INFORMAL ULAB RECYCLING IN AFRICA: CASE STUDIES OF SELECTED COUNTRIES

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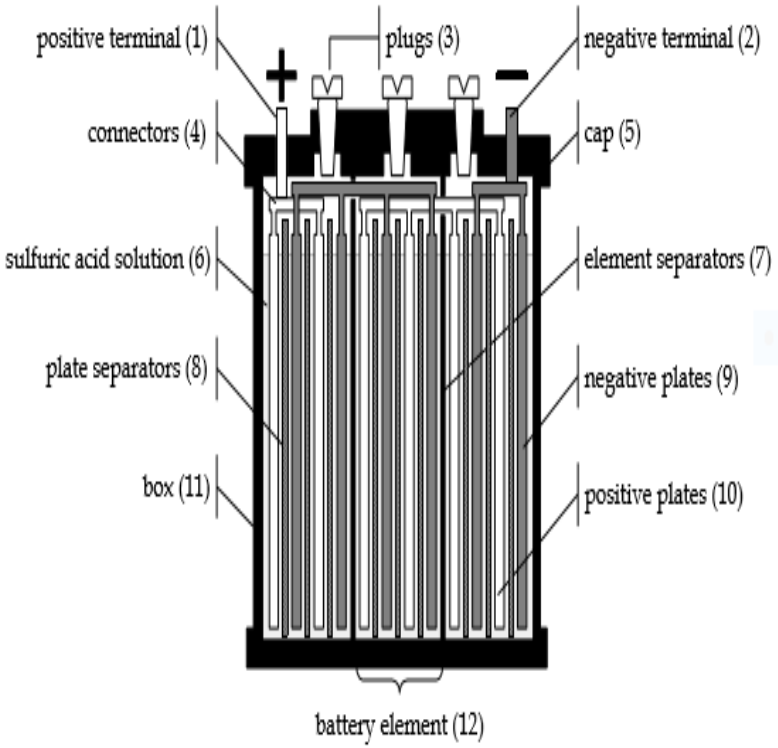
Lead-Acid battery

