Towards Environmentally and Socially Sound E-Waste Management in W-Africa: Results from a Survey in Ghana and Europe

Going Green - CARE INNOVATIONS 2010

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About Öko-Institut

- also named *“Institute for Applied Ecology”* -

The Öko-Institut is a leading European research and consultancy institution working for a sustainable future. It is a value driven non-profit-organisation and employs more than 120 staff at three locations: Freiburg, Darmstadt and Berlin.

The Öko-Institut has five research Divisions:

- Energy & Climate Protection
- Infrastructure & Enterprises
- Nuclear Engineering & Facility Safety
- Sustainable Products & Material Flows
- Environmental Law & Governance



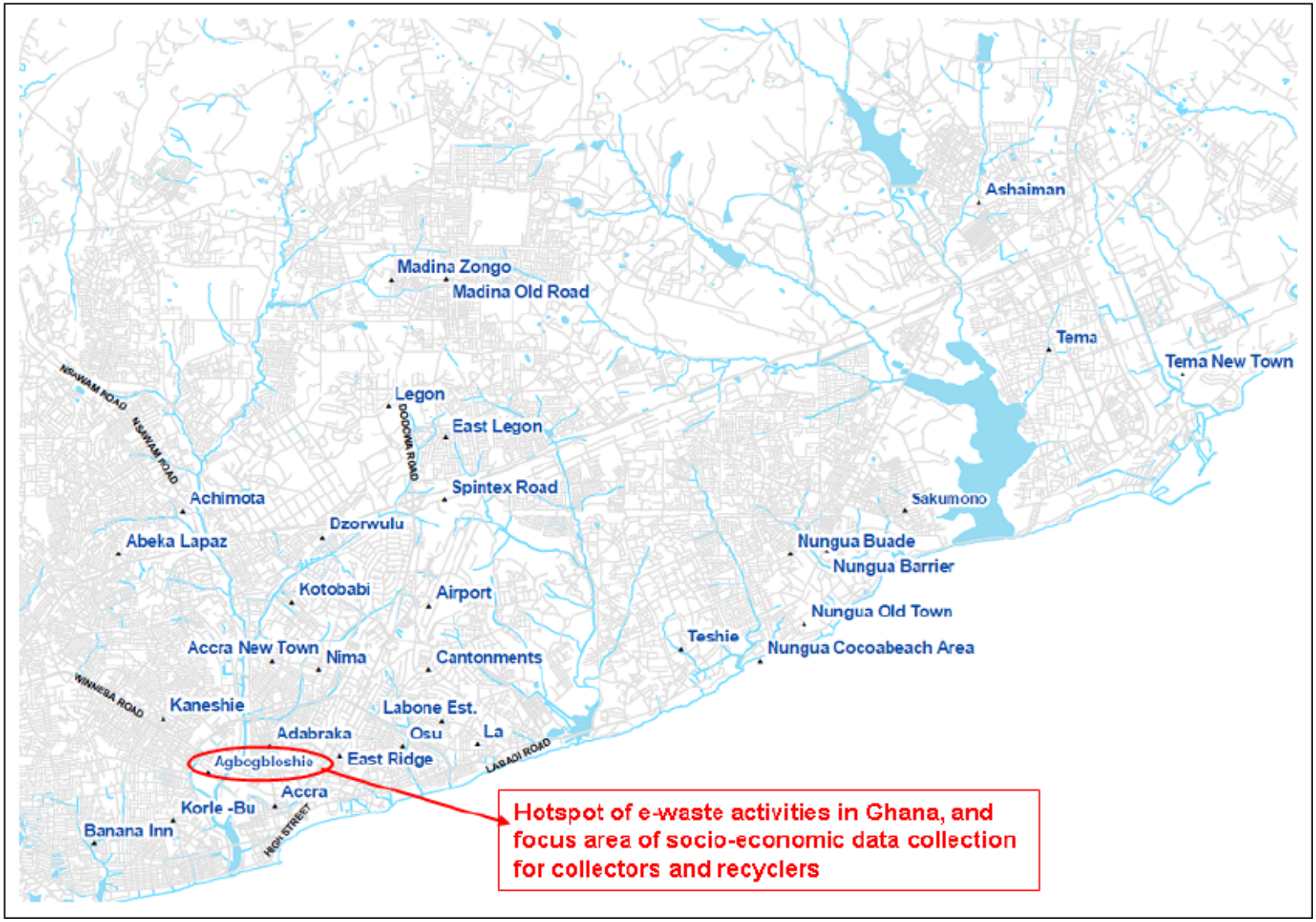
Activities in Ghana and West-Africa:

