Staatssekretariat für Wirtschaft
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Knowledge Partnerships with Developing and Transition Countries in e-Waste Recycling

rolf.widmer@empa.ch

EMPA - Swiss Federal Laboratories for Materials Testing and Research
tsl/sustec - sustainable technology cooperation
www.empa.ch/sustec

SIS Sustainability in the Information Society

EMPA

e-Waste: Truely a Problem Everywhere?

(c) BAN

Questions to be Answered

- Is e-waste recycling posing major problems / risks now or in the near future?
  - What is e-Waste or WEEE (Waste from Electric and Electronic Equipment)?
  - How much e-Waste has to be handled? globally and locally?
  - How is e-Waste handled / recycled?
- Do the framework conditions for e-waste handling allow for economically feasible improvements?
- Are solutions along the concepts of the SWICO / S.EN.S recycling system, the Swiss model for e-waste handling, feasible?

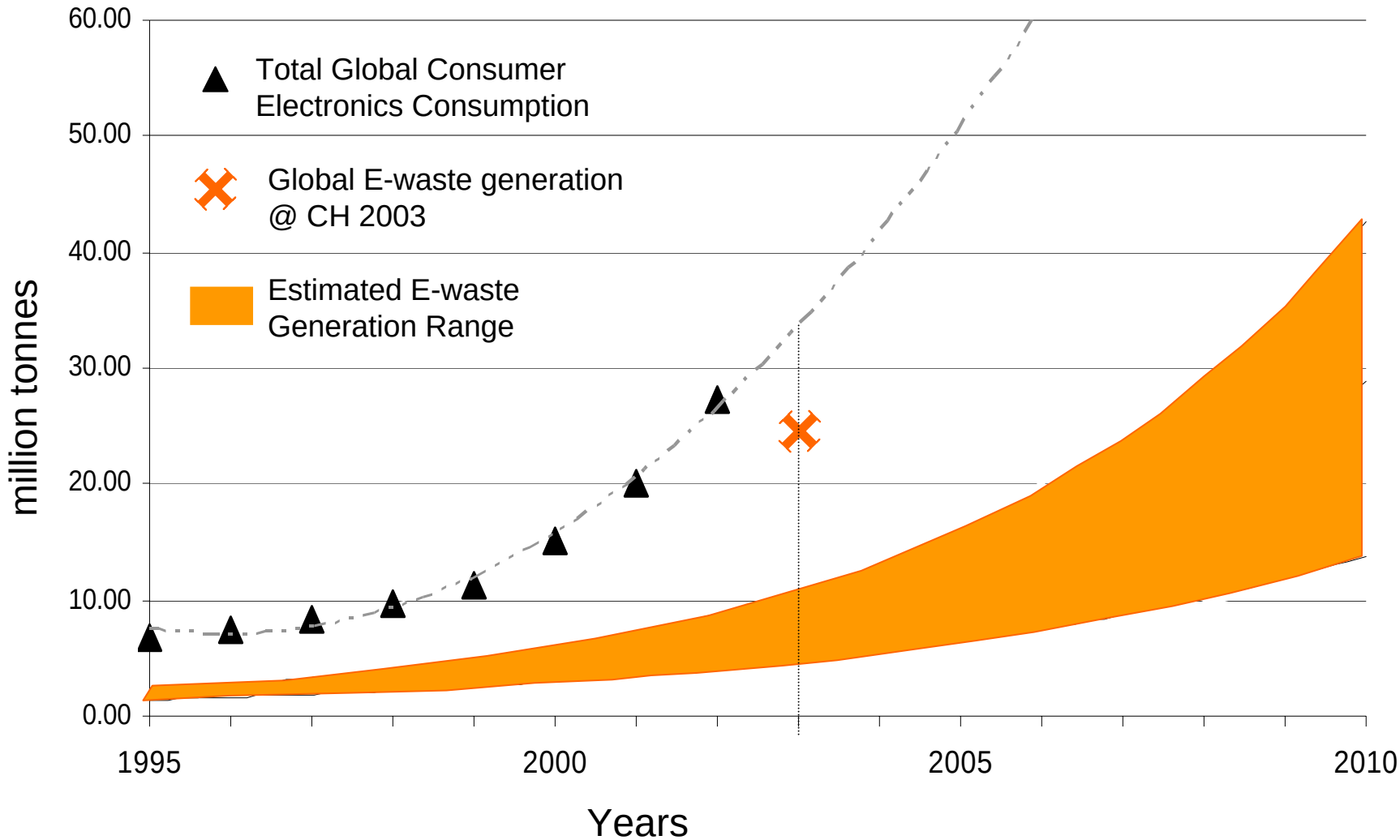
WEEE Facts and Figures, Switzerland

7.4 Mio.	Residents (2003)
<100’000 t	**WEEE** per year for recycling (tons, 2003)
~35’000 t	from the above 100’000 t are **electric waste** (per year, 2003)
~30’000 t	**electronic waste** (e-waste per year, 2003)
2’791 €	Investment in ICT per person and per year (2002) = ~3’000 US$
63%	of the Swiss are internet users
80%	of the Swiss are mobile phone users (2002)

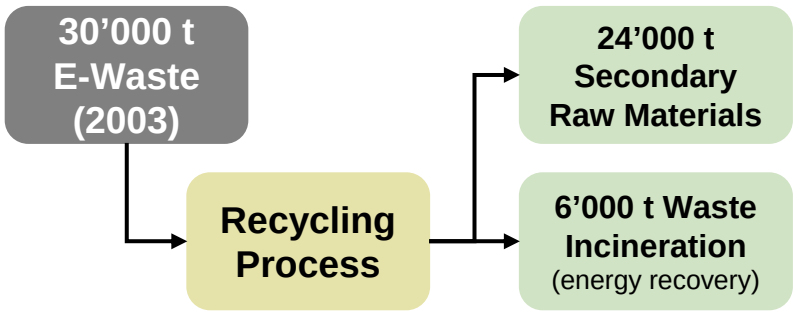
Electronic Equipment in Switzerland:

8.6 Mio.	TV sets	3.5 Mio.	Modems
8.2 Mio.	Hi-fi sets	1.9 Mio.	Scanners
7.0 Mio.	Mobile phones	1.7 Mio.	Video cameras
5.6 Mio.	Personal computers	1.7 Mio.	CD Players
5.6 Mio.	Video recorders	1.6 Mio.	Game consoles
5.0 Mio.	Printers	1.5 Mio.	Fax machines

