eco@work

October 2016

Sustainable reading
from the Oeko-Institut

Raw materials

Extraction, processing, recycling

Poisoning little by little Interview with Phyllis Omido

From Pliny to the present day – the strategic use of raw materials

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In the little free time that I have, I like to read the old scholars and historians – Pliny, for example. My summer reading was his Natural History, which is a collection of ancient knowledge of the natural sciences. In one section of his work, Pliny writes about metals and ores and their importance in the ancient world. Even back then, in 77 AD, there were signs of a sustainable approach to raw materials use: Pliny describes how old tools, those made of copper for example, should be melted down and the raw materials re-used.

Nowadays, the notion of recycling is central to a sustainable resource policy. However, strategic management of raw materials goes far beyond re-use, as we explained in our first issue this year ("A roundabout, not a one-way street"). In particular, the procurement of raw materials, frequently from countries outside Europe, must now be tackled strategically and monitored. That is because for us, in the industrial countries, it is no longer just the question of where raw materials for our manufacturing industry come from that counts, but also the conditions under which they were produced. Sustainable production has to meet both environmental standards and social criteria, and must avoid unilateral dependences.

This latest issue of eco@work describes the challenges of and solutions for a sustainable resource policy both for Germany and internationally. It also offers the first more detailed insight into our project "Germany 2049: Transition to sustainable use of raw materials", which we have funded ourselves, in order to develop a future-proof sustainable resource strategy for Germany. This and other research projects are the focus of this year's annual conference, to which you are warmly invited. It will be held in Berlin on 1 December 2016.

I hope you enjoy this issue.

Yours,

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"We battled for years before they admitted they were poisoning people"

In the heart of Owino Uhuru, a slum in Mombasa, Kenya's second city, people living near a lead smelter were falling ill. One of them was King David, the son of Phyllis Omido, an employee at the smelter. She realised that unsafe working practices in the extraction of lead from used car batteries were poisoning the local community and the environment. So Phyllis set up an NGO, the Center for Justice, Governance and Environmental Action, and campaigned for years for the closure of the smelter. She gradually managed to rally the community and affected workers and finally secured support from international organisations as well. 2014 brought her first major victory: the smelter was closed down. In 2015, her advocacy work was rewarded with the Goldman Environmental Prize – one of the world's most prestigious environmental awards, sometimes called the Green Nobel. But her battle to stop lead poisoning is far from over.

When you began your campaign against the smelter, how did you manage to mobilise support?
In the early days, it was a very long and lonely path, but gradually, I managed to convince people that they had to stand up for themselves. After all, the women could see that their children were getting sick. After my son, I arranged for three other children to be tested for lead poisoning – and the tests came out positive. That was when local people started to listen. And when one of the workers died from lead poisoning, his colleagues listened as well and began to get tested.

Now that the smelter is shut, what's the situation today?
Many people are still suffering from the legacy of having this lead smelter in the heart of our community. Our soil and water supply are still contaminated, so the food we eat is toxic. We're still burying people who have died from lead poisoning. In all, 800 people have been tested for it – and three quarters of the tests have come back positive.

What are your key demands today?
We want everyone to undergo testing at last – 2,200 tests have still to be done. And we are also calling on the government to clean up our community before the end of this year and to deal with the environmental pollution from the smelter. After all, this neighbourhood is still many people's home. We are also seeking compensation from the company directors and the government. People need the money to pay for medical treatment. And let's not forget that the Kenyan constitution guarantees citizens a clean, healthy and sustainable environment.

How long would the clean-up take?
Not long, probably less than a month. The area that needs to be cleaned up is quite small – about six hectares. And it's far from unaffordable: the clean-up would cost around KES 4 billion – roughly 39,5 million US dollars.

