The deadly business

Findings from the Lead Recycling Africa Project

AGENDA For Environment and Responsible Development

CREPD

Pesticide Action Nexus Association (PAN-Ethiopia)

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About the Lead Recycling Africa Project

The project aims at stimulating a broad debate on issues related to health, safety and the environmental performance of the steadily growing lead recycling sector in Africa.

Various local and international scientists and environmental groups had collected a substantial body of evidence that unsound lead-acid battery recycling not only causes severe pollution but has a serious impact on health in many metropolitan areas in Africa.

In order to expand the knowledge base on lead recycling industries in Africa, Oeko-Institut launched a fundraising campaign in late 2014 and initiated the Lead Recycling Africa Project to promote a more widespread understanding of the African lead recycling industry. With the funds collected, independent scientists in Cameroon, Ethiopia, Kenya and Tanzania conducted detailed investigations of the local management and recycling practices applied for waste lead-acid batteries. Furthermore, the project team continued collecting information on this industry in the African context beyond the named focus countries. Results of these activities can be retrieved from the project website at www.econet.international.

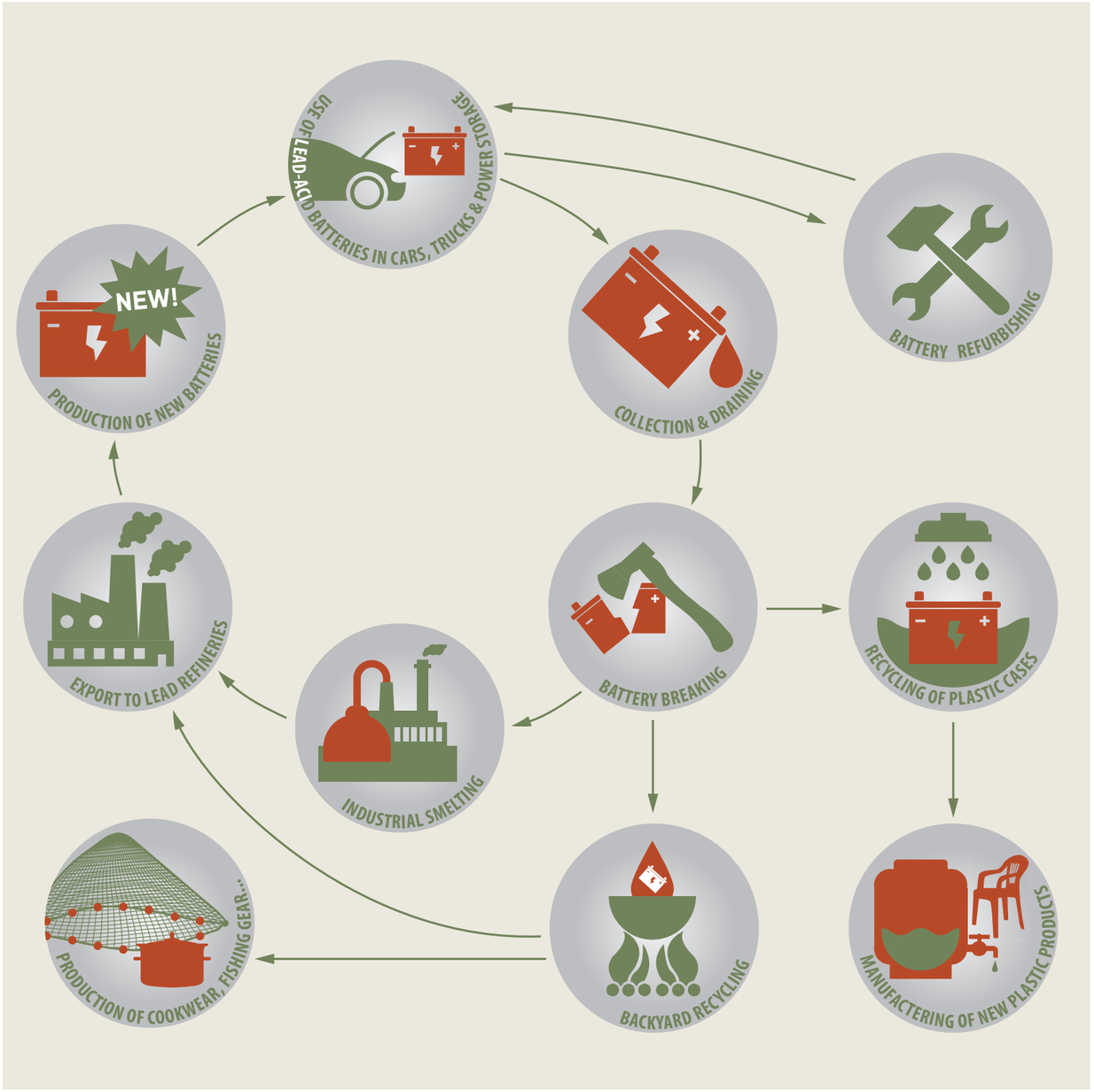
Lead applications in Africa

Every year, more than 1.2 million tonnes of used lead-acid batteries require sound management in Africa.