Global E-waste Estimates

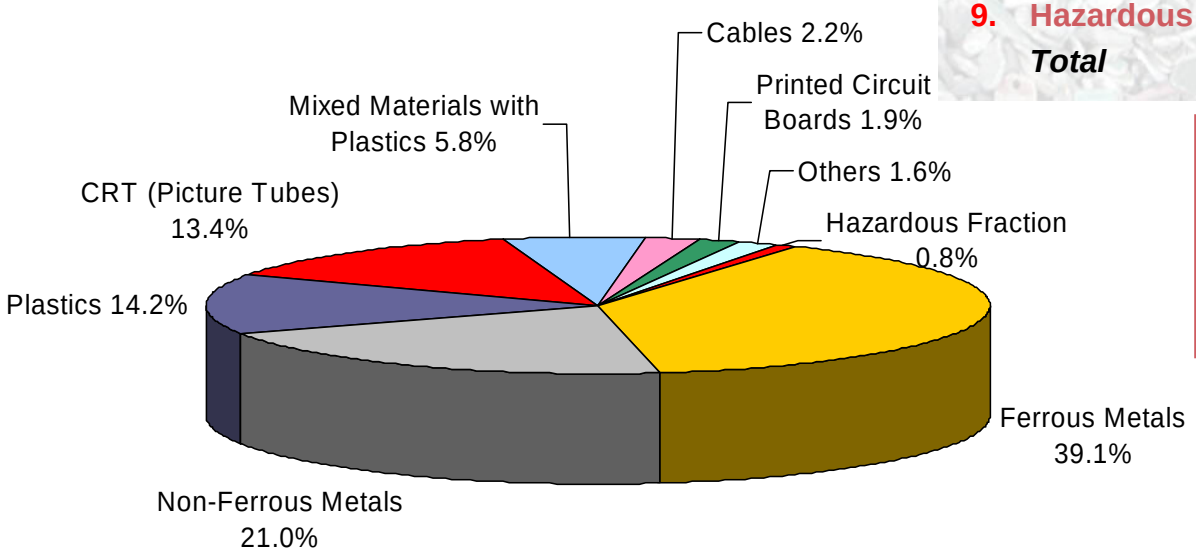


Materials from the e-Waste Recycling Processes



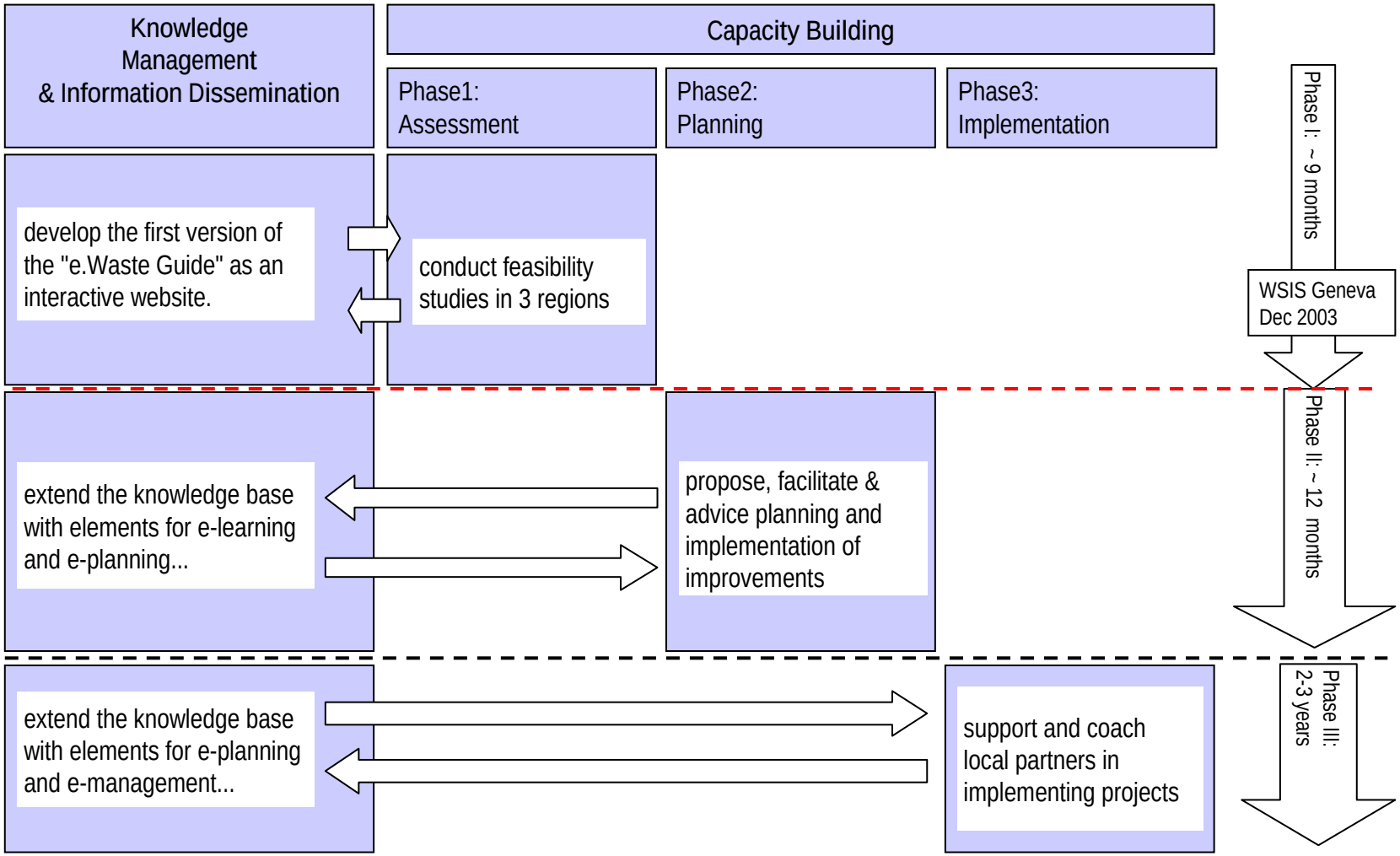
Materials from all SWICO Recyclers:

1.	Ferrous Metals	39.1 %
2.	Non-Fe Metals (Al, Cu, Au, Ag ..)	21.0 %
3.	Plastics	14.2 %
4.	CRT Glass	13.4 %
5.	Mixed Materials with Plastics	5.8 %
6.	Cables	2.2 %
7.	Printed Circuit Boards	1.9 %
8.	Others	1.6 %
9.	Hazardous Fractions	0.8 %
	Total	*100.0 %*