What were your greatest successes so far?
Securing the permanent closure of the smelter, of course, and the fact that the Kenyan government has finally admitted that our community was being poisoned. We had to battle long and hard for this admission because we had no firm evidence for it for so long. In fact, important information such as the results of medical tests was kept from us. In May, the United Nations Environmental Assembly expressed concern about unsafe lead-acid battery recycling at its meeting in Nairobi, which I myself attended, and that was another major victory for our campaign.

What does the Goldman Environmental Prize mean to you?
The Prize is a great honour and an important milestone in our campaign. It has also been enormously helpful in publicising the issue.

What does your son say about your campaigning activities?
He is very proud and is constantly encouraging me. King David is now 10 years old and wants to become an environmental activist when he's older. But he's more interested in protecting animals (smiles).

Thank you for talking to eco@work.
The interviewer was Christiane Weihe.

Talking to eco@work: Phyllis Omido, Founder and Chief Campaigner at the Center for Justice, Governance and Environmental Action
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Roadmap for a sustainable raw materials industry

Primary extraction of raw materials

Every year, around forty tonnes of mercury find their way into the Amazon region of Peru as a result of illegal gold mining. Global steel and cement production alone produce 5.7 billion tonnes of CO_2 equivalent, six times Germany's greenhouse gas emissions. According to estimates from UNICEF, the UN children's organisation, around 40,000 children work in the mines of the southern Congo. In the German state of Hesse, the forest to the south of the Langener Waldsee, which is protected due to its importance for hydrological balance, climate and air purity, is being cleared to expand gravel extraction.

These examples are clear evidence of the environmental and social problems related to primary raw material extraction – problems which Germany must also address, because some of these global mining and processing activities meet the demand from industrial countries such as Germany. Many of the raw materials required, such as gravel, are sourced within Germany itself but, particularly in the case of metals such as iron, aluminium and copper and the raw materials for technology, such as rare earths, the country is completely dependent on imports for its primary resources. It is clear that, in view of the existing supply risks and the often severe social and environmental impacts of production, Germany cannot carry on like this: what is needed is a transition to the sustainable use of raw materials for the long term.

Each year, **40 tonnes of mercury** find their way into the Amazon region of Peru as a result of illegal gold mining.

"We still have a lot to do here in Germany with regard to an effective long-term sustainable resource strategy," says Stefanie Degreif, a researcher at the Oeko-Institut. "Although indicators such as resource productivity can be used as a sort of crude measuring tool, they don't provide any information on environmental and social impacts of resource needs – and these can vary considerably, depending on the raw material." For example, the impacts of bulk raw materials such as steel and gravel may be completely different from those of non-bulk raw materials such as the technology metals lithium and neodymium. The same indicators and targets therefore cannot be applied to bulk and non-bulk raw materials in the context of a sustainable resource industry. This is where the Oeko-Institut comes in: through the self-funded project "Germany 2049: Transition to sustainable use of raw materials", the Institute is developing a long-term strategy for a sustainable resource industry for Germany. For the analysis, the project team identified 75 abiotic resources from the following categories: ores, industrial inputs and construction materials. "We are looking at precious metals like palladium and gold, and industrial materials like potassium salts and phosphate. Commodities such as sand and gravel, which are mainly produced here in Germany, are included in the study, as are those that have to be imported, such as neodymium and tin." The materials selected have a broad spectrum of properties in terms of primary extraction, use and recycling. An analysis of their risks and impacts forms part of the project. "It deals with economic issues such as supply risks, but we are principally interested in environmental impacts, so we focus on issues such as harmful emissions, land use and the hazards of radioactive materials. The social dimension, such as job security and child labour, is important too," explains Stefanie Degreif.

