

E-waste Africa Project

Impacts of current recycling practices and recommendations for collection and recycling

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Regional coverage of analysis





1.) Ghana

Initiator: VROM-Inspectorate & NVMP Duration: 09/2009 – 08/2010 Partner: Green Advocates, EMPA 2.) Nigeria

Initiator: UNEP - SBC Duration: 09/2009 – 12/2010 Partner: BCCC-N, EMPA



Activities in Ghana and Nigeria:

- In-depth socio-economic study on the sustainability impacts of the informal e-waste recycling sector
- Feasibility study for developing local niche markets for environmentally sound management
- Training of informal recyclers (Nigeria only)



Key findings that need to be considered in future strategies

Key finding 1:

There is no "e-waste sector"



Structure of e-waste management in Ghana & Nigeria:



1. Repair & refurbish



3. Dismantling / pre-processing



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Scrap metal workers (sometimes "scavengers")



Difference between refurbishers and scrap metal workers:

-Refurbishers typically work in registered businesses and pay taxes

-Average size of refurbishing enterprise: 1-8 persons

-Repair & refurbishing is technically demanding, thus the jobs are perceived as prestigious and high-tech

-Repair & refurbishing sectors run self-organised apprenticeship systems

- Scrap metal workers are typically not registered and do not pay any taxes (informal sector)
- Scrap metal workers are typically poor migrants from rural areas of the Sahel region



Key finding 2:

Refurbishing & scrap metal sector provide many jobs





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5,500 enterprises providing 15,000 jobs



Socio-economic opportunities of these two sectors:

Collection and recycling:

Employment and income opportunities for thousands of low skilled workers (in particular from rural areas in the north of the countries)

Refurbishing:

- Employment and income opportunities for a medium and high skilled workforce
- In Accra & Lagos: 30.000 jobs
- Potential to form a nucleus for further technical and economic developments





Every attempt to reform e-waste management needs to take into account the social dimensions of these two sectors!



Preservation of jobs



Key finding 3:

Jobs in refurbishing are better than in the scrap metal sector



Sector		Daily income [Naira]	Daily income [US\$]	
Collection & recycling	Door-to-door collectors	250–500	1.68–3.36	
	Collectors addressing freely available wastes	33–67	0.22-0.45	
Refurbishing	Workshop owners	1,000–3,300	6.72–22.2	
	Employees	330–500	2.22-3.36	
	Apprentices	0–300	0–2.0	

	Collectors & Recyclers	Refurbishers
Working hours per day	8.5 – 9.5	8.5 – 9.5
Working hours per month	255 – 285	210 – 240

Child labour:







Key finding 4:

Environmental hot spots are also in the scrap metal sector



Principle pollution pathways are known:



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Dioxin emissions from cable burning:

Observations in Agbogloshie (Accra, Ghana):

~ 200kg of cables are burnt per hour

10-20% from WEEE (rest mainly from waste cars)

> Extrapolation to 5 West-African countries



3-7% of total dioxin emissions to air in Europe

Source: EMPA



Key finding 5:

Collection works different in W-Africa



House-to-house collection:

Prices for non-reparable equipment in Lagos 2010:CRT-monitor50 Naira (US\$ 0.34)Fridge100 Naira (US\$ 0.67)Desktop PC100 Naira (US\$ 0.67)

Informal collectors offer a convenient pick-up serve and pay money for e-waste



Ghana is world champion in e-waste collection, achieving collection rates of 95%



Collection systems based on the consumers' willingness to actively bring back old equipment for free will fail!



Key finding 6:

Environmentally sound recycling cannot compete with crude recycling

Example CRT-devices:





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



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



Key finding 7:

European solutions will not work







Best Available Recycling Technologies Analysing environmental, social and economic strengths & weaknesses

Best Applicable Recycling Technologies



Solutions:

-Here, no full e-waste management strategy can be provided.

-But elements that should be part of coherent and sustainable e-waste management strategies.



Solution 1:

The Best of 2 Worlds Approach (Bo2W)



Solution for Information and Communication Technologies (ICTs):



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







Material content, intrinsic and net values of an average desktop computer

	Amount contained in a desktop computer [g/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 technology [US\$/unit]	Net material value with best applicable technology [US\$/unit]
Steel	6,737.50	253*	1.70	95%	95%	1.62	1.62
Plastics	1,579.55	310**	0.49	0%	0%	0	0
Aluminium	550.21	2,700	1.49	88%	78%	1.31	1.16
Copper	413.225	7,231	2.99	85%	98%	2.54	2.93
Zinc	25.94	3,400	0.09	0%***	0%***	0	0
Tin	19.57	19,800	0.39	0%	0%***	0	0
Antimony	18.58	5,660	0.11	0%	0%***	0	0
Nickel	12.70	37,200	0.47	0%***	0%***	0	0
Lead	6.59	2,730	0.02	0%	0%***	0	0
Neodymium	5.87	100,000****	0.59****	0%***	75%****	0	0.44****
Silver	1.70	550,000	0.94	0%	87%	0	0.81
Gold	0.26	22,400,000	5.82	30%	93%	1.75	5.42
Palladium	0.12	11,488,748	1.38	0%	91%	0	1.25
Chromium	0.02	2,010	0.00	0%***	0%***	0	0
Ceramics & others	366.04	-	-	-	-	_	-
Sum	9737.87		15.88			7.22	13.63

* Prices for iron & steel scrap ** Prices for mixed plastic *** Partly indirectly recovered together with other metals **** Material price as of November 2010 ***** Recovery rates not yet achieved on an industrial scale



Notification required according to the Basel Convention?





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Environmentally sound recyclers depend on a sound administrative procedure for export notification.



Solution 2:

CFC-recovery from fridges & airconditioners







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 $\geq 85\% \rightarrow$ high standards for foam treatment

2.8 t CO_{2-equ} x 0.9 x 5 US\$/t = 12.60 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)



Solution 3:

Training & start-up support



Training programme in Nigeria:



- 3 days training
- 70 participants from refurbishing
- Majority of participants from refurbishing & scrap metal sectors
- Some participants from administration
- Steep learning curve of all participants
- Participants registered one recycling company after completion of training



Continuous support needed



Solution 4:

Framework conditions



Thank you for your attention!

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