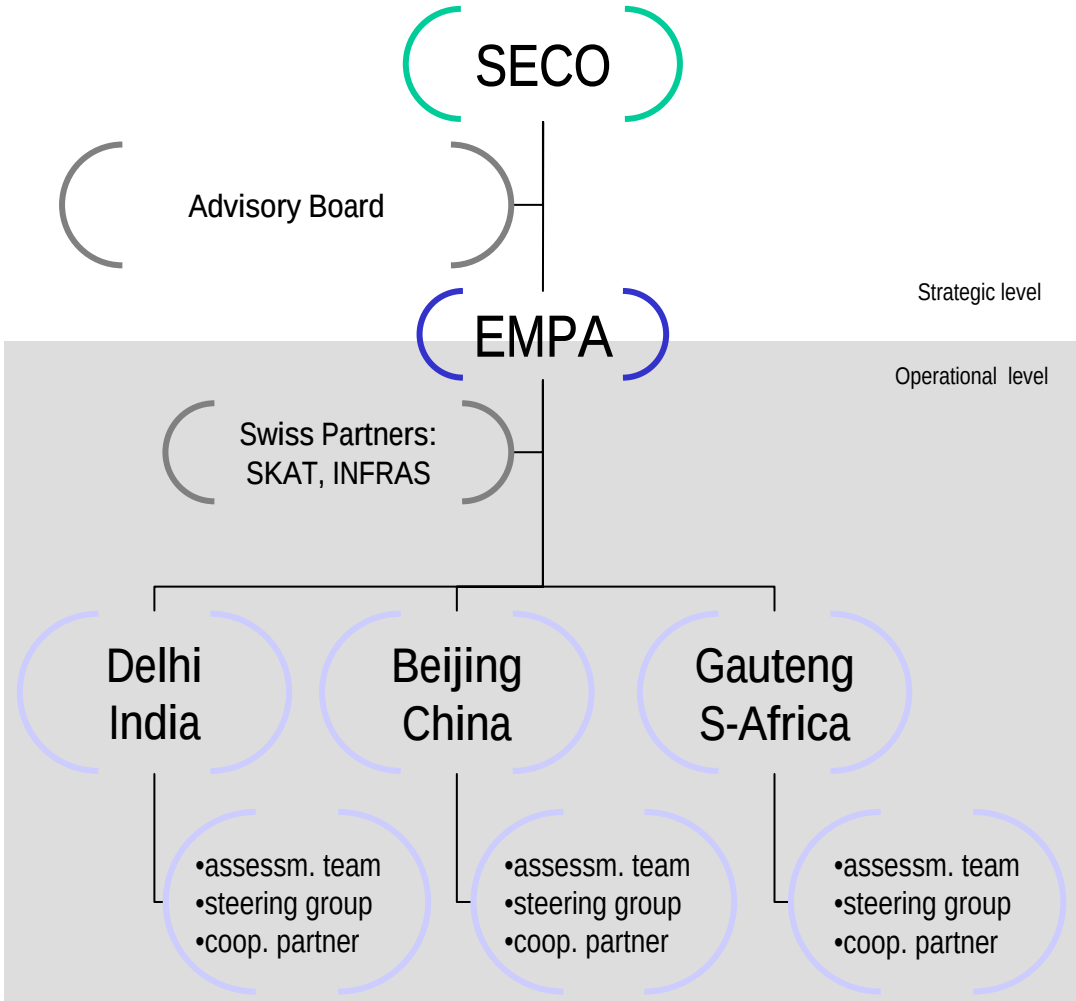


Individual figures from recyclers may differ from the above figures – depending on their specific recycling processes.