Internal Structure



Common Applications

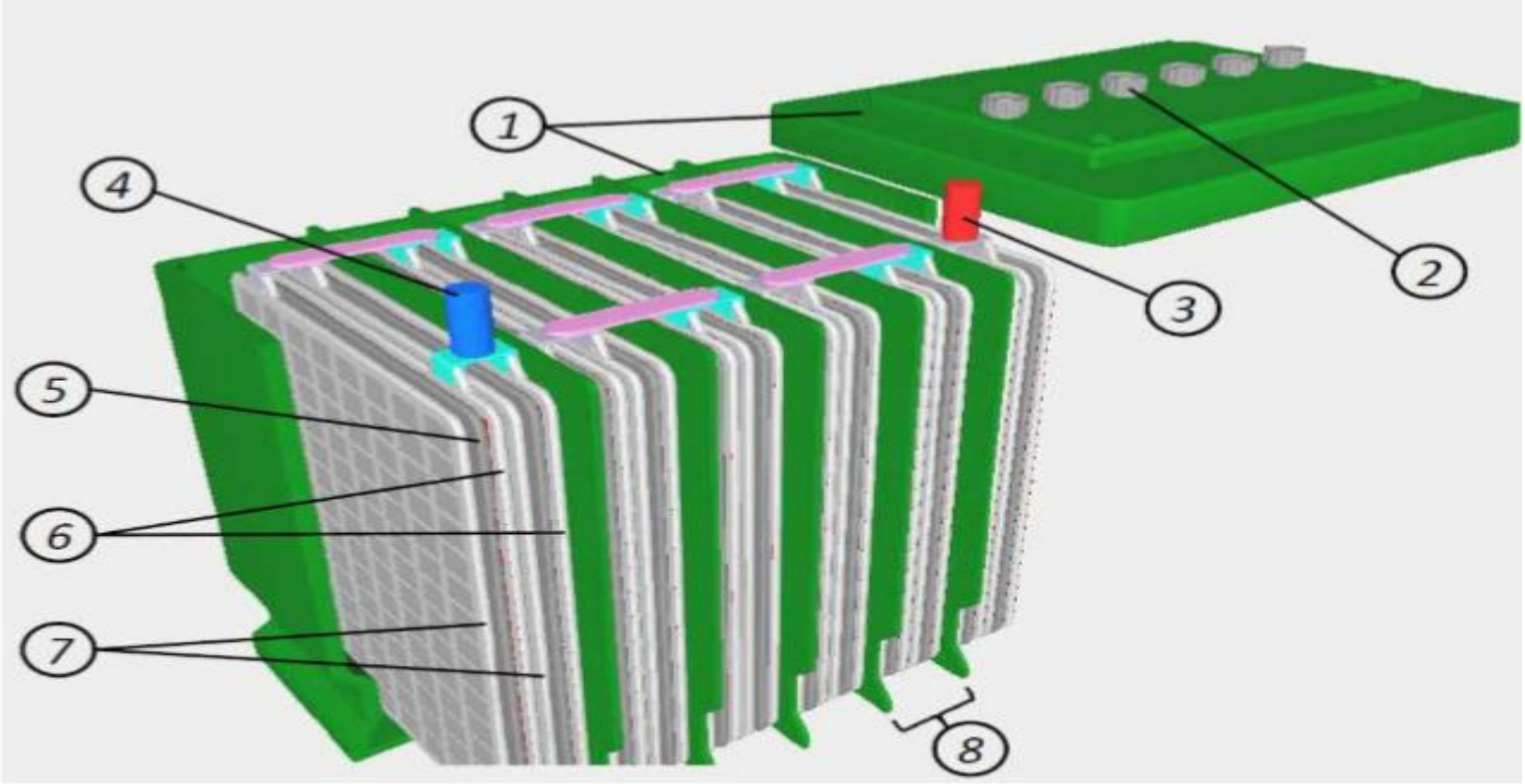
- Starting
- Ignition
- Lighting

automotive

- Off-grid electrification (inverters, solar batteries, etc)
- UPS storage
- etc

About 85% of world lead used for battery manufacture (ILA)

Lead-Acid battery



1 = case 2 = plugs 3 = positive terminal 4 = negative terminal

5 = plate separators 6 = negative plates 7 = positive plates 8 = one battery element

Growing need for lead-acid batteries

- Average of 70 million new vehicles per year
- Could rise to about 140 million by 2030
- About 40 million passenger and commercial cars in use in African countries as at 2013
- Total annual generation of ULABs from vehicles [t/a] in Africa - 1,060,996
- Total annual generation of ULABs from stationary use [t/a] in Africa - 173,934
- Africa Lead Acid Battery Market to Reach US$1,014 mn by 2021

Source: Oko Institue

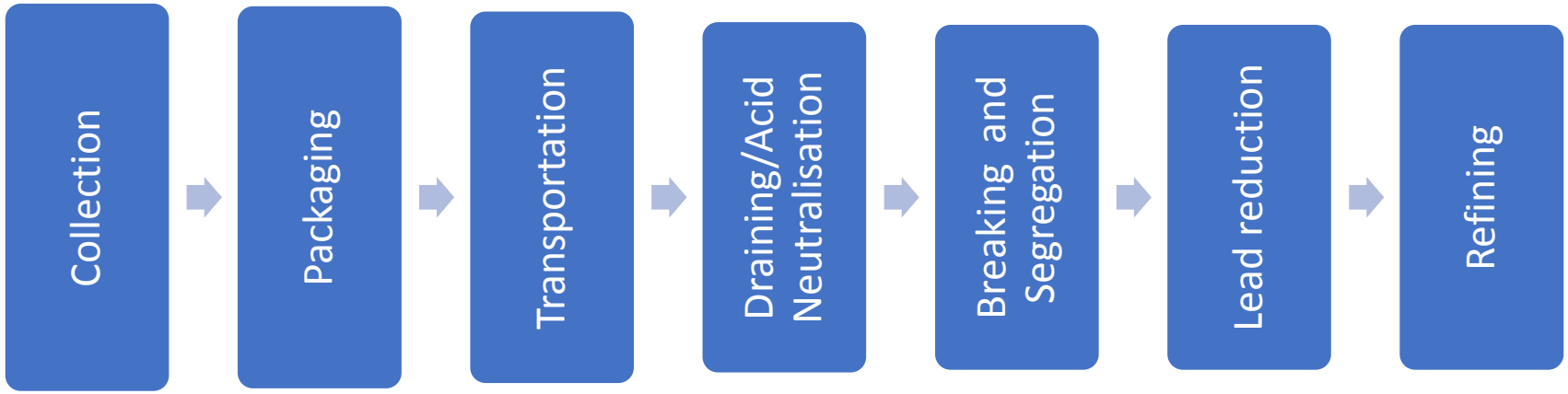
Why Recycle?

