



E-WASTE: ARE WE READY?



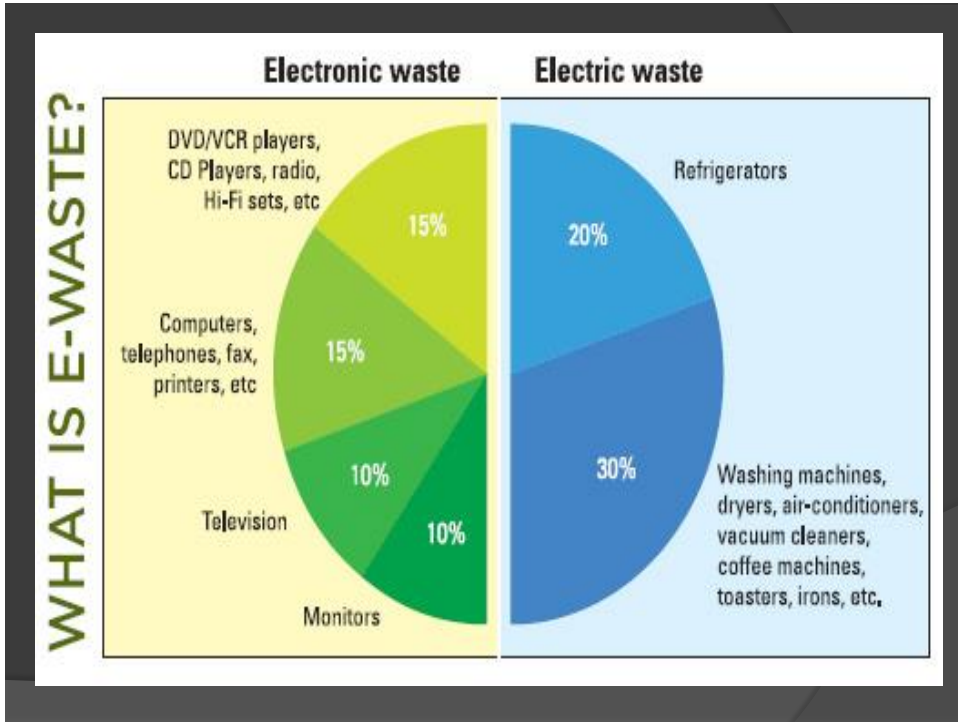
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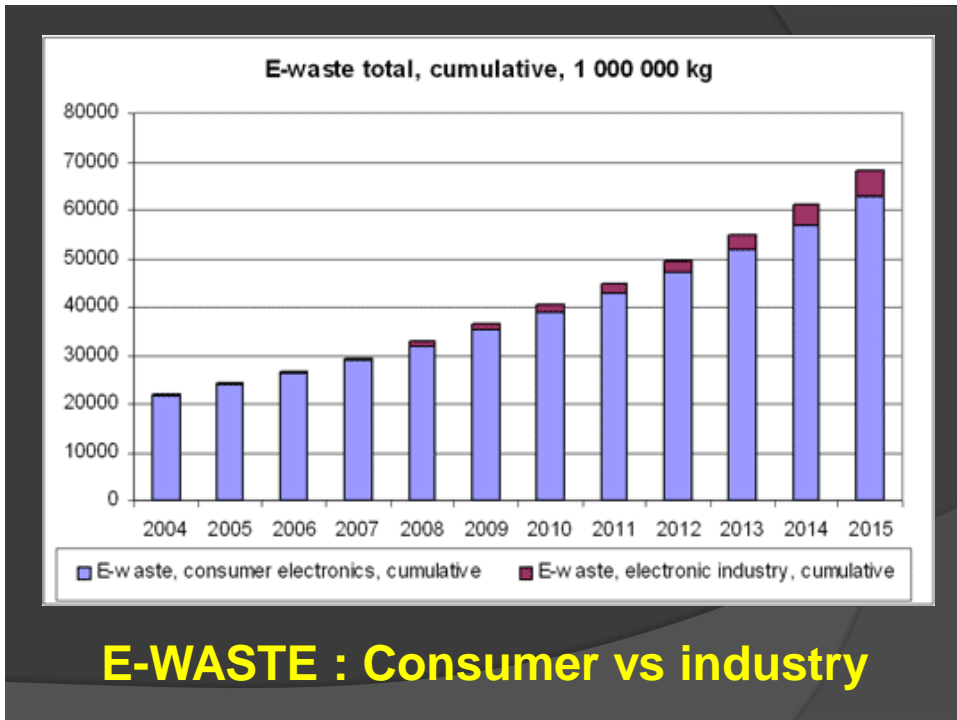
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What is E-WASTE ?