Project Outline

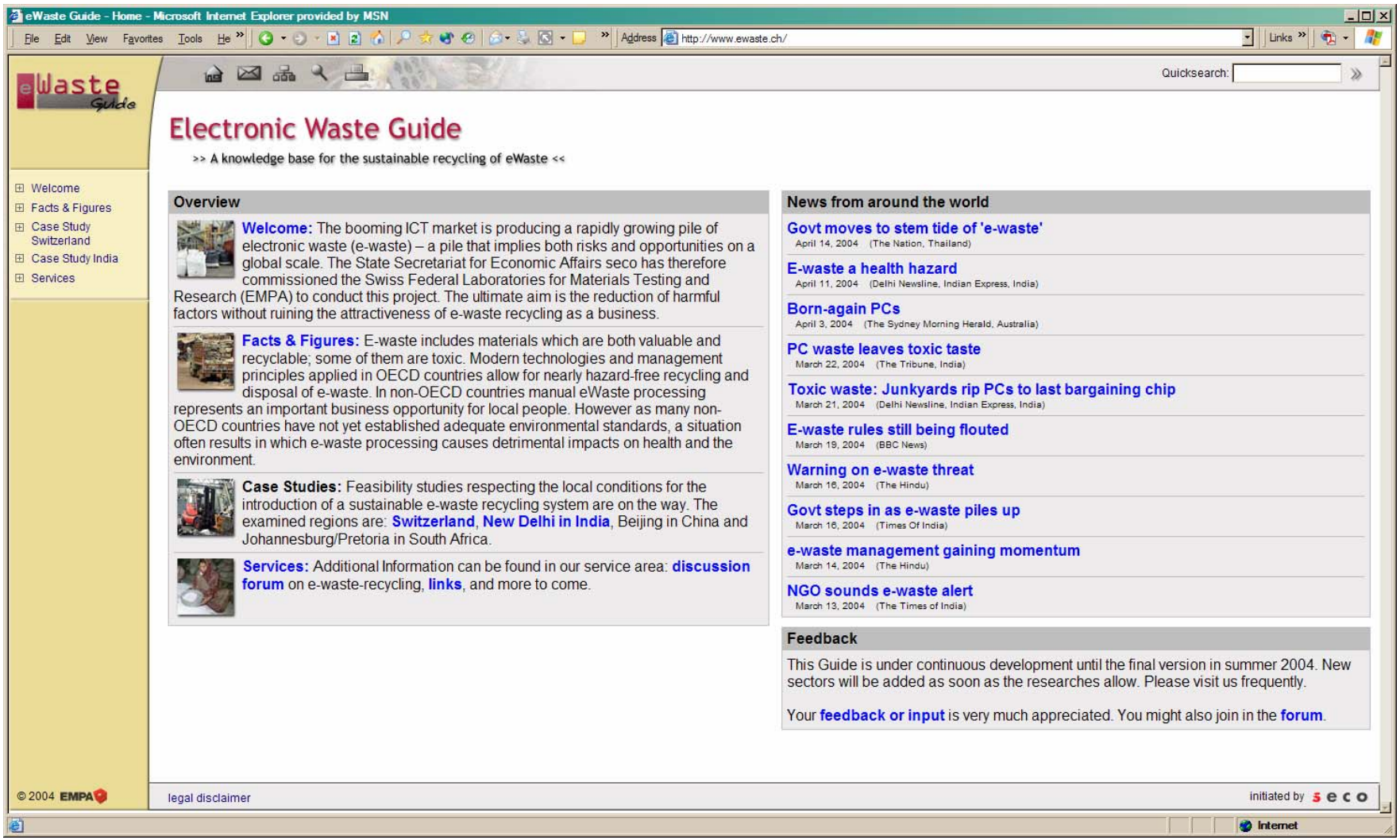


Project Structure & Organisation



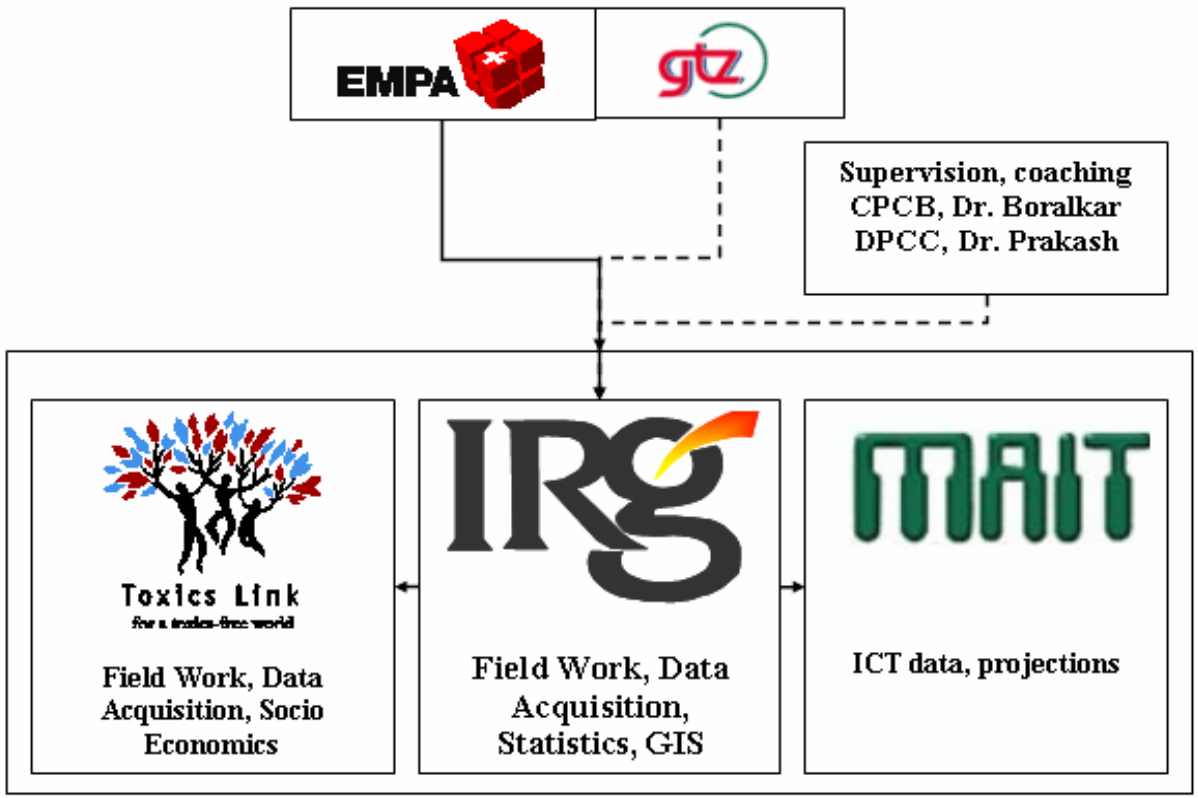
Knowledge Partnerships through the "e-Waste Guide"

www.ewaste.ch