- Massive demand for lead to manufacture LABs is not currently met by the volume of ingots obtained via direct lead mining and extraction
- Many localities do not have lead ore deposits
- Often cheaper to recycle than to import
- Provides local job opportunities/incomes
- Non-recycling would create a huge amount of waste lead that would contaminate the environment and cause health hazards
- About 90% of ULABs is ultimately recycled for lead

Informal Sector in Recycling

- Unlicensed, unpermitted small-scale (s)melters
- ULAB reconditioners (testers, chargers, repairers, etc)
- Often include vulnerable women and children labourers
- Includes scavengers and small level collectors
- Some of the poorest in the communities
- No formal training skills on recycling
- No tax paid to governments
- Generally low income earners

Typical Steps in Environmentally Sound ULAB Recycling



These should normally incorporate good workplace safety, environmental protection, protection of health of the population, and dignity in labour.

What do Informal Recyclers do wrong?

Economic/Social Factors

- Unlicensed, unenumerated
- Poor skills level
- No taxes paid
- Illicit Labour
  - Inclusion of vulnerable women
  - Inclusion of children/minors as labourers!!

What do Informal Recyclers do wrong?

Technological factors

- Use of very crude technologies (e.g., manual breaking, open-stove furnaces, etc)
- Inefficient techniques, very poor recovery rates
- Inability to scale up
- Limited purity of ingots

Safety Factors

- Inadequate/no personal protection equipment

What do Informal Recyclers do wrong?

Environmental factors

- Drain sulphuric acid electrolyte into open land and drains
- No neutralisation of drained acid
- No workplace effluent treatment
- No air particulate and gaseous emissions control systems
- Massive contamination of topsoil, water, air with lead dusts and traces of other contaminating metals (e.g. As, Sb, etc), toxic gases, etc.
- Contamination of homes, other persons and other locations through poor safety/hygiene practices (taking work clothes to canteens, homes, etc; non-wash of body,

Lead concentrations usually very high in soils around the smelters and in home dusts.

What do Informal Recyclers do wrong?

Human Exposure / Health factors

- Environmental contamination leads to human exposure to toxic lead in dusts, food, water, soil, air, plants
- Leads to elevated human blood levels of lead
- Children, most vulnerable to lead toxicity, manifest symptoms of poisoning
- Some children die
- Some domestic and wild animals die