In Africa, as in all world regions, lead is primarily used in batteries for passenger cars, trucks, motorcycles, uninterruptible power supplies and solar power storage. Frequent blackouts and projects to provide decentralised household electrification are major drivers in this market.

Due to the hot climate and rough road conditions, the lifespan of a vehicle battery is comparably low so that the end-of-life volume per 1,000 vehicles is higher than in other world regions. Together with rapidly growing vehicle fleets, this leads to growing volumes of used and end-of-life lead-acid batteries all over Africa.

The total end-of life volume for lead-acid batteries in Africa is estimated to sum up to 1.23 million tonnes in 2016, which means that every year, more than 800,000 tonnes of lead require sound management. This amount is equivalent to 8 % of the total annual world production of lead [1].



The recycling chain

The following chapters provide more detailed insights in each of the illustrated steps.

As shown on the left, the recycling of used lead-acid batteries involves a sequence of steps, ranging from the collection of old batteries to the production of new products. Although such circular economy flowsheets are commonly associated with environmentally friendly industries and processes, this is not the case for lead-acid battery recycling in Africa.

The following chapters provide more detailed insights into each of the illustrated steps, including information on working environments, pollution and health impacts. The information was gathered during the various investigations of the Lead Recycling Africa Project and is based on a combination of field visits, interviews and literature analysis. While local characteristics have for the recycling of lead-acid batteries have developed in most countries, the general patterns appear to be quite similar over the continent, and possibly also in many other developing countries and emerging economies.

Focus Ethiopia: The local battery refurbishing industry

Battery repair shops are often located in densely populated areas exposing large population groups to lead emissions.

According to investigations of the Lead Recycling Africa Project, in Ethiopia's capital, Addis Ababa, a large number of small workshops are engaged in the reconditioning of used lead-acid batteries. The workshop owners buy used batteries, replace the sulfuric acid and – depending on the quality of the battery – conduct additional repairs such as exchanging damaged lead electrodes. Most individuals in these repair shops depend on this work for their livelihood.

Generally, the level of awareness for the risks of lead poisoning among repair shop owners and workers was found to be very low: The operations are mostly carried out in the immediate surroundings of their residential homes. It is obvious that such settings bear the risk that the workers' families and other community members are also exposed to high lead contaminations, in particular, because none of the workshops have an adequate solid or liquid waste management system. [2]

Collection of used lead-acid batteries

Many small-scale collectors already drain the acid right after reception.

Due to the high lead content, used lead-acid batteries have an economic value all over Africa. End-of-life batteries are commonly sold to local scrap dealers for cash money. The local scrap dealers sell their batteries to traders who are in contact with wholesale buyers. Many of these buyers demand that batteries are delivered without acid. Batteries still containing the acid – which is commonly referred to as "water" on many African scrap markets – achieve distinctly lower prices. For this reason, many small scale collectors drain the acid right after receipt. Most commonly, the acid together with the dissolved and dispersed lead is simply poured out into the environment all over Africa. This is the first major point of pollution in the recycling chain.

Battery breaking

Manual battery breaking should be avoided at all costs.

In both small scale and industrial scale recycling, lead-acid batteries are broken manually using machetes or axes. While workers are exposed to acid and lead dusts in this process, much of the retrieved lead scrap is stored in premises not sufficiently protected against heavy rainfall and wind. Unavoidably, this leads to severe contamination of the surrounding environment. Although a report by the Secretariat of the Basel Convention specifies that these practices "should be avoided at all costs, not only because it is a major source of human health contamination but also because it is an environmentally unsound management of these wastes" [3], it is still common practice in most secondary lead smelters in Africa.

Backyard recycling

In Senegal, 18 children under the age of five died from acute lead poisoning.