Indo - Swiss Pilot Assessment in Delhi:

Management, Handling & Practices of e-Waste Recycling in Delhi (2003 - 04)

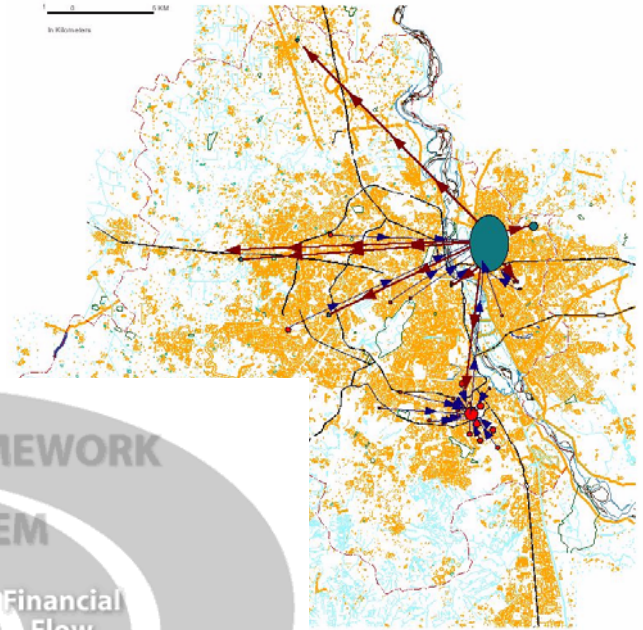


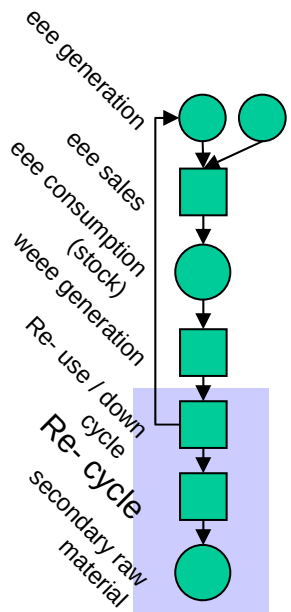
Impressions of e-Waste Handling in Delhi