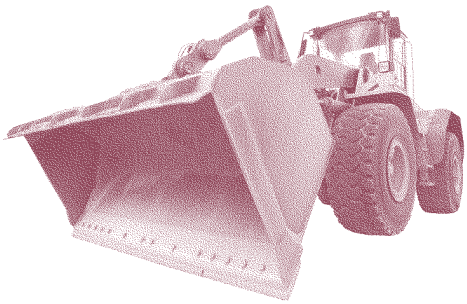
"Hotspots" – particularly significant negative impacts of resource extraction – are being identified for the various materials in different categories, so for each resource-related hotspot, the project team is also developing material-specific targets, together with actions and tools for achieving them. In relation to the raw materials supply, for example, that might include guidelines for sustainable, environmentally and socially responsible primary extraction, while in the case of demand it might mean extending the useful life of infrastructure and goods.

"We have devised two scenarios – the 'business as usual' scenario and the 'transition' scenario," says Stefanie Degreif. "In each, we predict how resource needs will develop to 2049. In addition, we recommend courses of action in the various areas of need, such as information and communications technology, housing, work and mobility." Comparing the two scenarios shows to what extent the transition to sustainability is possible. "Take housing: with 'business as usual', the proportion of designs requiring intensive use of land and materials would remain high, as would the amount of new building. There would still be very little use of wood or recycled concrete, and only a moderate amount of renovation," she says. In the transition scenario, on the other hand, the Oeko-Institut assumes that the life of buildings will be prolonged by boosting renovation rates, more apartment blocks will be built to house more people and more wood and recycled concrete will be used.

TRANSITION TO SUSTAINABILITY: GRAVEL AND NEODYMIUM

The approach taken by the "Germany 2049" project is exemplified by two raw materials: gravel and neodymium. "Two very different commodities: gravel is a bulk material, practically all of which is extracted here in Germany, whereas the technology metal neodymium is entirely imported," says Stefanie Degreif. "What's more, the challenges posed by their extraction are in different hotspots and therefore require different material-specific targets." The particularly negative impacts of primary extraction of gravel, a bulk material, include the amount of land used and the destruction of the landscape. That is why a resource-specific target must be to reduce the absolute primary need in the medium and long term. Among other things, the project team set a target of increasing the use of recycled material from 0.4 per cent at present to almost 10 per cent and curbing the volume of new building through better maintenance of the housing stock. "For example, we identified measures that cut the primary demand for gravel by almost half," says Stefanie Degreif. "These include introducing a tax on primary building materials, stipulating a minimum input of recycled concrete in public construction projects and prolonging the life of buildings."

A comparison of the primary resource demand in the projected scenarios showed how significantly gravel use can be reduced by the proposed measures: in the sectors considered (housing, work and mobility), the gravel required in the transition scenario to 2049 is almost half that in the "business as usual" scenario: 23 million tonnes less per year.



Demand for gravel in the housing, work and mobility sectors can be reduced by **almost half** by 2049.

Where the technology metal neodymium is concerned, there is not only the supply risk, but also the problems of corruption, lack of workplace health and safety and child labour and, above all, very significant environmental hazards, namely radioactive residues and heavy metals in primary production. "In contrast to the goal for gravel of reducing primary demand to an absolute minimum, the focus for neodymium, which is used in motors for electric vehicles, for example, is not on reducing primary demand," explains Stefanie Degreif. "This is because using the rare earth metal in green technologies makes a huge contribution to saving other resources. So in this case a resource strategy should focus mainly on measures in the primary supply chain and on the provision of certified primary material." The Oeko-Institut's project team has therefore defined ambitious criteria for certified neodymium. "If voluntary certification doesn't achieve the desired result in the medium term, import duties and bans could be implemented to support certification." In addition, the project specifies a target of increasing the use of secondary material from zero at present to 30 per cent by 2049 and of extending the life of information and communications technology (ICT) by 50 per cent. "Despite the ambitious recycling target, the demand for primary neodymium in the relevant sectors of mobility and ICT that we looked at rises by 1200 tonnes a year – or almost 60 per cent – in the transition scenario," says Stefanie Degreif. "However, this scenario also shows that the proportion of certified neodymium can be boosted substantially: by 2049, it could, potentially, account for around 80 per cent of total demand and thus mitigate the negative environmental and social impacts very significantly."

