiation – first time Vs replacement – percentage breakdown - changing trends in the split between first time and replacement - Lifetime of a typical mobile handset. [*]
- Current market shares across major companies
- Gray market size in MMR – comparison with the regular market – trends in the gray market, i.e. increasing or shrinking – price differentials vis-à-vis products of the regular market. [*]

Mobile service providers

The following information needs to be obtained from secondary sources and discussions with mobile service providers:

- Major service providers in MMR, their market shares and total subscriber base in the current month [*]
- Monthly increase in the subscriber base in MMR.
- Buyer / user segments in MMR – high, middle and low income groups
- Current market penetration in MMR in percentage, i.e. no. of mobile phones per 100 people and derived estimation of the number of mobile phones in MMR based on the population. [*]
- Future of the mobile phone industry – market trends – total projected increase in subscribers in MMR. [*]

Consumer / End User

The following information needs to be obtained from secondary sources and discussions with consumers / end users:

- Views of the frequency of replacement across different income segments, i.e. high, medium and low income - Is it 6 months or 1 year or 2 years or more? [*]
- Views on exchange schemes and their level of attractiveness
- Views on upgrading to new technology – of the different consumer items, are mobile phones most likely to be upgraded when new technology becomes available?
- Views on purchases from gray and used mobile phones market, particularly in the low-income segment. [*]
- Disposal practices adopted for old mobile phones, i.e. store at home or exchange scheme or give-away to driver / servant or junk in the dustbin.

Service Centre / Repair / Reuse

There are two types of service centres: (a) company-owned and (b) local. Both these have to be covered. The following information needs to be obtained from secondary sources and discussions with service centers for repairs and reuse.

Service scenario

- Estimate of the number of service centres in MMR.
- Views on the viability of repair taking into consideration the cost of new mobile phones.
- Estimate of the number of mobile phones that received for repair – percentage of those that are returned after proper repair – percentage of the remaining that can be stripped for components, used for recovery and finally disposed. [*]

Recycling & waste-related

- Estimate of waste quantity, i.e. unusable mobile phones and components, generated annually – are these sold locally? If so, what's the price obtained for them in the different service centres? – are these sent back to the manufacturers? [*]
- Estimate of waste quantity likely to be generated from all the service centres in MMR. [*]
- Disposal practices adopted for unusable mobile phones and components, e.g. use of middlemen or junk in the dustbins. [*]
- Information on whether or not the unusable mobile phones and components go outside of MMR. If so, what is the extent and why? [*]
- Visual inspection of the storage area of unusable mobile phones and components to determine whether segregation is done.
- Information on good practices and bad practices of the recovery recycling that is being done elsewhere in MMR. [*]

Recovery Recycler

The following information needs to be obtained from secondary sources and discussions with recovery recyclers – both formal and informal recyclers. This covers both the scrap dealers / agents (large & small) and those involved in the physical recovery operations.

Raw material sourcing

- Different sources of their raw material, i.e. unusable mobile phones and components, only domestic or imported waste as well. [*]
- Quantity of waste from the mobile phone manufacturing facilities (if started in India) reaching the MMR recycling sector. [*]
- Trends in the availability of their raw material [*]

Recovery operations

- Types of recovery operations done, e.g. segregation, re-gunning of cathode ray tubes, extraction and burning. [*]
- Environmental impacts of these recovery operations[*]
- Good practice and bad practice information on the methods and operations adopted. [*]
- Views on the size of the recovery operations – medium and small [*]
- Information on the financial viability of these recovery operations. [*]

Final recovered products

- Different final applications of their produce. Good and bad practice information associated with those methods and operations. [*]

Recovery market information

- Estimate of the size of the recovery market based on unusable mobile phones and components in MMR. [*]
- Information on whether or not the unusable mobile phones and components after recovery go outside of MMR. If so, which locations? To what extent and why? [*]

Disposal [Combined for all three types of WEEE]

