

E-waste Africa Project

Status report for Component 3

Socioeconomic study & feasibility study

Second Advisory Board Meeting, 17.05.2009, Geneva

By Andreas Manhart & Siddharth Prakash

Objectives of Component 3:

- ➔ To study the feasibility of establishing environmentally sound materials recovery operations and promoting ESM in the context of the Basel Convention in a major informal e-waste recycling area in Africa and train local stakeholders on how to establish economic activities in the e-waste sector.

Major Activities under Component 3:

- ➔ In-depth socio-economic study on the functioning and the sustainability impacts of the e-waste sector in Nigeria; ➔ *“Socio-economic study”*
- ➔ Meetings and interviews with leading European recycling enterprises to elaborate on the demand and quality requirements of specific e-waste fractions; ➔ *“Feasibility study”*
- ➔ Stakeholder Workshop in Nigeria;
- ➔ Three technical trainings;
- ➔ Final presentation in Nigeria.

Timeline of Component 3:

	2009					2010									
Activity	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Component 3 „Socioeconomic study & feasibility study “															
Socio-economic study											Draft report				
Feasibility Study											Draft report				
Stakeholder Workshop															
Technical Trainings										3 trainings until end 2010					
Public Presentation													Public presentation in 4th quarter of 2010		

In parallel with reconciliation meeting of Component 1 & 2

First visit to Nigeria in October 2009:

**STAKEHOLDERS WORKSHOP ON THE BASEL CONVENTION
E-WASTE AFRICA PROJECT NIGERIA SEGMENT
ORGANISED BY**

- * SECRETARIAT OF BASEL CONVENTION
- * BASEL CONVENTION COORDINATING CENTRE
FOR AFRICA UNIVERSITY OF IBADAN
- * **Federal Ministry Of Environment**

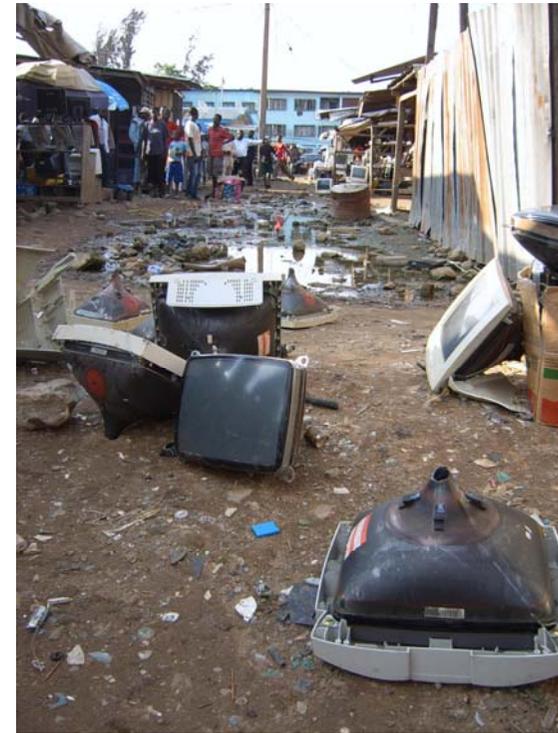
Venue: FED. MIN. OF ENVIRONMENT LAGOS OFFICE
GAMES VILLAGE, SURULERE, LAGOS

Date: *Wednesday 21st October*

Time: *9.00 a.m.*

First visit to Nigeria in October 2009:

- Meetings with key stakeholders
- First Stakeholder Workshop
- Visits to second-hand markets and waste dumps
- Training of local assessment team



➔ Next visit scheduled for June 2010

Feasibility Study:



Currently Applied Recycling Technologies

Analysing environmental, social and economic strengths & weaknesses



Best Available Recycling Technologies

Analysing environmental, social and economic strengths & weaknesses



Best Applicable Recycling Technologies

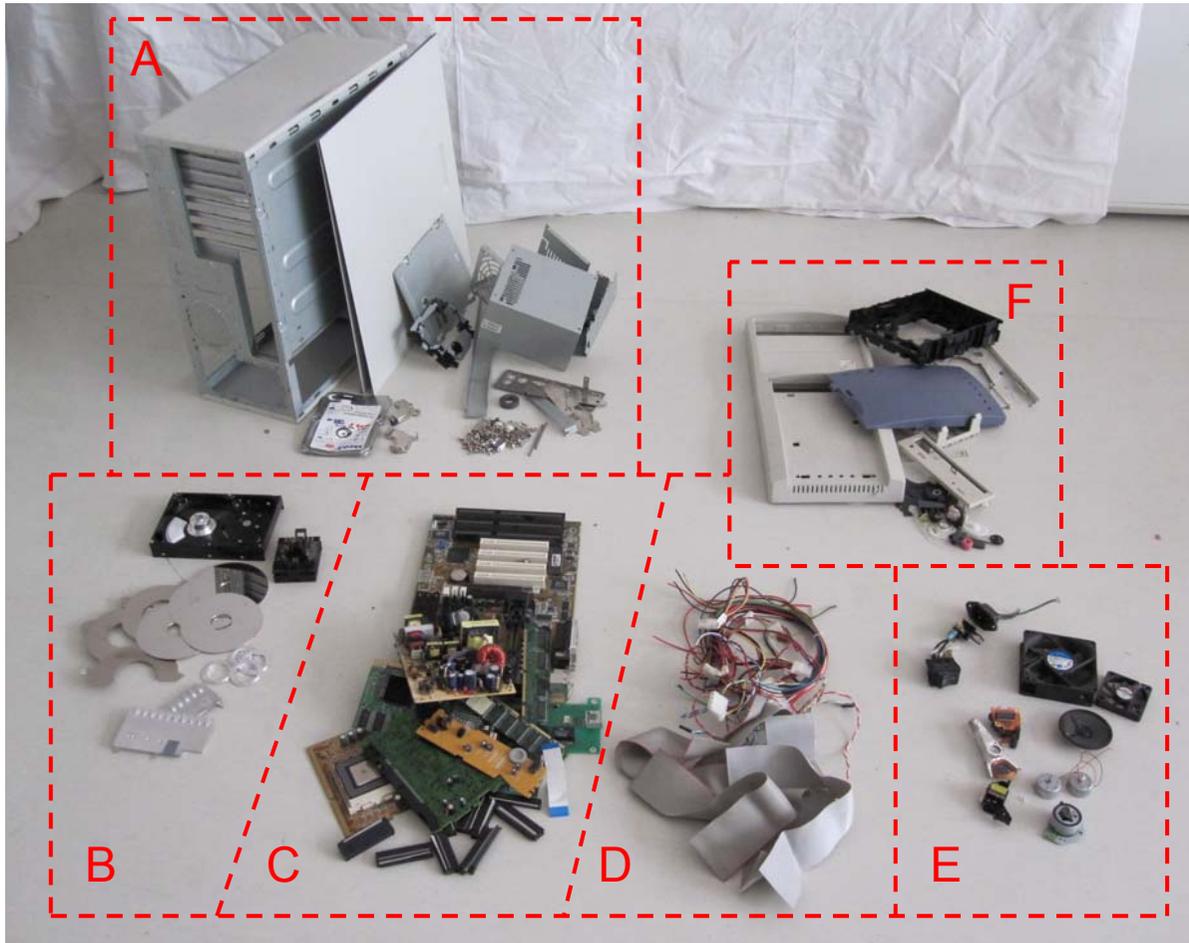
Key products:

- Desktop PCs
- Fridges & freezers
- CRT-devices (monitors & TVs)

Rationale:

- Large volumes
- High environmental impacts
- Recycling technologies also applicable for other e-waste types

Desktop PC:



- A: Steel scrap
- B: Aluminium scrap
- C: Printed circuit boards
- D: Cables
- E: Copper-steel scrap
- F: Plastics

How to tap these potentials?

Model 1: Indirect co-operation with one or more intermediaries

Intermediaries could act as formal joint between the widely informal e-waste sector and the refining companies.

Chances: Easy to implement

Risks: Monopoly positions, no intrinsic interest to reduce health & safety risks

Model 2: Direct co-operation between small scale recyclers and refineries

Community based or cooperative recycling structures could directly link with refining companies.