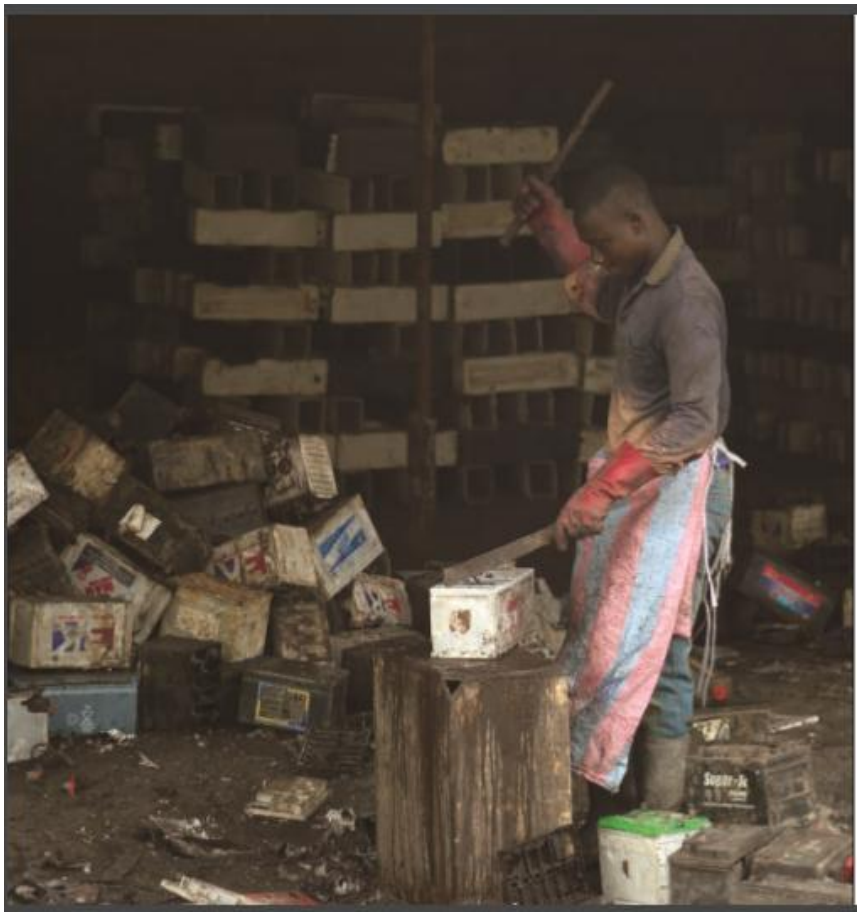
Scavenging for ULABs

Source: Oeko-Institut e.V.