E-WASTE comprises of old electronic and electrical appliances ranging from personal computers to various household appliances such as TV's, refrigerators, cell phones, switches, wires, batteries and fluorescent lamps.







E-WASTE : Guiyu (China) no 1 in the world

- Received about 47 million computers and 100 million mobile phones every year .
- Black market business of dismantling e-waste and recycling workers earned USD 8 per day.
- Releasing toxins that they not only inhale, but release into the air, ground and water.
- Guiyu has the highest levels of cancer-causing dioxins in the world.
- Pregnancies in Guiyu are six times more likely to result in miscarriages, and 70% of the children there have high blood lead level.



E-WASTE : Malaysian situation

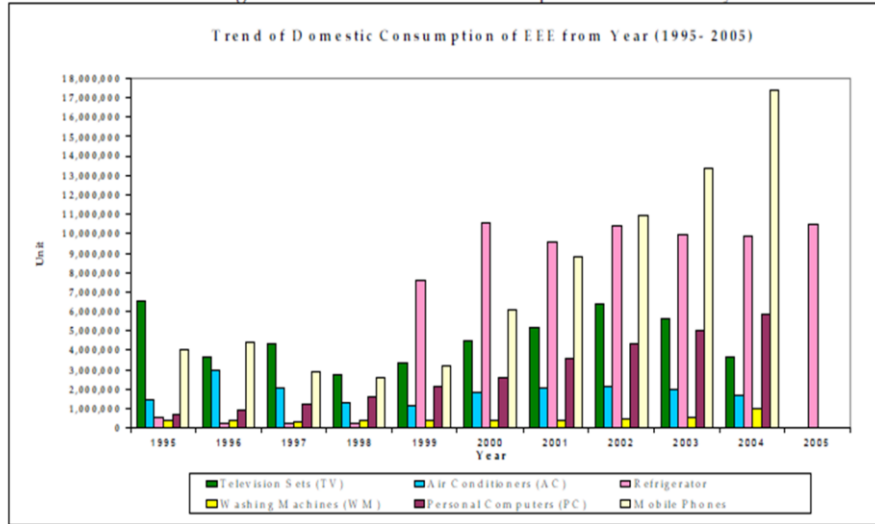
- ✓ Average 8,000 tons per year and keep increasing 3-5% per year.
- ✓ Fastest growing waste stream.
- ✓ Inline with rapid growth of the electronics industry.
- ✓ Poor awareness and enforcement.



Table 6.2 Malaysia : Quantity of Scheduled Wastes Generated by Category, 2008

NO.	CATEGORY OF WASTE	QUANTITY OF WASTE	
		(MT / Year)	PERCENTAGE (%)
1	Gypsum	366,771.99	28.11
2	Dross / Slag / Clinker	208,319.53	15.96
3	Oil & Hydrocarbon	129,701.99	9.94
4	Mineral Sludge	107,122.05	8.21
5	E-Waste	102,808.53	7.88
6	Heavy Metal Sludge	91,730.67	7.03
7	Used Containers	38,876.04	2.98
8	Acid & Alkali	38,179.66	2.93
9	Spent Solvent	38,062.81	2.92
10	Batteries	34,283.59	2.63
11	Mixed Wastes	33,928.70	2.60
12	Clinical/Pharmaceutical	26,967.95	2.07
13	Ink & Paint Sludge	18,695.78	1.43
14	Contaminated Paper & Plastic	17,270.40	1.32
15	Rubber Sludge	15,512.02	1.19
16	Residue	13,544.07	1.04
17	Others	6,627.73	0.51
18	Phenol/Adhesive/Resin	6,184.99	0.47
19	Catalyst	5,225.53	0.40
20	Contaminated Land / Soil	1,324.77	0.10
21	Chemical Waste	1,169.75	0.09
22	Contaminated Active Carbon	934.42	0.07
23	Asbestos	668.94	0.05
24	Mercury	465.31	0.04
25	Photographic Waste	418.77	0.03
26	Sludge Contain Cyanide	84.78	0.01
27	Pesticide	12.26	0.00
28	Peroxide Agent	5.73	0.00
	TOTAL	1,304,898.77	100.00