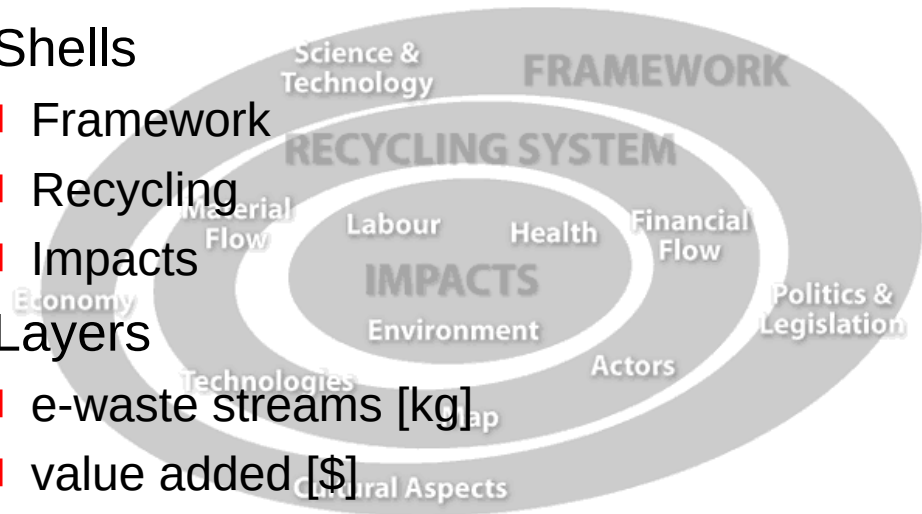
Impressions of e-Waste Handling in Delhi

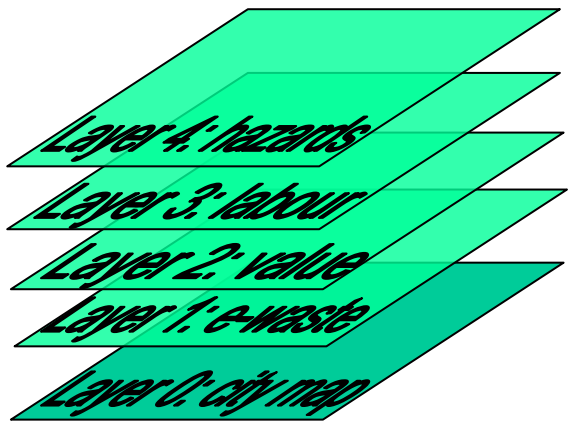
2-3-4 e-Waste Assessment Methodology

- 2 Views
  - process (stream analysis, “umberto”)
  - geographical (GIS, “arcview”)
- 3 Shells
  - Framework
  - Recycling
  - Impacts
- 4 Layers
  - e-waste streams [kg]
  - value added [$]
  - employment [hrs]
  - hazards [+=-]









PWB acid washing / burning








Step 0

Inspecting raw material: PWB (Printed Wiring Boards) with varnish or multilayer

Step 1

remove varnish manually with spate and water. Residues washed away!

Step 2

PWBs submerged in sulpheric acid to remove Cu layer (12hrs)

Step 3

pouring acid to stainless steel tub and boil of the water (firing with PWBs!). Remove Cu-Sulphate crystals for selling.

Step 4

remaining acid solution is poured into plastic drums and iron scrap (for instance Fe wires) is added to fallout Cu.

Step 5

the solution is poured in drums for settling. Cu sludge is recovered. Solution is thrown. Cu is sold.