The informal recycling of lead-acid batteries is a highly toxic process, leading to massive contaminations and severe impacts on human health. Between November 2007 and March 2008, 18 children under the age of five died from acute lead poisoning in a neighbourhood of Dakar, Senegal. The poisoning was caused by informal recycling activities and the disposal of lead-acid batteries that had taken place in that area since about 1995 [4].

In areas with secondary lead-smelters, informal lead recycling is on the decline. This is because informal recyclers can only process the elementary lead from batteries but not their lead-oxide. Industrial smelters have higher efficiencies and, thus, have an economic advantage over informal recycling.

Industrial lead smelting

Workers have to charge and tap the melting furnaces manually and without basic protection equipment.

There are an increasing number of secondary lead smelters operating in African countries. In these facilities, the lead scrap from batteries is fed into furnaces fuelled with charcoal or oil. The process yields molten lead with some impurities which is casted into ingots.

Although many of these facilities are equipped with off-gas treatment systems, insufficient process management and a weak implementation of basic health and safety standards is widespread. In many cases, workers have to charge and tap the smelting furnaces manually and without basic protection such as breathing masks.

The working environments

The most relevant exposure pathways are related to lead-containing dusts being inhaled or taken up with food and drinks.

In many secondary lead smelters, workers and also organizational staff are commonly exposed to highly elevated concentrations of lead in their working environment. Measures to reduce the accumulation of lead dust in and around the facility are mostly inadequate or even absent. Moreover, most workers have no canteen that is properly separated from the factory. In such conditions they are forced to eat and drink within the highly contaminated factory environment.

In some cases, workers wear their private clothing and have no opportunity to wash off lead dusts from clothes and body after their shifts. In such cases, lead contamination also extends to the families and close communities of the workers.

Recycling of plastic cases

The insufficient recycling practice of battery cases leads to cross-contamination of lead into other products for daily use.

Battery cases are made from the same types of plastic as many products of our daily lives. This makes the recycling of battery cases an attractive side business. Most often, the cases are washed in an open water bath, shredded and sold on the local or international plastic market. Although this process can help to reduce the demand for virgin materials, the washing processes applied are mostly insufficient. While a full cleaning of plastic cases would require at least three washing cycles – one of them using an alkaline solution – most recyclers in Africa only apply one washing cycle, which cannot fully remove lead-oxide contaminations [3]. Therefore, the current recycling practice of battery cases leads to cross-contamination of lead into products such as plastic chairs, buckets, water tanks, and kitchen bowls.

Focus Cameroon: Use of secondary lead for kitchenware

The use of lead in cookware is a severe potential pathway exposing large groups of the society to this hazardous heavy metal.