Figure 8: Trend of domestic consumption of EEE in Malaysia



Source: Department of Statistic, Malaysia (2007).
 Malaysian Communication and Multimedia Commission (2007)
 Department of Treasury, Ministry of Finance Malaysia (2007)

Future Projection for WEEE in Malaysia for the Year 1981-2020

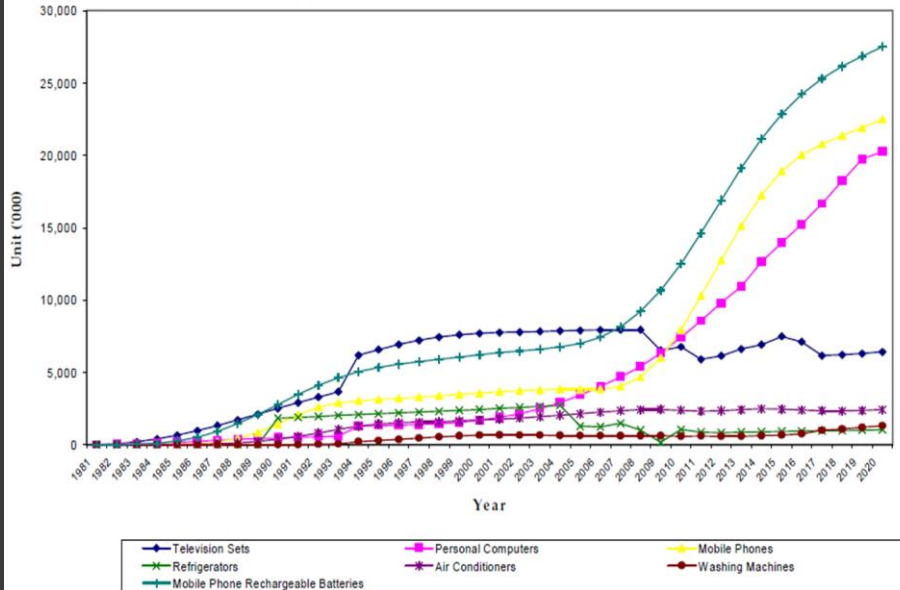
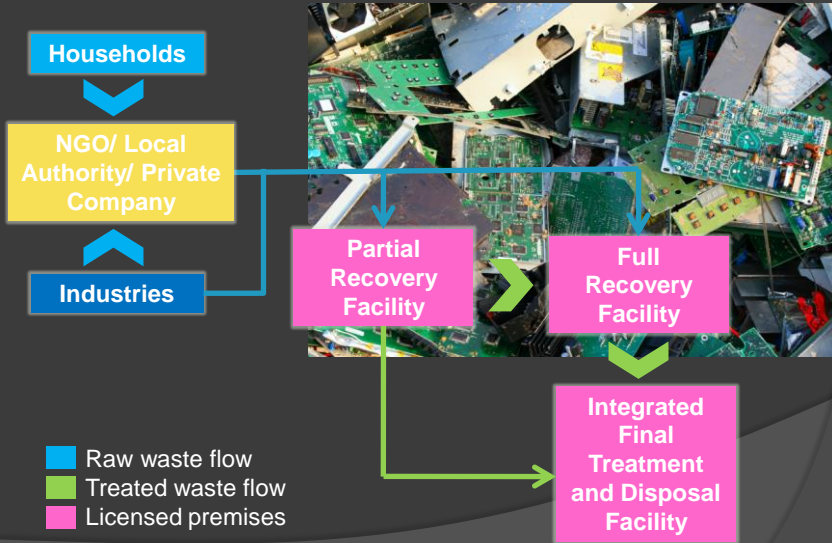


Figure 9: Projection of WEEE in Malaysia ('000 Units)

E-WASTE Management in Malaysia



Malaysian Scheduled Waste Contractor 2010-2011 (update 15/07/2010)

Source : Department of Environment Malaysia

Partial recovery facility
Full recovery facility



States	Partial	Full
Johor	15	4
Melaka	14	3
Negeri Sembilan	5	2
Selangor	25	4
Kuala Lumpur	8	0
Perak	5	0
Kedah	15	1
Pulau Pinang	38	7
Perlis	0	0
Kelantan	0	0
Terengganu	0	0
Pahang	0	0
Sarawak	7	0
Sabah	0	0

E-WASTE : Sabah situation

- ✓ 3 incinerators for **CLINICAL WASTES** (Sipitang - 50 kg/hour, Sandakan - 25 kg/hour, Kota Marudu - 25 kg/hour).
- ✓ 2 incinerators for **OIL WASTES** (Sepangar - 95 kg/hour, Sandakan - 100 kg/hour).
- ✓ Plans to build 2 incinerators before end 1999.
- ✓ Ongoing project incinerator plant in Labuan
- ✓ Oils waste, toxic waste and e-waste are not accepted in the landfills (Kayu Madang Dumpsite)



E-waste where??