- UNEP E-waste Africa Project
  (UNEP-SBC, BCCC, EMPA, Öko-Institut)

- Socio-economic assessment and feasibility study on sustainable e-waste management in Ghana
  (VROM-Inspectorate, NVMP, EPA-Ghana, GreenAd, Öko-Institut)

➡ *In-depth socio-economic study on the sustainability impacts of the informal e-waste recycling sector in Ghana*

➡ *Feasibility study for developing local niche markets for environmentally sound management*


Ashaiman
Madina Zongo
Madina Old Road
Tema
Tema New Town
NSAWAM ROAD
NSAWAM ROAD
Legon
DODOWA ROAD
East Legon
Spintex Road
Achimota
Sakumono
Dzorwulu
Abeka Lapaz
Nungua Buade
Nungua Barrier
Kotobabi
Airport
Nungua Old Town
Teshie
Nungua Cocoabeach Area
Accra New Town
Nima
Cantonments
WINNEBA ROAD
Kaneshie
Labone Est.
Adabraka
Osu
La
Agbogbloshie
East Ridge
LABADI ROAD
Accra
Korle -Bu
Banana Inn
HIGH STREET
Hotspot of e-waste activities in Ghana, and focus area of socio-economic data collection for collectors and recyclers

	Refurbishers	Collectors	Recyclers
Remuneration per day [US$]	**3,3 – 8,3**	**2,0 – 4,6**	**2,0 – 9,5**
Remuneration per month [US$]	**100 – 250**	**60 – 140**	**60 – 285**

	Refurbishers	Collectors	Recyclers
Working hours per day	**8 – 10**	**10 – 12**	**10 – 12**
Working hours per month	**210 – 260**	**300 – 360**	**300 – 360**

➡ *In Ghana, 20.300 – 33.600 people work in the informal refurbishing and e-waste recycling sector*

Future e-waste management systems in Ghana need to comply with the following principles:

- Significantly reduce environmental impacts
- Significantly reduce health risks for workers and neighbouring communities
- Preserve the jobs of collectors and recyclers already engaged in this sector
- Enable the implementation of social and environmental standards

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

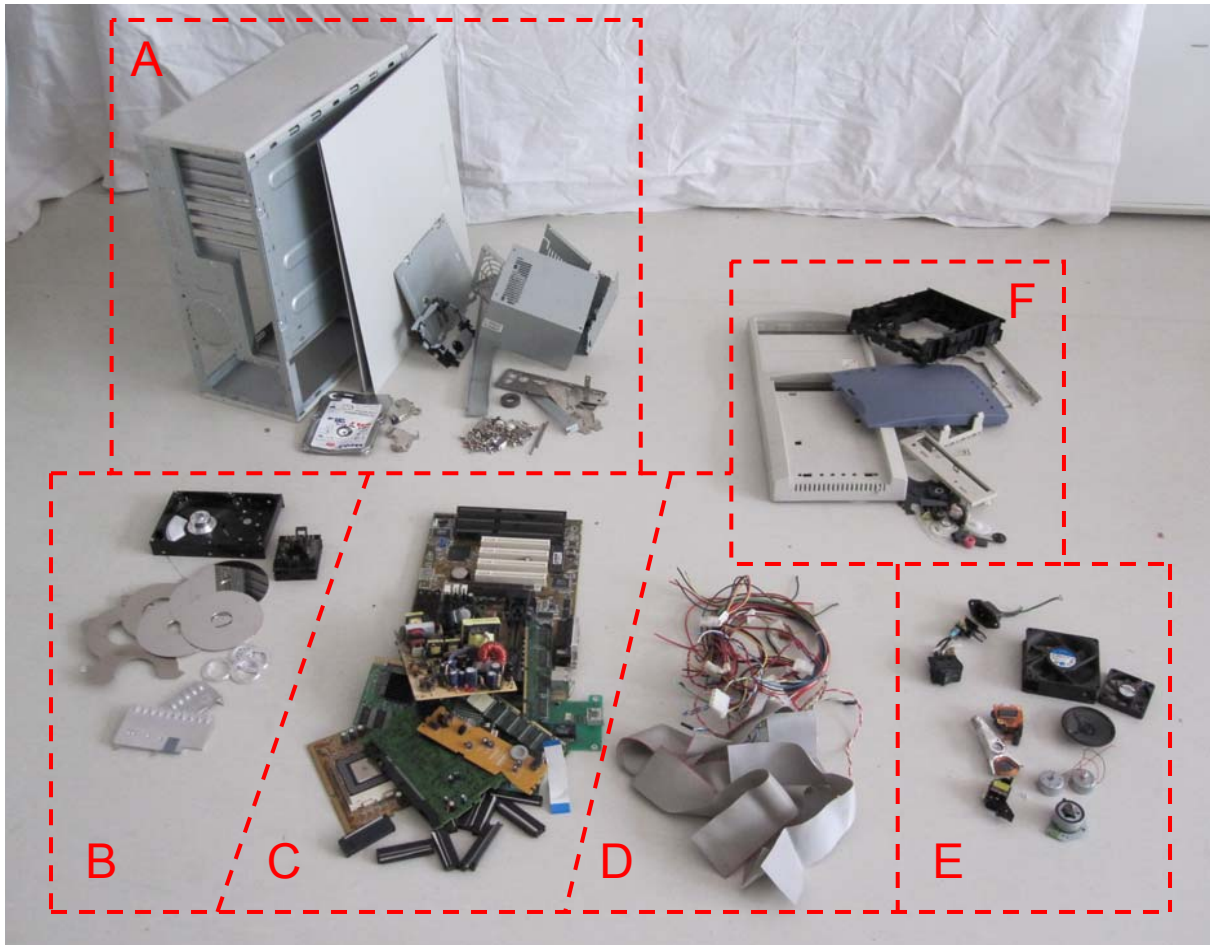
Key products:

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

Rationale:

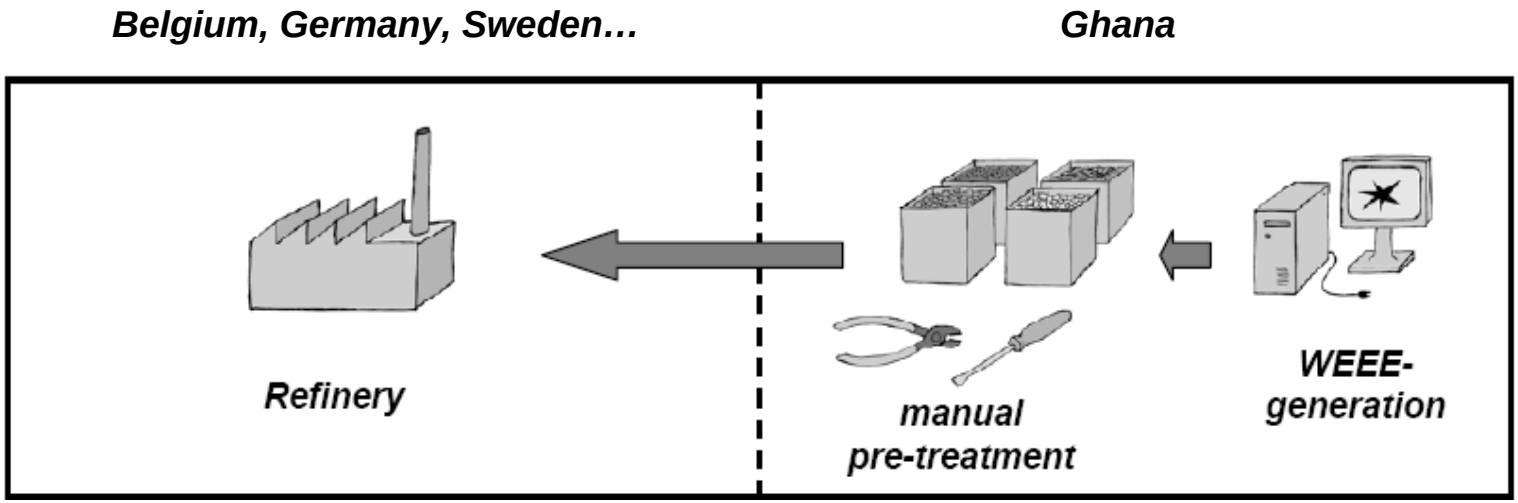
- Large volumes
- High environmental impacts
- Recycling technologies also applicable for other e-waste types

Desktop PC:



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

International co-operation for precious metals recycling needed:



	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	6,737.501	253*	1.70	95%	95%	1.62	1.62
Plastics	1,579.545	310**	0.49	0%	0%	0	0
Aluminium	550.212	2,700	1.49	88%	78%	1.31	1.16
Copper	413.225	7,231	2.99	85%	98%	2.54	2.93
Zinc	25.940	3,400	0.09	0%***	0%***	0	0
Tin	19.573	19,800	0.39	0%	0%***	0	0
Antimony	18.577	5,660	0.11	0%	0%***	0	0
Nickel	12.700	37,200	0.47	0%***	0%***	0	0
Lead	6.585	2,730	0.02	0%	0%***	0	0
Silver	1.702	550,000	0.94	0%	87%	0	0.81
Gold	0.260	22,400,000	5.82	30%	93%	1.75	5.42
Palladium	0.120	11,488,748	1.38	0%	91%	0	1.25
Chromium	0.015	2,010	0.00	0%***	0%***	0	0
Ceramics & others	371.909	-	-	-	-	-	-
Sum	**9737.860**		**15.88**			**7.22**	**13.19**

** Prices for iron & steel scrap ** Prices for mixed plastic *** Partly indirectly recovered together with other metals*

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 certification 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 ≥ 85% → high standards for foam treatment

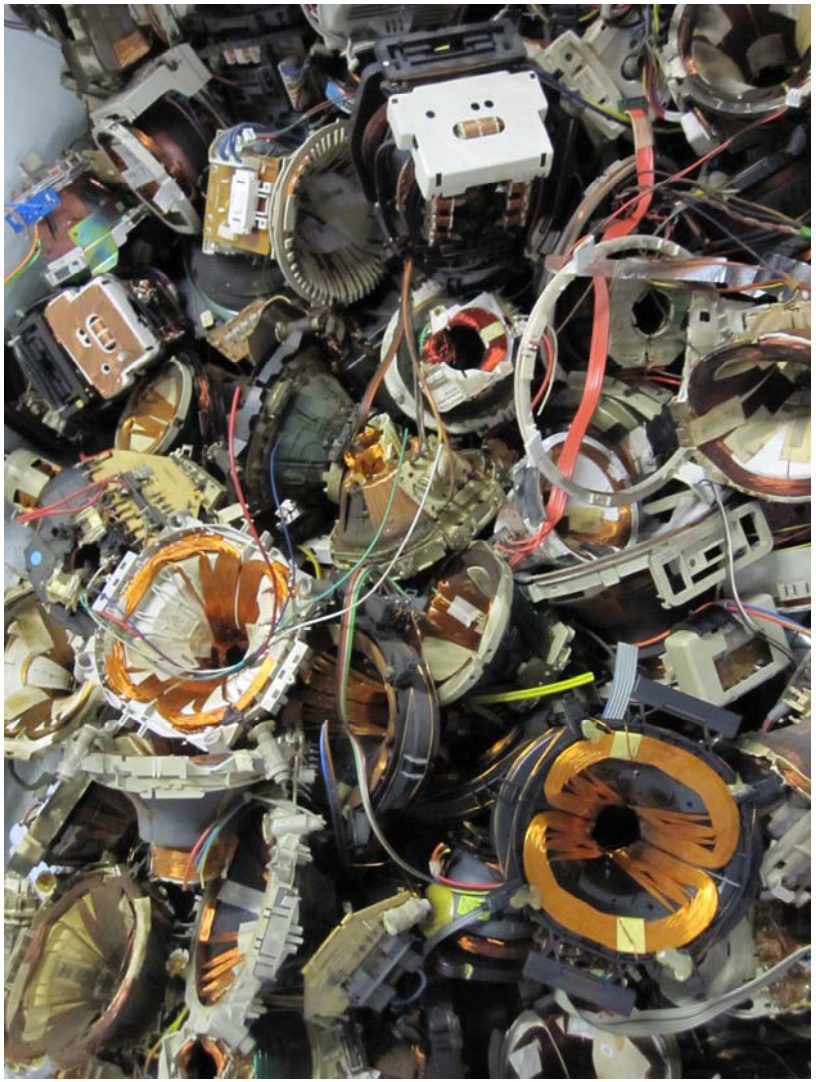
2.8 t $CO_{2\text{-equ}}$ x 0.9 x 5 US$/t = 12.60 US$

~ 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)

CRT-devices:



CRT-glass: - 160 US$/t

- 2.73 $/device

Copper: + 7231 US$/t

+ 5 $/device

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*

General recommendations:

- Incorporate the informal sector in future e-waste strategies
- Deploy manual labour for pre-processing
- Support and maintain international recycling co-operations
- Focus on high quality recycling products
- Develop regulative framework
- Develop appropriate finance mechanisms

Specific recommendations for pilot follow-up activities:

- Conduct pilot operations in or close to existing recycling clusters
- Give priority to directly linking Ghanaian recyclers to international recycling networks
- Improve social standards
- Ensure rapid cash-flow
- Focus on all e-waste fractions

Thank you for your attention!

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