Storing Collected ULABs

Draining the Acid Electrolyte

Breaking the Battery



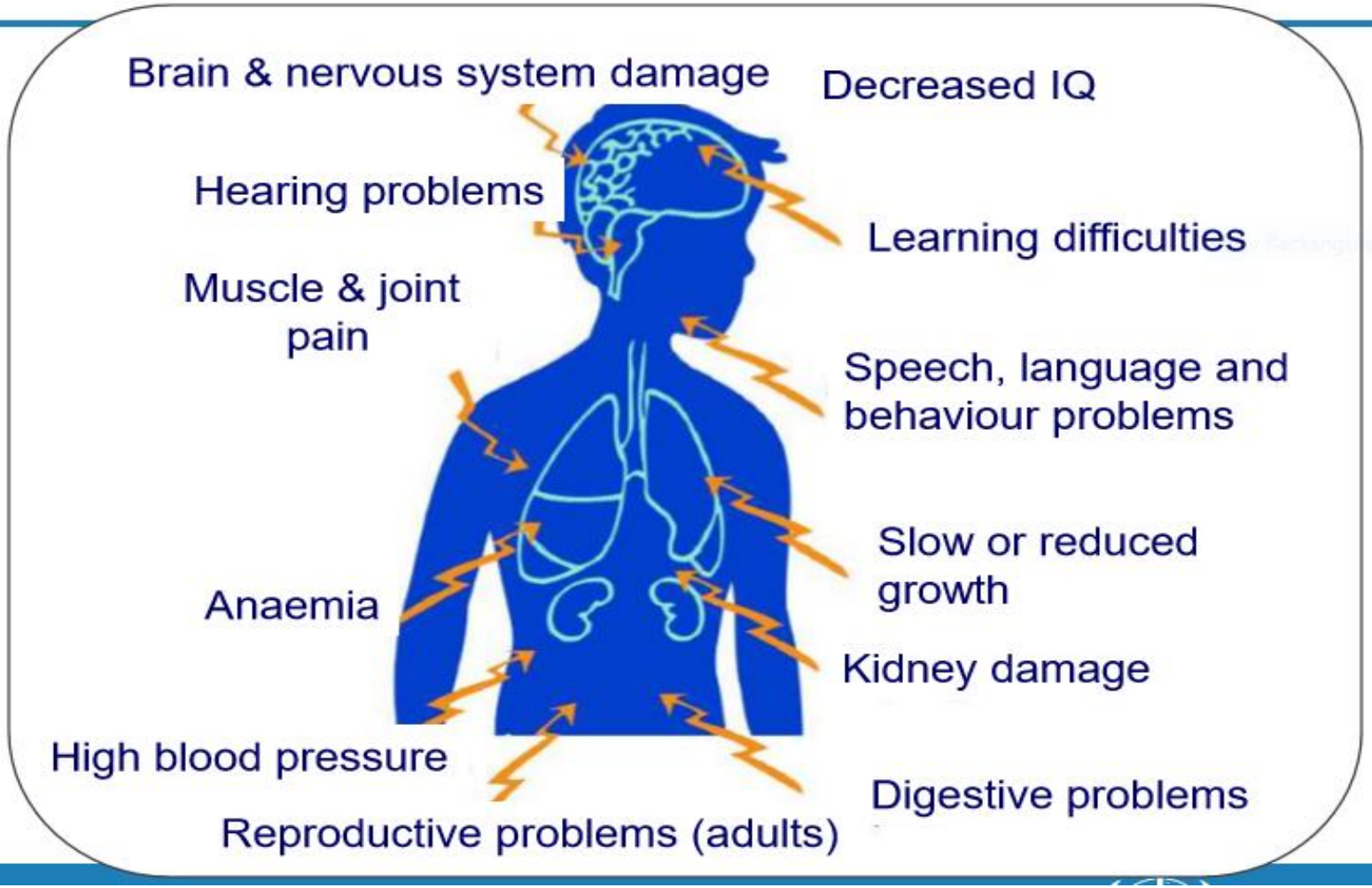
“S”melting ULABs

Another form of the smelter

Children exposed to contaminated soil

Children exposed to contamination

Lead is a multi-system toxicant



Many cases of deaths of children have resulted from lead poisoning

Source: WHO

CASE STUDY:

THIAROYE-SUR-MER (SENEGAL)

Incidence of Severe Lead Poisoning from Informal Recycling of ULAB

THIAROYE-SUR-MER (SENEGAL)