"Close to 95% of the e-waste that is recycled goes through the informal sector" – WHO, 2010

The Threat of E-Waste

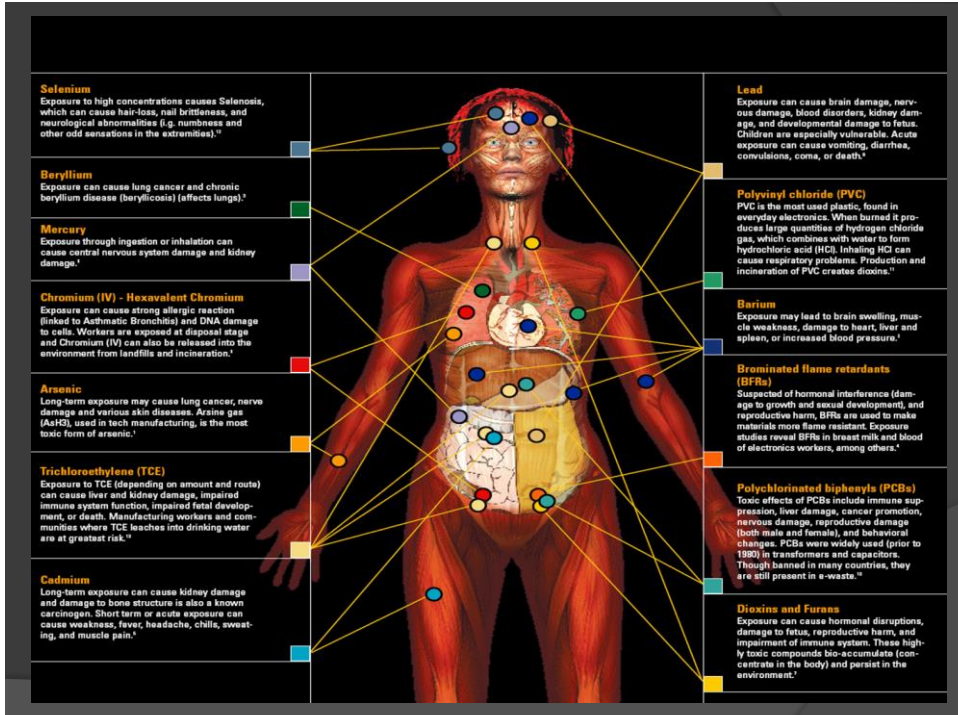
- ✓ Discarded e-waste contain hazardous materials.
- ✓ If disposed improperly, they pose a potential threat to human health and the environment.
- ✓ E-Waste accounts for 40 percent of the lead and 75 percent of the heavy metals found in landfills (Iowa, DNR).
- ✓ Once electronics are discarded in a landfill, the acidic conditions provide an environment in which lead and other heavy metals may leak out.
- ✓ If the landfill's liner fails, the groundwater supply may become contaminated.

Why E-WASTE was toxic?

- Solvents to make chips, disk drives and other parts.
- Lead and cadmium in circuit boards.
- Lead and barium in monitors.
- Brominated flame retardants on printed circuit boards, cables and plastic casings.
- Poly-vinyl chloride (PVC) casings.
- Mercury switches and flat screens.
- Brominated flame retardant in plastics