The following information needs to be obtained from secondary sources, visit to the dump yards and discussions with representative-in-charge of the dump yards:

- Estimate of the quantity of WEEE received in the particular dump yard. [*]
- Estimate of the total quantity of WEEE reaching all the dump yards in MMR. [*]
- Information on whether rag pickers are collecting WEEE in these dump yards.
- Information on which of the wards in MMR receives more of WEEE - why? [*]

Annexure 2: Terms of Reference for Individual Consultants

Annexure 2A: Terms of reference for the market / industry research consultant [Yet to be identified]

The consultant should conduct various market / industry research-related activities in the three electronics sub-sectors - personal computers, televisions and mobile phones - that are relevant to the rapid WEEE assessment in the city of MMR. These activities are to be seen in the context of the overall stakeholder / industry / waste chain methodology depicted as a flow chart in the methodology (Annexure 1). The consultant's focus should be on the stakeholder / industry / waste chain above the dark horizontal line included and on the associated information required (Annexure 2). The various activities include the following:

* To identify appropriate secondary information sources, both on the web and in print, using the guidance given in the Annexure documents.
* To review the secondary information to sift out the data / information - both qualitative and quantitative aspects.
* To identify potential respondents across the different industry stakeholders / chain for conducting primary meetings among the various stakeholder groups.
* To develop a checklist using the guidance given in the Annexure documents as a preparation for the primary meetings.
* To administer the checklist through the conduct of these primary meetings.
* To compile and collate the data / information collected from these meetings in a structured, systematic manner.
* To analyze both the primary and secondary data / information in order to draw-out the findings that are relevant to the WEEE assessment.
* To compile and prepare a structured draft report (MS Word) on each of the three sub-sectors.
* To make a presentation (MS-Power Point) on the study findings.
* To revise the draft report and prepare a final report on each of the three sub-sectors based on the comments from the other members of the study team.

Annexure 2B: Terms of reference for the recycling / waste management consultant [To be decided]

The consultant should conduct various activities in the recycling / waste management pertaining to three sub-sectors / products: personal computers, televisions and mobile phones. These activities are to be seen in the context of the overall stakeholder / industry / waste chain methodology depicted as a flow chart in the methodology (Annexure 1). The consultant's focus should be on the stakeholder / industry / waste chain below the dark horizontal line included. The consultant is required to collect the data / information, which has been detailed in a separate list (Annexure 2). The various activities include the following:

* To identify appropriate secondary information sources, both on the web and in print, using the guidance given in the Annexure documents.
* To review the secondary information to sift out the data / information - both qualitative and quantitative aspects.

* To identify potential respondents across the industry / waste chain for conducting primary meetings among the various stakeholder groups.
* To develop a checklist using the guidance given in the Annexure documents as a preparation for the primary meetings.
* To administer the checklist through the conduct of these primary meetings.
* To compile and collate the data / information collected from these meetings in a structured, systematic manner.
* To analyze both the primary and secondary data / information in order to draw-out the findings that are relevant to the WEEE assessment.
* To compile and prepare a structured draft report (MS Word) on each of the three sub-sectors.
* To make a presentation (MS-Power Point) on the study findings.
* To revise the draft report and prepare a final report on each of the three sub-sectors based on the comments from the other members of the study team.
* To seek assistance from the Adviser (WEEE) in all the above activities as and when required.