Chances: High development potential for the informal sector

Risks: Informal structures might have difficulties fulfilling the necessary administrative criteria

Fridges & freezers:



➔ Possibility to finance environmentally sound recycling via emission reduction trading schemes

Clean Development Mechanism (CDM):

- CFCs are not eligible

Climate Action Reserve (CAR):

- Does account for CFC from cooling circuits but not from foams
- R22 (CFC used in many air conditioners) is not eligible
- CFCs must be shipped to the USA for destruction

Voluntary Carbon Standard (VCS):

- Does account for CFC from cooling circuits and from foams
- Recovery & destruction efficiency $\geq 85\%$ → high standards for foam treatment

$$2.8 \text{ t CO}_{2\text{-equ}} \times 0.9 \times 5 \text{ US\$/t} = 12.60 \text{ US\$}$$

~ 50% achievable with medium investments (280,000 US\$)

~ 50% achievable with high investments (6,300,000 US\$)

Not very labour intensive (~ 6-8 people to operate and maintain the machinery)

CRT-devices:



CRT-glass: - 160 US\$/t
- 2.73 \$/device



Copper: + 7231 US\$/t
+ 5 \$/device

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	Amount in a PC [g/unit]	Average material price 2007 [\$/t]	Intrinsic material value 2007 [\$/unit]	Estimated recovery rates with presently applied techn.	Estimated recovery rates with best applicable techn.	Net material value with present. applied techn. [\$/unit]	Net material value with best appl. tech. [\$/unit]
Steel	6737.501	253*	1.70	95%	95%	1.62	1.62
Plastics	1579.545	310**	0.49	0%	0%	0	0
Al	550.212	2700	1.49	88%	78%	1.31	1.16
Copper	413.225	7231	2.99	85%	98%	2.54	2.93
Zinc	25.940	3400	0.09	0%***	0%***	0	0
Tin	19.573	19800	0.39	0%	0%***	0	0
Antimony	18.577	5660	0.11	0%	0%***	0	0
Nickel	12.700	37200	0.47	0%***	0%***	0	0
Lead	6.585	2730	0.02	0%	0%***	0	0
Silver	1.702	550000	0.94	0%	87%	0	0.81
Gold	0.260	22400000	5.82	0%	93%	0	5.42
Pd	0.120	11488748	1.38	0%	91%	0	1.25
Cr	0.015	2010	0.00	0%***	0%***	0	0
Ceramics & others	371.909	-	-	-	-	-	-
Sum	9737.860		15.88			5.47	13.19

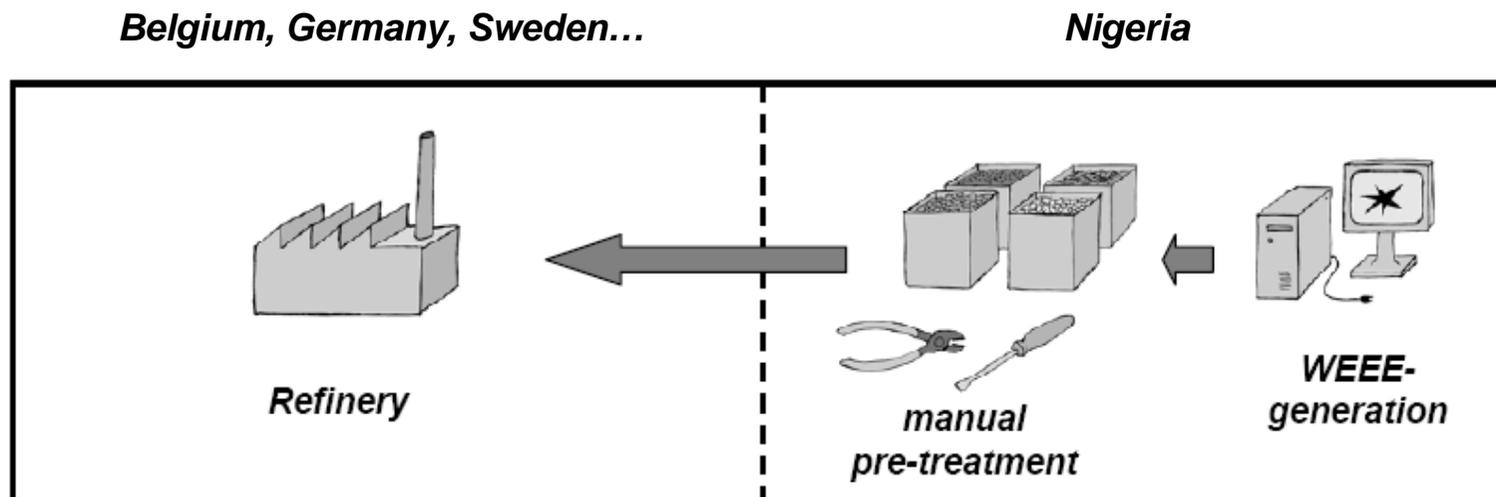
* Prices for iron & steel scrap

** Prices for mixed plastic

*** Partly indirectly recovered together
with other metals

Source: Gmünder 2007, USGS 2009a,
USGS 2009b, CSR 2009.