Source of e-wastes	Constituent	Health effects
Solder in printed circuit boards, glass panels and gaskets in computer monitors	Lead (Pb)	<ul style="list-style-type: none"> Damage to central and peripheral nervous systems, blood systems and kidney damage. Affects brain development of children.
Chip resistors and semiconductors	Cadmium (Cd)	<ul style="list-style-type: none"> Toxic irreversible effects on human health. Accumulates in kidney and liver. Causes neural damage. Teratogenic.
Relays and switches, printed circuit boards	Mercury (Hg)	<ul style="list-style-type: none"> Chronic damage to the brain. Respiratory and skin disorders due to bioaccumulation in fishes.
Corrosion protection of untreated and galvanized steel plates, decorator or hardner for steel housings	Hexavalent chromium (Cr VI)	<ul style="list-style-type: none"> Asthmatic bronchitis. DNA damage.
Cabling and computer housing	Plastics including PVC	<ul style="list-style-type: none"> Burning produces dioxin. It causes Reproductive and developmental problems; Immune system damage; Interfere with regulatory hormones
Plastic housing of electronic equipments and circuit boards.	Brominated flame retardants (BFR)	<ul style="list-style-type: none"> Disrupts endocrine system functions
Front panel of CRTs	Barium (Ba)	<ul style="list-style-type: none"> Short term exposure causes: Muscle weakness; Damage to heart, liver and spleen.
Motherboard	Beryllium (Be)	<ul style="list-style-type: none"> Carcinogenic (lung cancer) Inhalation of fumes and dust. Causes chronic beryllium disease or berylliosis. Skin diseases such as warts.



Local Research : Effects of heavy metal on health

Zailina H., Junidah R., Saliza M.E., [Shamsul B.S.](#) and Jamal H.H. (2011). Low blood lead concentrations and cognitive development of primary school children from three areas in Malaysia. *Journal of Environmental Science and Engineering*, 2:5(2011) 493-499.

Norazura I., Zailina H. and [Shamsul B.S.](#) (2011). Naphtha exposure, neurobehavioral performance, knowledge, attitude and practices among tyre factory workers. *Asia-Pacific J of Public Health*. 030/01-11(22).

Rumaizah R., Zailina H., [Shamsul B.S.](#), Lin Naing, Jamal H.H. and Rusli N. (2010). Follow-up study on occupational exposure to organic solvents and neurobehavioral performances of automotive workers. *Journal of Medical Safety*, 2010:9-19.

[Shamsul B.S.](#) and Zakirah M. (2009). Exposure to Suspended Chromium Compounds in Air and Its Association with Urinary [beta]-2-Microglobulin Level among Welders in an Automotive Components Manufacturing Plant, Selangor. *Epidemiology*, 20(6):16-32.

[Shamsul B.S.](#), Jamal H.H., Nik Nasri N.I., A. Rahman A.J. and Zailina H. (2005). The Influence of Blood Lead on the Neuropsychology of Pregnant Women in the Klang Valley, Malaysia. *Epidemiology*, 16(5):158-163.

Mimala A., Zailina H. and [Shamsul B.S.](#) (2004). Occupational lead exposure of soldering workers in an electronic factory. *J Occu Safety Health*. 1(2):51-57, 2004.

Zailina H., Nurunniza Z.A. dan [Shamsul B.S.](#) (2004). Perbandingan kepekatan plumbum darah dan hubungannya dengan skor neurotingkahlaku antara pekerja kilang bateri dengan pekerja pentadbiran di Selangor. *Sains Malaysiana* 33(1):81-98.

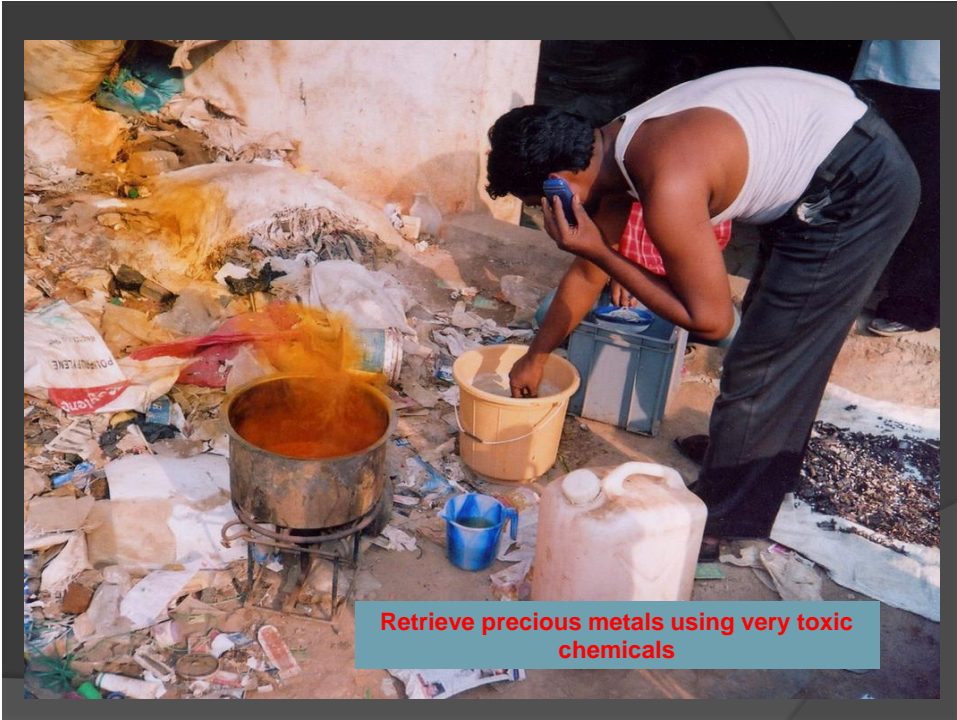
[Shamsul B.S.](#), Jamal H.H., A. Rahman A.J. and Nik Nasri I. (2003). Blood lead concentration during pregnancy and the health implication to the mothers and their babies. *Epidemiology*. 4(5):s23-s24.