The project team will continue working until late 2016 on how the transition to sustainability can be achieved for these and other raw materials; the final results of the project will be presented in public for the first time at the Oeko-Institut's annual conference on 1 December 2016.

SUSTAINABLE IN EUROPE

The Institute's researchers have joined partners in other countries on the STRADE project (Strategic Dialogue on Sustainable Raw Materials for Europe) to address the issue of sustainability in the raw materials supply. At present the EU-funded research project is considering how to develop a long-term resource strategy for the EU that is environmentally and socially sustainable. To that end, the researchers are collaborating with project partners in resource-rich countries such as South Africa. "These countries' interests must be taken into consideration, which is why we are holding workshops to discuss our experiences with resource policy and raw materials extraction," Stefanie Degreif explains. "We will use what we learn, together with the accompanying research findings, to draw up an internationally recognised evaluation scheme for resource extraction." This will include clear, transparent criteria for socially and environmentally compatible extraction of raw materials. "It will help governments, industry and investors to assess the degree of sustainability of a production site," she says. The project team is also looking at issues of supply security and at the European mining industry: "One aspect of STRADE is developing solutions for safeguarding the competitiveness of European resource extraction and the raw materials industry."

Christiane Weihe

Stefanie Degreif has been researching resource issues at the Oeko-Institut's Resources and Transport Division since 2010 – including working on the project "Germany 2049: Transition to sustainable use of raw materials", which focuses on a comprehensive strategy for a sustainable resource industry.
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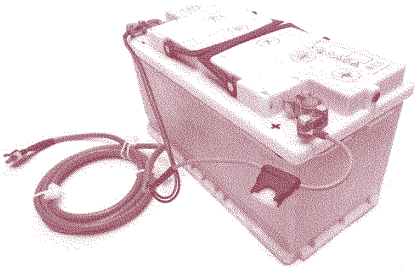
The dark side of recycling

Secondary extraction of raw materials

Like the words "organic" and "sustainable", the term "recycling" has positive connotations in Germany. Recovering resources makes sense, of course: without recycling, a sustainable resource strategy would be inconceivable. Recycling has positive impacts on the environment and the remaining mineral deposits. But is this true of all recycling? As experts at the Oeko-Institut reveal, there is another, darker side to recycling in developing countries: for example, the informal recycling of lead from used batteries in many African countries has catastrophic consequences for humans and the environment. This was one of the topics on the agenda at the United Nations Environment Assembly (UNEA2) in May 2016.

The amount of scrap generated in developing countries and emerging economies is rising steadily; in Africa, for example, the total number of vehicles – and thus also the number of scrapped vehicles – is increasing by around 5 per cent a year. "Developing countries and emerging economies are now on a par with the industrial countries in terms of scrap production," says Andreas Manhart, a researcher at the Oeko-Institut. "This is a problem which will make the issue of recycling much more relevant in developing countries in future." That is because the waste is rarely recycled correctly: "Unfortunately, the fact that recycling takes place here is not positive per se, as the processes are often very basic and put people and the environment at risk," he explains. "Examples are setting light to car tyres, or burning off the plastic sheathing on cables to recover the copper inside."

The recovery of lead from car batteries is linked to particularly serious problems. "The growth in vehicle ownership in Africa is driving up the number of used batteries; estimates for 2016 put these at over 1.2 million tonnes," says Andreas Manhart. "This amounts to more than 800,000 tonnes of lead annually, most of which is recycled in countries south of the Sahara, mostly under very problematical conditions." No precautions are taken when the battery acid is poured off, and workers lack basic protective equipment, such as gloves and facemasks – even when melting the lead. "This causes severe lead poisoning – which can be life-threatening – for the workers as well as for people living near lead smelters," he explains. "And most people are totally unaware of the dangers – they mistake the symptoms of lead poisoning for those of an infection."