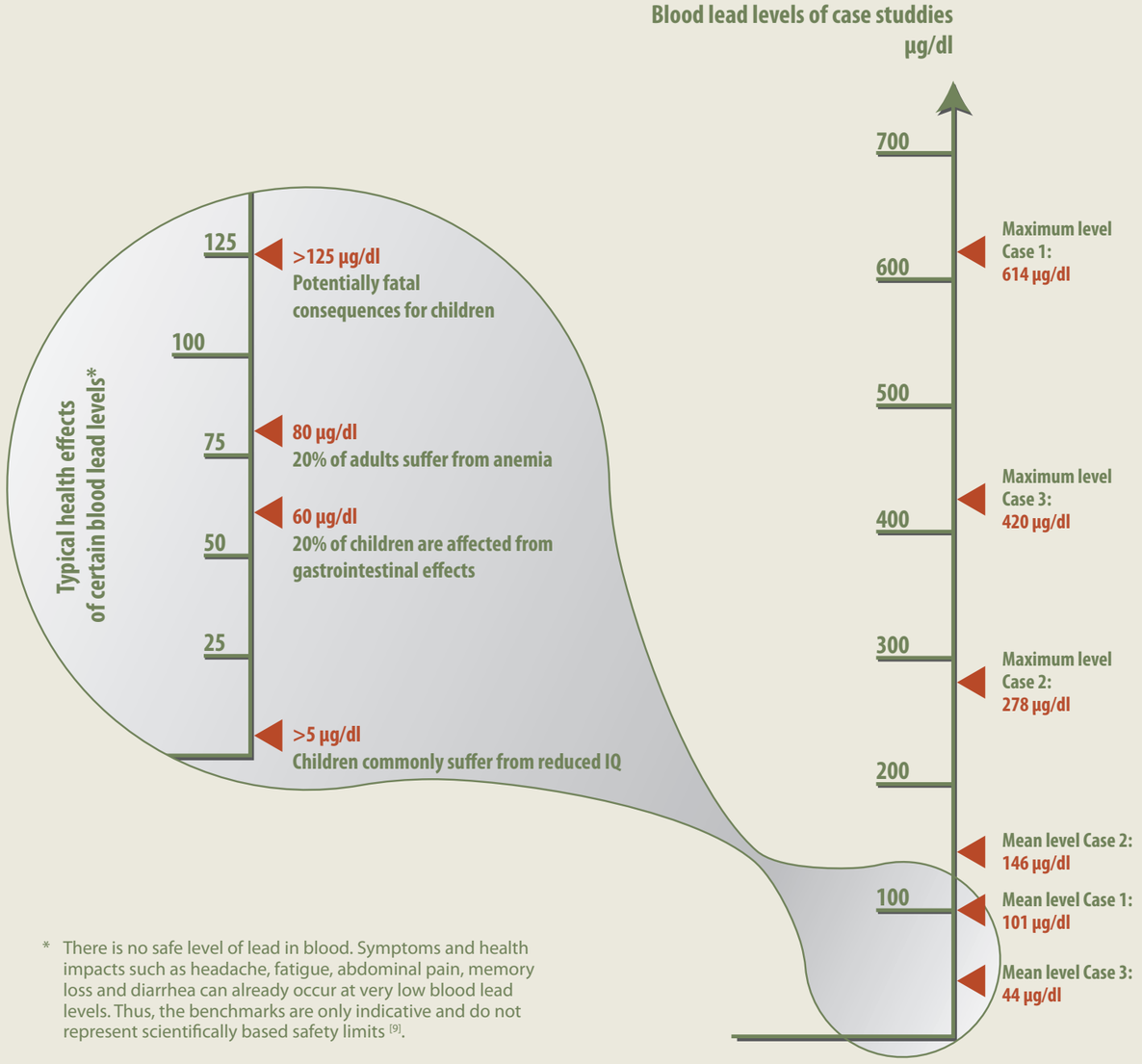
In Cameroon, lead-acid batteries are mainly recycled by two secondary lead smelters, but also by a number of small informal enterprises. The Lead Recycling Africa Project's local field study revealed that part of the informally recycled lead is passed on to manufacturers of cookware. These enterprises re-use lead from batteries to make aluminium-lead alloys for pots, locally known as "macoccote". Such pots are used all over the country in households, canteens, restaurants and open food stalls [5].

The markets for secondary lead

Most secondary lead is exported to refineries in Asia and Europe.

In most African countries, secondary lead has a quite limited number of applications: It is used by fishermen as weights for their nets, by producers of cookware (see page 23), to manufacture training-weights for local fitness centres, and for the (illegal) production of weapons and ammunition. Although these applications might be relevant in some places, they are niche markets not capable of absorbing the estimated 800,000 tonnes of lead annually available for recycling in sub-Saharan Africa. Therefore, industrial smelters commonly export secondary lead to foreign destinations. As their bars of lead do not yet meet a standardized level of purity, they are usually shipped to lead refineries, mostly in Asia and Europe.

On a global scale, around 85% of all lead is used for the manufacturing of batteries [6]. Thus, it is likely that secondary lead from Africa is again used for the production of lead-acid batteries.



* There is no safe level of lead in blood. Symptoms and health impacts such as headache, fatigue, abdominal pain, memory loss and diarrhea can already occur at very low blood lead levels. Thus, the benchmarks are only indicative and do not represent scientifically based safety limits [9].

The health impacts

Although it is known from various studies and cases around the world that unsound lead recycling provides severe and potentially fatal risks to workers and neighbouring communities, there are only very few studies systematically analysing exposure pathways, intake and effects of lead in sub-Saharan Africa. Despite hundreds of lead-acid battery recycling clusters all over Africa, health studies have only been conducted in three cases. But even these three studies show alarming results and prove that workers and neighbouring communities are often systematically exposed to potentially life-threatening lead emissions.

Case 1 | Senegal

Between November 2007 and March 2008, 18 children under the age of five died from acute lead poisoning in a neighbourhood of Dakar, Senegal. The poisoning was caused by informal recycling and disposal of lead-acid batteries. After these deaths had become public, clinical and laboratory assessments were performed on 81 individuals living in the affected area. All of the tested persons suffered from lead poisoning, some of them severely. Blood lead level measurements revealed that 41 out of 50 surveyed children had life-threatening poisonings requiring immediate hospitalization and therapy. In total, the study estimated that 950 inhabitants were subject to lead poisoning with many children suffering from severe chronic forms, including neurologic, developmental and behavioural disorders [4].