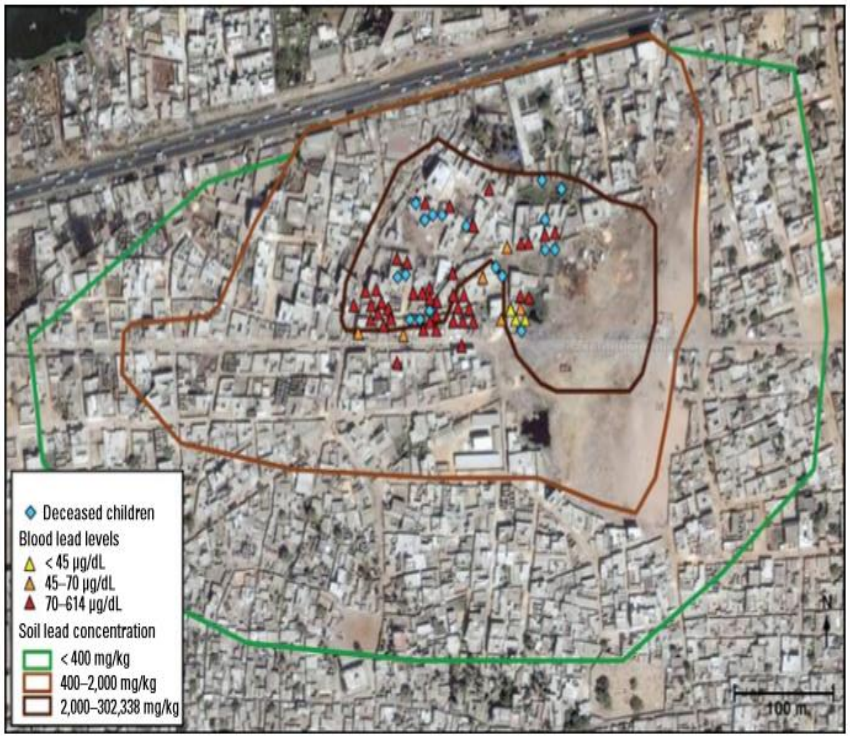


Figure 2. Map of the NGagne Diaw neighborhood of Thiaroye sur Mer, Senegal, showing the geographic distribution of the 18 deceased children, the blood lead levels of the 50 children investigated, and the environmental lead contamination, extrapolated from 194 outdoor measurements. The scale used for the environmental contamination is based on French recommendations for residential and industrial areas set at 400 mg/kg and 2,000 mg/kg, respectively (Laperche et al. 2004).

THIAROYE-SUR-MER (SENEGAL)

Impact Area:

NGagne Diaw neighbourhood of Thiaroye sur Mer, suburbs of Dakar, Senegal.

Period of Main Impact:

November 2007 to March 2008

THIAROYE-SUR-MER (SENEGAL)

Causative Activity:

- Crude ULAB recycling since about 1995
- On an open area of sandy land in the middle of NGagne Diaw
- Many women and children involved
- Activity more intense in 2007
- Topsoil extensively contaminated with lead
- Soil packed into bags and taken home by women for sieving to recover lead!
- Children played with contaminated soils

THIAROYE-SUR-MER (SENEGAL)

Impact:

- 18 children known to have died in strange manners during 2007-08.
- Investigation by local and international health and environmental authorities (WHO, etc)
- Medical examinations carried out on about 55 nos. mothers and siblings of the dead, and few others, tested
- Very high blood levels noted (383 to 3454 µg/L)

  (cf. safe limit of 100 µg/L for children)

THIAROYE-SUR-MER (SENEGAL)

Impact contd..:

- Lead poisoning identified to be cause of deaths
- Soils very heavily contaminated with lead.
- Lead concentrations up to 30% (300,000 mg/kg) were measured outdoors, while concentrations up to 1.4 % (14,000mg/kg) were measured indoors

  (cf. safe limit for children play area – 45 mg/kg

Sieving contaminated soil to extract lead particles

Source: WHO

Storage of lead enriched soils inside homes

THIAROYE-SUR-MER (SENEGAL)

Remediation:

- In March 2008 the Senegalese Ministry of Environment (in partnership with the Blacksmith institute and others) removed 300 tons of battery waste and contaminated soil and covered the area with clean sand.

Removal of contaminated topsoil

Landfilling of recycling wastes

New soil cover for a street

CASE STUDY:

Incidence of Severe Lead Poisoning from Recycling of ULAB in MOMBASA

Mombasa Informal ULAB Recycling Case

Impact Area:

- Owinu Uhuru slum areas in Mombasa county on the coast of Kenya.
- In the vicinity of the Metals Refinery EPZ.

Period of Main Impact:

- Started 2007
- By 2009 pollution concerns raised

Mombasa Informal ULAB Recycling Case

Mombasa Informal ULAB Recycling Case

Causative Activity:

- Smelting of lead in open and backyard smelters.
- Barely any Personal Protective Equipment (PPEs).
- Near other businesses such as clothes sellers, cobblers,
- Large containers converted into a working space with very poor ventilation with no near source clean water. vegetable vendors etc
- Sulfuric acid from the LABs is directly poured on the ground or the nearest drainage

Mombasa Informal ULAB Recycling Case

Impacts:

- Three children tested and found to be poisoned with lead
- High level of contamination of soils.
- Levels of lead in soils near the smelters greater than 10,000 mg/kg

A factory incorporating a ULAB recycling facility was located adjacent to a school in Ibadan, Nigeria

THERE ARE STILL SEVERAL HUNDREDS MORE OF SUCH INFORMAL RECYCLING FACILITIES ALL AROUND AFRICAN COUNTRIES AND ELSEWHERE;

and

VERY MANY HIGHLY CONTAMINATED SITES