[Shamsul B.S.](#), Zailina H., Jamal H.H. dan Ariffin O. (2002). Kepekatan partikel temafas (PM10) dan plumbum temafas dalam udara ambient di kawasan Bandar dan luar Bandar. *Sains Malaysiana*. 31(2002):223-239.

Jamal H.H., Zailina H., Ariffin O. and [Shamsul B.S.](#) (2000). Blood lead levels of urban dan rural Malaysian Primary School Children. *Asia-Pacific Journal of Public Health*. 2000:12(2):65-70.



Burn the waste releasing toxic and carcinogenic substances into the air

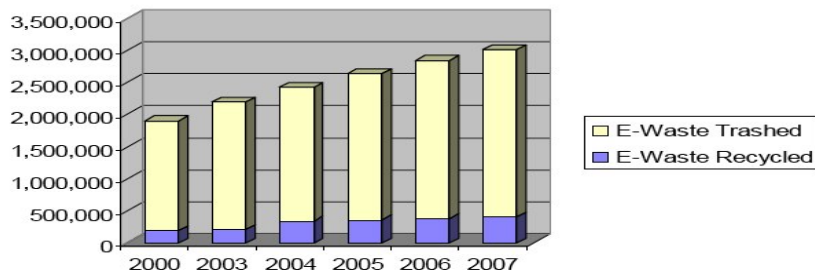


Do not dump your E-WASTE !!!

- Heavy metals may leach and contaminate groundwater.
- When burnt, the metals vaporizes into the air releasing lead and acids.
- Collected by illegal waste collector.
- Bad to human and environmental health.



E-Waste: Trashed vs Recycled (Tons)



Data in Tons	2000	2003	2004	2005	2006	2007
Trashed	1,710,000	1,980,000	2,080,000	2,270,000	2,460,000	2,600,000
Recycled	190,000	210,000	340,000	360,000	380,000	410,000
Total E-Waste	1,900,000	2,190,000	2,420,000	2,630,000	2,840,000	3,010,000
Disposed	1,900,000	2,190,000	2,420,000	2,630,000	2,840,000	3,010,000
% Recycled	10.0%	9.3%	14.0%	13.7%	13.4%	13.6%