Case 2 | Ghana

There are several secondary lead smelters operating in Ghana's port city of Tema. In one of these facilities that showed obvious shortcomings in terms of health and safety and pollution control, a health survey was conducted in 2010. The blood lead level of twenty workers was tested. Apart from one individual who joined the company only shortly before the survey, all persons had highly elevated blood lead levels, bearing risks of severe and potentially fatal health impacts [7].

Case 3 | Kenya

Until recently, a secondary lead smelter in Mombasa, Kenya, was operating within a densely populated neighbourhood. After various workers from the factory fell ill and died, advocacy with of a local organization with former employees and local residents led to a closure of the plant. Nevertheless, a health survey amongst 50 inhabitants of the community revealed that many of them still face chronic lead poisoning [8].

The hidden part of the iceberg

Lead poisonings tend to be misdiagnosed and treated as infectious diseases.

Lead poisoning is severely underreported in sub-Saharan Africa. Although most secondary lead smelters had to undergo an environmental impact assessment prior to operation start, they are usually far from meeting the established standard-levels of industrialised countries. Amongst others, the facilities are neither properly monitored on a regular basis, nor do they run own biomonitoring programs.

Furthermore, the typical symptoms of lead poisoning resemble those of widespread infectious diseases. In this situation, cases of lead poisoning are not recognized as such and patients are often misdiagnosed and treated by local medical doctors. Proper diagnoses would require equipment for blood lead tests, which is mostly only available in few well-equipped hospitals.

The global dimension

Unsound recycling of lead-acid batteries is a major problem in many world regions, including Africa, Asia and Latin America.

Unsound recycling of lead-acid batteries is not only a problem in sub-Saharan Africa. Cases of lead-poisoning have also be reported from countries such as China [10], Vietnam [11], the Philippines [12], the Dominican Republic [13] and a broad range of other countries [14]. As a consequence, unsound recycling of lead-acid batteries was ranked as the world's worst polluting industry in 2012 [15]. According to the authors of this ranking, inappropriate lead-acid battery recycling is a severe health risk to almost 1 million persons globally, and is by far the world's biggest source of pollutants that directly affect human health. In terms of geographic distribution, the problem is most pronounced in Southeast Asia, Africa, Central and South America [15].

Summary

Lead-acid batteries are used all over the world in vehicles, uninterruptible power supplies and for off-grid and local energy supply projects. Although various countries and recycling plant-operators have proven that these batteries can be recycled without causing significant damage to human health and the environment, management of end-of-life batteries in developing countries and emerging economies is often inadequate and presents a severe health risk to workers and neighbouring communities.

In its intensive field studies, the Lead Recycling Africa Project has shown that the situation in sub-Saharan Africa is of particular concern. Collection and recycling practices in all surveyed countries lack even basic precaution measures to prevent the emission of lead and battery acid to the workspace and the environment. This causes severe and potentially life-threatening health risks for workers and the communities in the surroundings of such operations.

The Lead Recycling Africa Project has also found evidence that unsound recycling practices affect much larger society groups via cross-contamination into other products. This is particularly the case for devices such as cookware, water tanks, buckets and kitchen bowls, for which some production industries use secondary raw materials from battery recycling.

Recommendations

The Lead Recycling Africa Project recommends taking strong and effective measures to reduce the massive health and environmental impacts from unsound lead-acid battery recycling:

- Governments and regulatory bodies should implement stringent standards and requirements to control the operations of lead-acid battery recycling enterprises within their jurisdiction. These requirements should cover management practices, emission and health monitoring and capital reserves for environmental clean-up after plant closures.
- While various aspects for the implementation of such standards will require know-how transfer and investments, various other, more basic steps can be taken to reduce emissions and exposure of humans to lead. Although such measures cannot entirely solve the problems raised, they are important first steps that should be urgently applied by recycling companies.
- In order to control the widely informal nature of lead-acid battery collection, reconditioning and backyard recycling, governments and industries are encouraged to develop collection and take-back schemes based on the principle of extended producer responsibility. Such systems shall provide the necessary infrastructure and incentives to channel used lead-acid batteries to sound recycling enterprises – also in countries where such systems are still in their infancy.
- To support the design of national policies, international organizations are called upon to develop standards for environmentally sound lead-acid battery recycling.
- Industries, governments and international organizations such as UNEP and WHO are requested to support the transfer of know-how and technologies to developing countries and emerging economies in order to support and encourage the modernization of the lead recycling industry all over the world.
- Governments, international and regional bodies and donors are called upon to support civil society-based research and awareness activities on unsound lead-acid battery recycling in Africa and other world regions.
- Lead-consuming industries shall be required to conduct due diligence on their lead supply chains. In particular producers of batteries, vehicles and power systems should make sure to source solely from facilities and supply chains that implement best available technologies for battery recycling and lead processing.
- The international community is called upon to pass a resolution through the United Nations Environmental Assembly to stimulate global action on reducing health and environmental impacts from unsound lead recycling activities, including mobilization of resources to properly address this threat.