Over 1.2 million tonnes
of batteries will be discarded in Africa in 2016.

STANDARDS FOR LEAD SMELTERS

Through the current Lead Recycling Africa Project, which is funded from donations, the Oeko-Institut, in collaboration with environmental organisations in Ethiopia, Kenya, Tanzania and Cameroon, has helped to disseminate information about these plants and their recycling practices, as well as their impacts in African countries, to raise awareness of the problem and to promote sustainable solutions. "In Dakar in Senegal, for example, 18 children under the age of five died of acute lead poisoning between November 2007 and March 2008," Andreas Manhart says. However, it is not only in the immediate vicinity of the lead smelters that severe consequences of unsafe recycling occur: "In Cameroon, some of the heavy metal is used to make cookware. Recycling the plastic battery casing is also a problem, because in most cases the material is not cleaned sufficiently and the lead residues end up in products such as drinking water tanks, where they pose a serious health risk."

Key measures for improving protection for humans and the environment from these hazards include educating the community about the risks that exist and providing information to policymakers. "And, first and foremost, local recycling companies must take urgent steps to prevent people from being exposed to lead without proper protection," Andreas Manhart insists. Standards for recycling batteries in a way that is safe for health and the environment, with requirements for health checks, business management, emissions and provision of capital for rectifying en-

vironmental damage, are also a good idea, he says, adding that an incentive scheme is needed for those who recycle safely. "It is not acceptable that people who don't care about the impacts of their activities, who just want to gain access to the raw materials as cheaply as possible, can earn more than the people who recycle correctly." This situation needs to be reversed with incentives for environmentally sound recycling, he believes.

In his view, the automotive industry must accept much of the responsibility, since it accounts for a large proportion of global lead consumption. The lead recovered in Africa rarely has any industrial application locally, so much of it is exported to Asia and Europe where, after passing through the refineries, it ends up being used in the manufacture of car batteries. "The European car industry must take responsibility, for example by imposing significantly more rigorous standards for their suppliers from the outset," Andreas Manhart says.

BEST OF TWO WORLDS

The Oeko-Institut has also been working on ways to tackle unsafe recycling as part of Best of Two Worlds (Bo2W), a joint project with local institutions in Ghana and Egypt and industry partners in Belgium and Germany. "We have focused on scrap vehicles and electronic waste to investigate how sustainable collection and recycling systems can be set up in Ghana and Egypt," Andreas Manhart explains. The project, which is funded by the German Federal Ministry of Education and Research (BMBF), aims to combine the best of both worlds: the respective advantages of existing recycling structures in industrial countries and emerging economies. "The basic idea is that the products are dismantled locally – meeting strict environmental and social standards, of course – and then recycled in highly efficient plants in industrial countries. For example, lead-acid batteries collected in Ghana were shipped to Europe to be recycled by skilled workers." The project showed that the Bo2W initiative is viable. However, the researchers also identified structural problems with its large-scale implementation: "Even in Ghana and Egypt it was evident that the recycling companies that did not externalise the costs of workers' health and safety, for example, had a significant disadvantage in terms of competitiveness. The informal waste industry does not bear these costs itself and therefore dominates the market."

The severity of the problems that can arise from the extraction of secondary raw materials was also emphasised by the UN Environment Assembly (UNEA2) in Nairobi in May 2016: it expressed deep concern about the problem of unsafe recycling of lead-acid batteries and called for the introduction of standards. "That is a statement that can be referred to in future negotiations, so it is an important step forward," says Andreas Manhart. It is not just about shining a light on the dark side of lead recycling in Africa: the problem exists on other continents as well. "For example, we know of cases in Vietnam and the Dominican Republic. Worldwide – based on conservative estimates – the health of almost a million people is directly at risk."

Christiane Weihe

Andreas Manhart's research focuses on social and environmental standards in international production chains. A geography graduate, he has worked in the Sustainable Products and Material Flows Division at the Oeko-Institut since 2005.
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