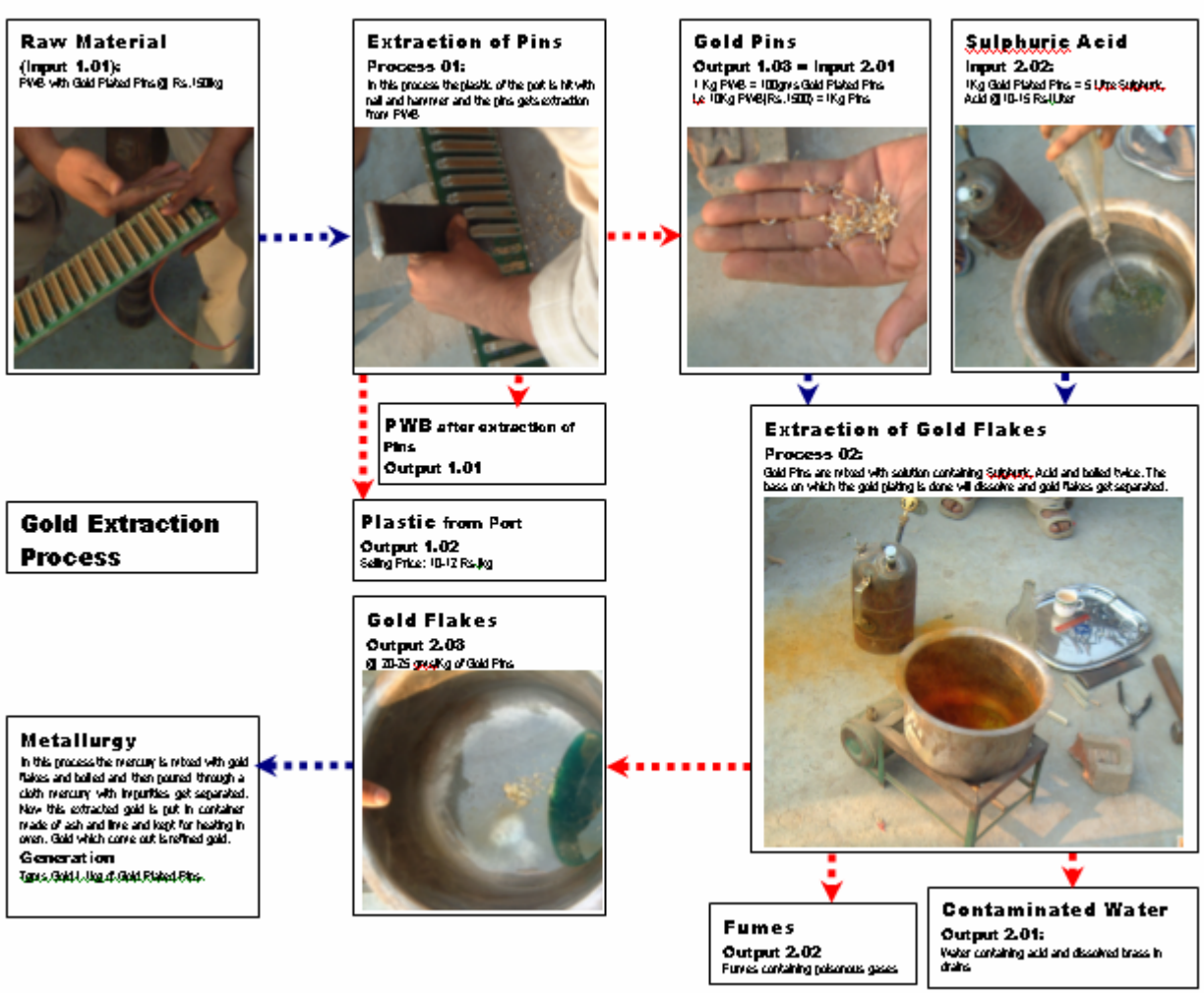
Step 6

glass fiber residues are stocked (further use unclear). Some cleaning / rinsing processes take place here. water hose runs constantly and dilutes effluents

Step 7

behind the factory wall are rice paddies and vegetable gardens. Effluents end up here.

Quantitative Analysis of Gold Extraction



Total WEEE Stream for Delhi

		2004	2010
PCs		8‘000	23‘000
Scenario 1 (conservative)			
WEEE	t	80'000	230'000
Recycling Market Turn Over	mio US$	51	147
Jobs	person years	4'000	11'500
Scenario 2 (realistic)			
WEEE	t	160'000	460'000
Recycling Market Turn Over	mio US$	102	294
Jobs	person years	7'900	22'713

Global Impacts Delhi

Impact / Process	Health (Score)	Environment (Score)	Bussiness (Score)	Total
IC's Extraction from PWB (Manual Plucking)	0	0	+1	+1
Surface Heating of PWB and Extraction of components	0	-1	+1	0
Regunning CRT's	0	+1	+1	+2
Dissembling of Monitor and extraction of components	-1	-1	-1	-3
Yoke core extraction	+1	0	0	+1
Metallic Transformer	+1	0	0	+1
Rare Earth Core of Transformer	+1	-1	0	0
Rare Earth Static Transformer	+1	-1	-1	-1
Wire PVC and Copper (Manual Stripping)	+1	0	0	+1
Plastic Shredder	0	0	+1	+1
Gold Extractions from pins and Comb	0	-1	+1	0
Acid Bath for PWB	-1	-1	-1	-3

Note: Score of Impacts
(-1) bad; (0) improvable; (+1) ok

www.ewaste.ch

Thank you for your Attention