Annexure 2C: Terms of reference for the Adviser (WEEE) [To be identified]

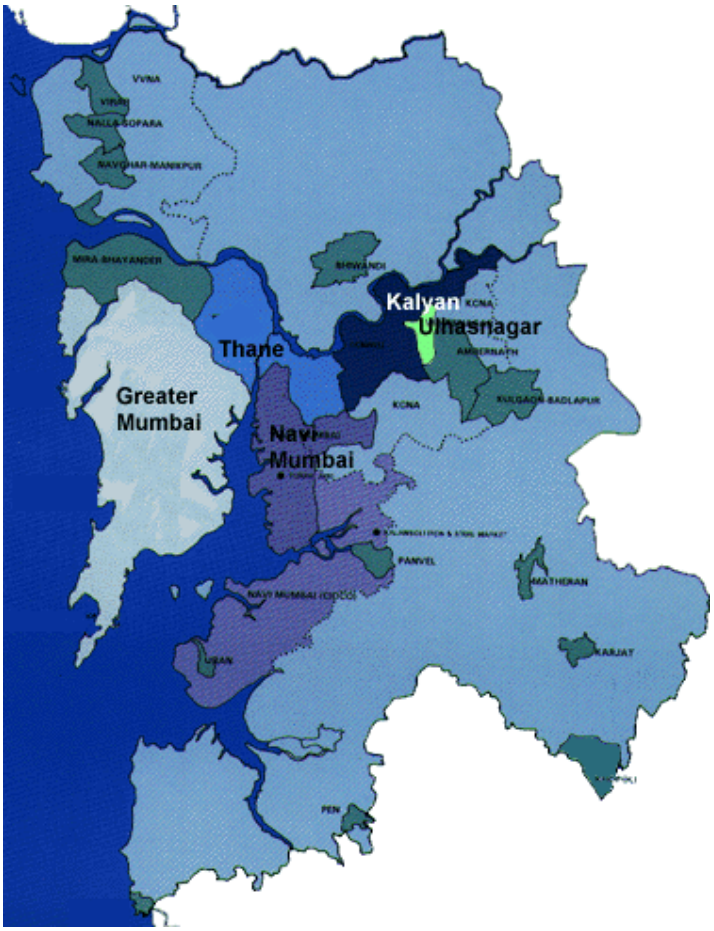
The Adviser should provide guidance on the various activities in the recycling / waste management pertaining to three sub-sectors / products - personal computers, televisions and mobile phones - that are relevant to the rapid WEEE assessment in the city of MMR. These activities are to be seen in the context of the overall stakeholder / industry / waste chain methodology depicted as a flow chart in the methodology (Annexure 1). The Adviser's focus should be on the stakeholder / industry / waste chain below the dark horizontal line included and on the associated information required (Annexure 2). The Adviser should work closely with the identified recycling / waste management consultant. The following activities are envisaged for the Adviser:

* To provide guidance to the recycling / waste management consultant to locate secondary information sources.
* To compile all the relevant information ready available with the adviser and provide them to the recycling / waste management consultant.
* To assist the recycling / waste management consultant in identifying potential respondents across the industry / waste chain that are relevant to the each of the sub-sectors.
* To participate in selected primary meetings along with the recycling / waste management consultant in order to facilitate and to make these meetings most effective.
* To participate in the joint discussion meeting of the teams - as and when held - in order to provide technical advice / comment as relevant.
* To analyse the primary and secondary data / information collected by the study teams and to provide advice / comment on the conclusions that can be drawn.
* To provide comments on the draft report that would be prepared and compiled by the recycling / waste management consultant in each of the three sub-sectors.

Annexure 3: Geographical Boundaries of the Mumbai Metropolitan Region

Basic information on MMR	Greater Mumbai	Rest of MMR
AREA (Sq. Km.)	468	3,887
Population (in million) (Census 2001 Provisional)	11.91	5.90
Villages (1991)	Nil	982
Municipal Corporations (December 2001)	1	6
Municipal Councils (December 2001)	Nil	13
Factories in June 1997	7,153	4,267
Factories Employment in 1997 (in '000)	401	196
Industrial Value Added in 1996-97 (Rs. in million)	69,390	77,748
Solid waste generation in tons/day (1993)	6,000	1,550

Source: http://www.mmrdamumbai.org/basic_information.htm



Source: http://www.mmrdamumbai.org/basic_map.htm