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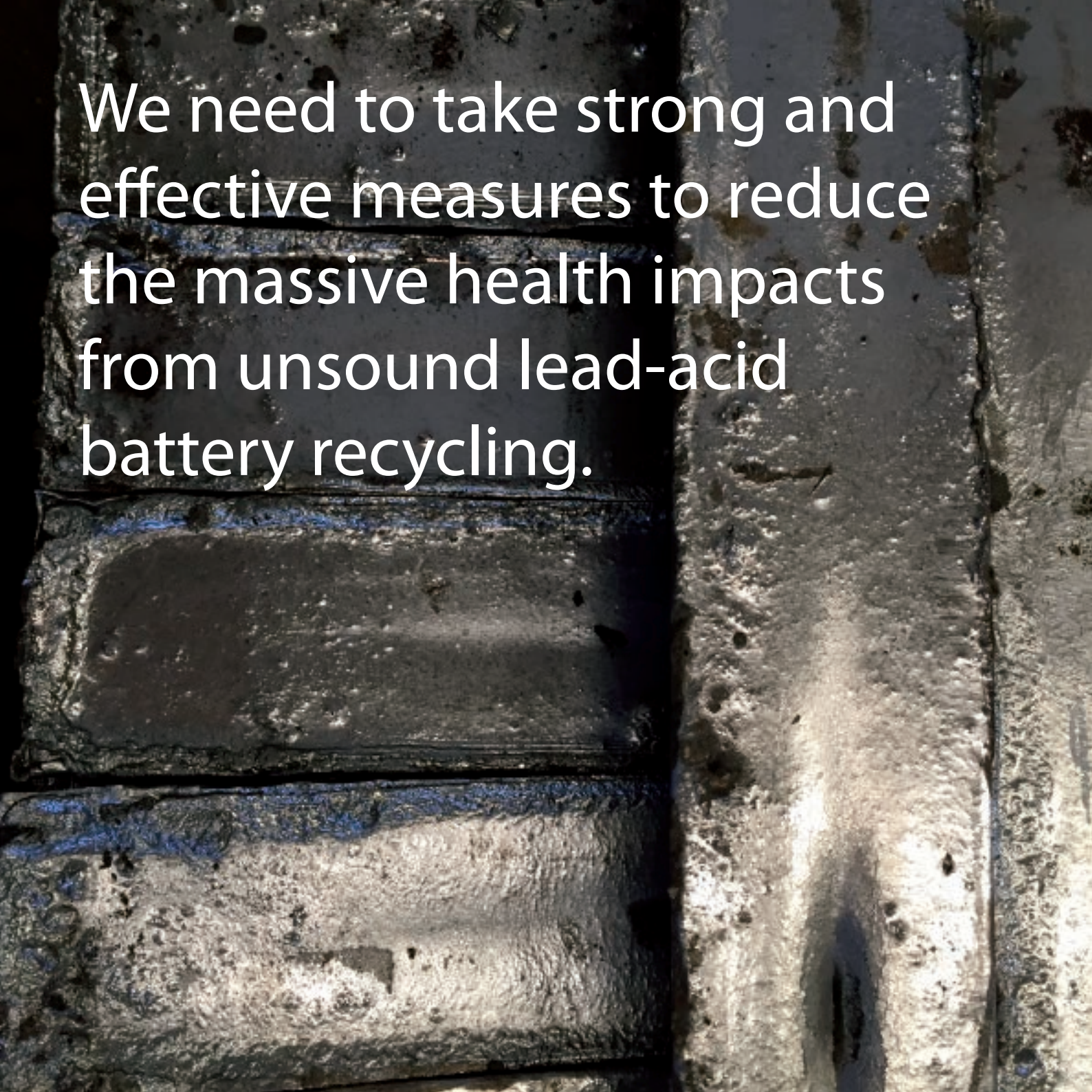
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