E-WASTE : Trashed vs Recycled

E-WASTE recycle model

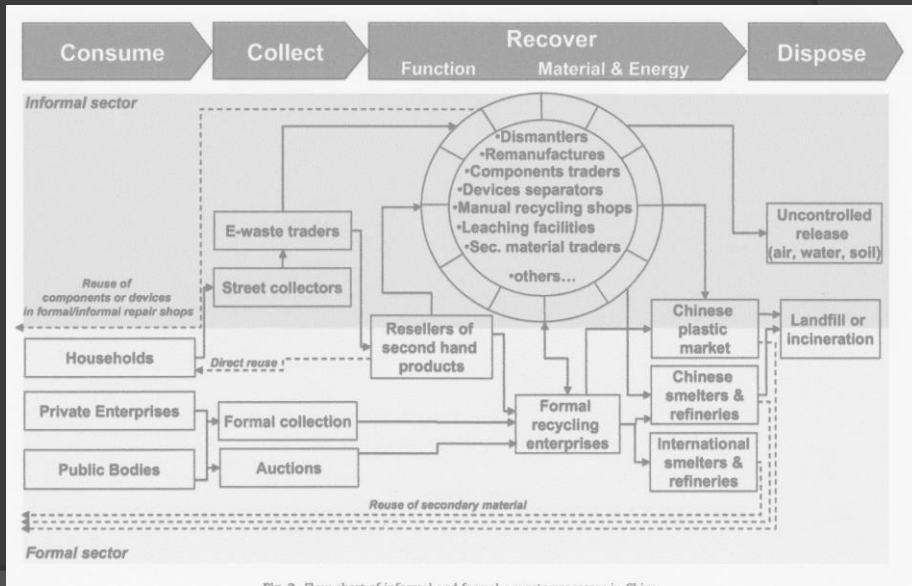
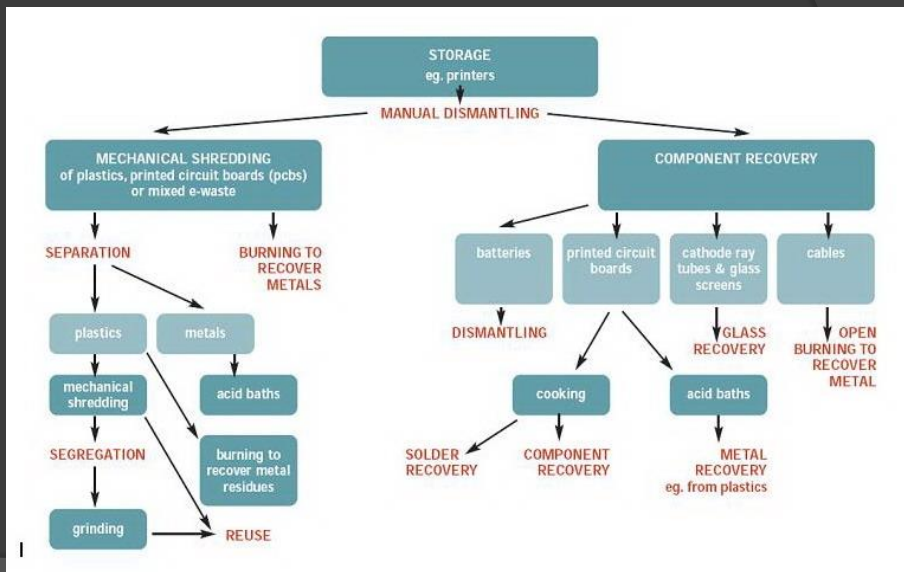


Fig. 7. Flow chart of informal and formal e-waste processing in China.

E-WASTE recycling processes



E-WASTE Legislation's (MALAYSIA)

- ✓ E-waste has been regulated in Malaysia since 2005;
- ✓ **Environmental Quality (Scheduled Wastes) Regulations, 2005**. This regulation has included e-waste as scheduled wastes.
- ✓ The 2005 regulation has replaced the 1989 regulation to enable Malaysia to **control trans-boundary movement of e-waste**;
- ✓ Guidelines for the **Classification of Used Electrical and Electronic Equipment** in Malaysia, 2008.
- ✓ Environmental Quality (Prescribed Premises) (Treatment Disposal Facilities for Scheduled Wastes) Regulations, 1989 (**control on collection, treatment, recycling and disposal of e-waste**).

ENVIRONMENTAL QUALITY (SCHEDULED WASTES) REGULATIONS 2005



SW110 : wastes from the electrical and electronic assemblies containing components such as accumulators, mercury-switches, glass from cathode-ray tubes and other activated glass or poly-chlorinated biphenyl-capasitors, or containing cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or poly- chlorinated byphenyls (PCB).

E-WASTE : Business Opportunities



Gold + RM
?????

Simple estimation ...

What is in a Computer?

Ferrous Metal	Plastics	Non-ferrous Metal	Glass	Electronic Boards
32%	23%	18% Lead, Cadmium, Antimony, Beryllium, Mercury	15%	12% Gold, Palladium, Silver, Platinum

Gold and gold component : 0.8%

Waste for 1000 PC

PC weight : 8kg

Total waste : 1000 x 8kg = 8000kg

Heavy metal : 18% x 8000kg = 1440kg

Gold/Silver/Platinum : 12% x 8000kg = 960kg

Gold and gold component : 0.8% x 8000kg = 64kg

* RM 175,000.00/kg (oct. 2011)

What next???



- Policy
- Recycle Programs
- Awareness
- Educations
- Enforcements
- Campaigns
- Wait, see and react
- Let nature decide