- House-to-house collection of e-waste;
- Manual pre-treatment, including deep dismantling until the level of parts;
- Refinery of steel- and aluminium-fraction in domestic plants;
- Refinery of high grade precious metals fraction in pyrometallurgical refineries;



- Further manual pre-treatment of cables and low grade copper fraction;
- Refinery of Cu and low-grade Cu fraction in copper- or steel-copper refineries;
- Controlled incineration / energy recovery of remaining plastic fraction.

Type and amount of refrigerant and foaming agent according to year of manufacture

Date of manufacturing	before 1988	1988 – 1993	1993 - 1997	from 1994
Refrigerant	R12	R12	R134a	R600a
Amount in „small“ appliance	140g	105g	95g	36g
Amount in „large“ appliance	332g	249g	226g	85g
Foaming agent (PUR-foam)	R11	R11	R134a	Cyclopentane
Amount in „small“ appliance	358g	247g	165g	194g
Amount in „large“ appliance	851g	587g	392g	460g
GHG-potential of refrigerant & foaming agent [CO ₂ -equ]				
CO ₂ -equ in „small“ appliance	3.23 t	2.32 t	0.37 t	0.0022 t
CO ₂ -equ in „large“ appliance	7.66 t	5.50 t	0.88 t	0.0053 t

Sources: Gabel et al. 1998; Rüdener & Gensch 2007; IPCC 2007.

	Amount contained in a fridge [kg/unit]	Average material price 2007 [US\$/t]	Intrinsic material value 2007 [US\$/unit]	Estimated recovery rates with presently applied technology	Estimated recovery rates with best applicable technology	Net material value with presently applied techn. [US\$/unit]	Net material value with best applicable technology [US\$/unit]
Steel	20	253*	5.06	99%	99%	5.01	5.01
Plastics	16	310**	4.96	0%	65%	0	3.22
Copper	1.6	7231	11.57	92%	92%	10.64	10.64
Aluminium	1.2	2700	3.24	92%	92%	2.98	2.98
Glass	0.4	31	0.01	92%	92%	0.01	0.01
Others	0.8	-	-	-	-	-	-
Sum	40		24.84			18.65	21.87

* Prices for iron and steel scrap ** Prices for mixed plastics Sources: DTI 2006; USGS 2009, CSR 2009

$$2.8 \text{ t CO}_{2\text{-equ}} \times 0.9 \times 5 \text{ US\$/t} = 12.60 \text{ US\$}$$

~ 50% achievable with medium investments (280,000 US\$)

~ 50% achievable with high investments (6,300,000 US\$)

Not very labour intensive (~ 6-8 people to operate and maintain the machinery)

CRT-devices:

Material content, intrinsic and net values of an average CRT-TV

	Amount contained in a CRT-TV [g/unit]	Average material price 2007 [\$/t]	Intrinsic material value 2007 [\$/unit]	Estimated recovery rates with presently applied techn.	Estimated recovery rates with best applicable techn.	Net material value with presently applied techn. [\$/unit]	Net material value with best applicable techn. [\$/unit]
Glass	17043	0	0	0%	0%	0	0
Plastics	6880	310**	2.13	0%	0%	0	0
Steel	2990	253	0.76	95%	95%	0.72	0.72
Copper	900	7231	6.51	85%	98%	5.53	6.38
Al	598	2700	1.61	88%	88%	1.42	1.42
Tin	31	19800	0.62	0%	0%***	0	0
Lead	22*	2730	0.06	0%	0%***	0	0
Nickel	6.7	37200	0.25	0%***	0%***	0	0
Silver	0.62	550000	0.34	0%	87%	0	0.30
Gold	0.04	22400000	0.85	0%	93%	0	0.79
Pd	0.02	11488748	0.26	0%	91%	0	0.23
Ceramics & others	1434	-	-	-	-	-	-
Sum	29900		13.38			7.67	9.84

→ - 160 \$/t
 - 2.73 \$/device

* Only lead contained in the TV-board ** Prices for mixed plastic

*** Partly indirectly recovered together with other metals