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Institut für angewandte Ökologie
Institute for Applied Ecology

Partnership for Responsible Battery and Metal Recycling (ProBaMet)

Project concept for implementing a multistakeholder initiative promoting responsible battery recycling & responsible sourcing of secondary non-ferrous metals

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1 Context

This document contains a project concept aimed at a *Partnership for Responsible Battery and Metal Recycling* with selected African countries. The project concept has been developed and worked-out after various interactions with African environmental civil society groups, regulatory authorities, battery using industries (e.g. solar energy access industry) and international non-ferrous metals using industries. It is also based on a decade of various previous business and project experiences around managing waste lead-acid batteries. This includes experiences from the BMBF-funded Best-of-2-Worlds project implemented between 2012 and 2015, a fact finding study on lead-acid battery recycling in African countries, various efforts on improving the battery recycling sector in Nigeria and Ethiopia by Heinrich Boell Foundation and GIZ, and the ongoing Sustainable Recycling Industries Project in Ghana, funded by the Swiss State Secretariat for Economic Affairs. The concept responds to a) concerns about the standards and performance of the lead-acid battery recycling industries in African low-and middle-income countries, b) the need to develop responsible battery recycling options in a key solar market, and c) the metals industry's attempts for responsible sourcing of secondary raw materials, as well as reliable and diversified supply-chains. It is in-line with the just transition agenda laid out in BMZ's Africa Strategy, particularly related to a responsible use of resources and sustainable supply chains (BMZ 2023). The chosen approach aims at a positive and lasting improvement cycle where battery recyclers in African settings develop intrinsic interests in upgrading working conditions and environmental standards, supported through sector benchmarks and market drivers.

In that context, the organisations listed in section 5.8 have been in contact with GIZ, including the *Globalvorhaben Go Circular* and the *Initiative for Global Solidarity (IGS)* and were asked to provide this concept for a focused project in this field.

2 The challenge

Metals and alloys can be recycled numerous times without loss of quality. In addition, metal recycling avoids considerable greenhouse gas emissions and many other environmental and social impacts compared to primary production (mining). For these reasons, German industries increasingly turn their attention towards sourcing of recycled raw materials within Germany and the EU. But as major exporting country (e.g., cars, machines), domestic scrap generation and recycling is insufficient to satisfy industrial demand. A circular economy strategy for Germany's metal sector must therefore look beyond national boundaries and include sourcing of recycled materials available in other countries and world regions. In this context, used-lead acid batteries deserve special attention. They contain high concentrations of lead, tin and antimony, are used and distributed all over the world, and represent the by far most relevant scrap type for these raw materials.

Figure 2-1: Polluting battery recycling plant in Nigeria



Source: SRADeV

Nevertheless, global recycling of lead-acid batteries is not at an equally high level yet: While high technical standards (including emission control and health & safety) are established in industrialised countries, there is still significant room for improvements in many recycling plants in low-and middle-income countries. Such countries and plants can greatly benefit from improvement pathways already successfully implemented elsewhere.

The low-standard segment of this industry is known to be one of the world's most polluting industries (Green Cross & Blacksmith Institute 2016) and a UN-resolution calls upon all countries to take efforts for environmentally sound management of such batteries (UNEA 2017). The biggest challenge associated with lead-acid battery recycling is the release of toxic lead-compounds to the workplace and surrounding environment. People exposed to lead are prone to various short-, mid- and long-term health impacts that can even have lethal consequences. Women in childbearing age and children are most vulnerable as lead-exposure impacts brain development causing lifelong impairment of cognitive and intellectual abilities. According to recent health studies, it is estimated that 1/3 of all children are exposed to elevated lead levels, with the vast majority of affected children living in low- and middle-income countries (UNICEF & Pure Earth 2020).

Challenges are particularly pronounced in many African countries that experience economic development, growing vehicle fleets, high demand in backup power systems and decentralised solar installations. Here, skyrocketing battery volumes, as well as a still widely unregulated markets attract investments in recycling facilities, but not yet in sufficient pollution control and safety measures. While German industries have an intrinsic interest in sourcing secondary raw materials, ethical considerations, reputational risks, as well as legal supply chain due diligence requirements[1] do effectively restrict supply and business relationships with most recyclers of that region.

Despite these limitations, interest in improving and remediating the challenges above are increasing, mainly due to the following reasons:

1) **Low- and middle-income countries** increasingly realise that sub-standard recycling leads to considerable pollution and severe drawbacks to socio-economic development. In some

[1] The German "Lieferkettensorgfaltspflichtgesetz" and the proposed EU Directive on corporate sustainability due diligence.

countries, pollution cases initially caused confrontations between activists, government and industries but have meanwhile turned into target orientated and constructive dialogues on how to modernize and upgrade these sectors. Subsequently, countries such as Ghana, Nigeria, Kenya, Ethiopia and Tanzania have a growing interest in cooperation approaches for systematic improvements.

2) **European manufacturing industries** are trying to concentrate on the EU market in regard to their lead supply chains. Due to the high global demand for lead, they do have to rely on raw material imports and increasingly try to diversify their sourcing and strengthen their focus on secondary raw materials. While individual companies tend to shy away from cooperating with partners in world regions that are commonly associated with sub-standard processes and pollution, they are interested in a form of collective approach that allows upgrading of processes and standards on the side of partner countries and ensure that potential future business relationships can be conducted in-line with societal expectations and supply chain due diligence requirements.
3) **Renewable energy companies** are large scale users of batteries and have multiple operations in low- and middle-income countries. In particularly in Sub-Sahara Africa, the renewable energy sector plays a decisive role in achieving the Sustainable Development Goal No. 7 (affordable and clean energy for all) and the number of batteries in this field is expected to grow between the factor of 7 and 14 until 2030 (Angliviel et al. 2021). Many renewable energy companies, especially many solar companies as well as other battery using industries like telecom or the backup-power sector are aware of the unresolved end-of-life management challenges and aim at identifying and supporting responsible solutions for their old batteries.

While the interest above led to various initiatives on improving recycling already (e.g. development of national legislation, corporate policies on end-of-life battery management), activities are still widely uncoordinated and do not yield mutual synergies.

3 The approach

This concept aims at establishing a cooperative approach for responsible recycling and sourcing of secondary raw materials with selected Sub-Sahara Africa countries. It aims at leveraging synergies between the interest from national stakeholders (government, national recycling industries, civil society), metal using industries (Germany/European Union, but also global), and solar companies with operations in Sub-Sahara Africa and uses lead-acid batteries as focus case.

The approach mainly aims at reducing health and safety risks of workers and wider population groups and environmental impacts. It will consider technical feasibility, economic aspects and regulatory frameworks. In this context it is noteworthy that many sub-standard recycling processes currently benefit from the absence of binding minimum standards and enforcement. While high standard recycling is technically possible in all world regions, many plant managers are hesitant investing in upgrades because of the following reasons:

- While upgrades would enable higher metal recoveries, investment costs are often substantial, possibly even outweighing potential gains.
- In competitive markets, it is of high importance for businesses to have enough financial leverage for acquisition of scraps for recycling. Investments in upgrades can limit this leverage and there are known cases of recycling companies that lost significant market shares after investments in facility upgrades.

- While regulatory authorities aim at introducing and enforcing minimum standards across sectors, many such authorities lack know-how to develop and enforce standards thoroughly throughout a country[2]. Thus, decisions on upgrades are still widely regarded as voluntary by many companies.

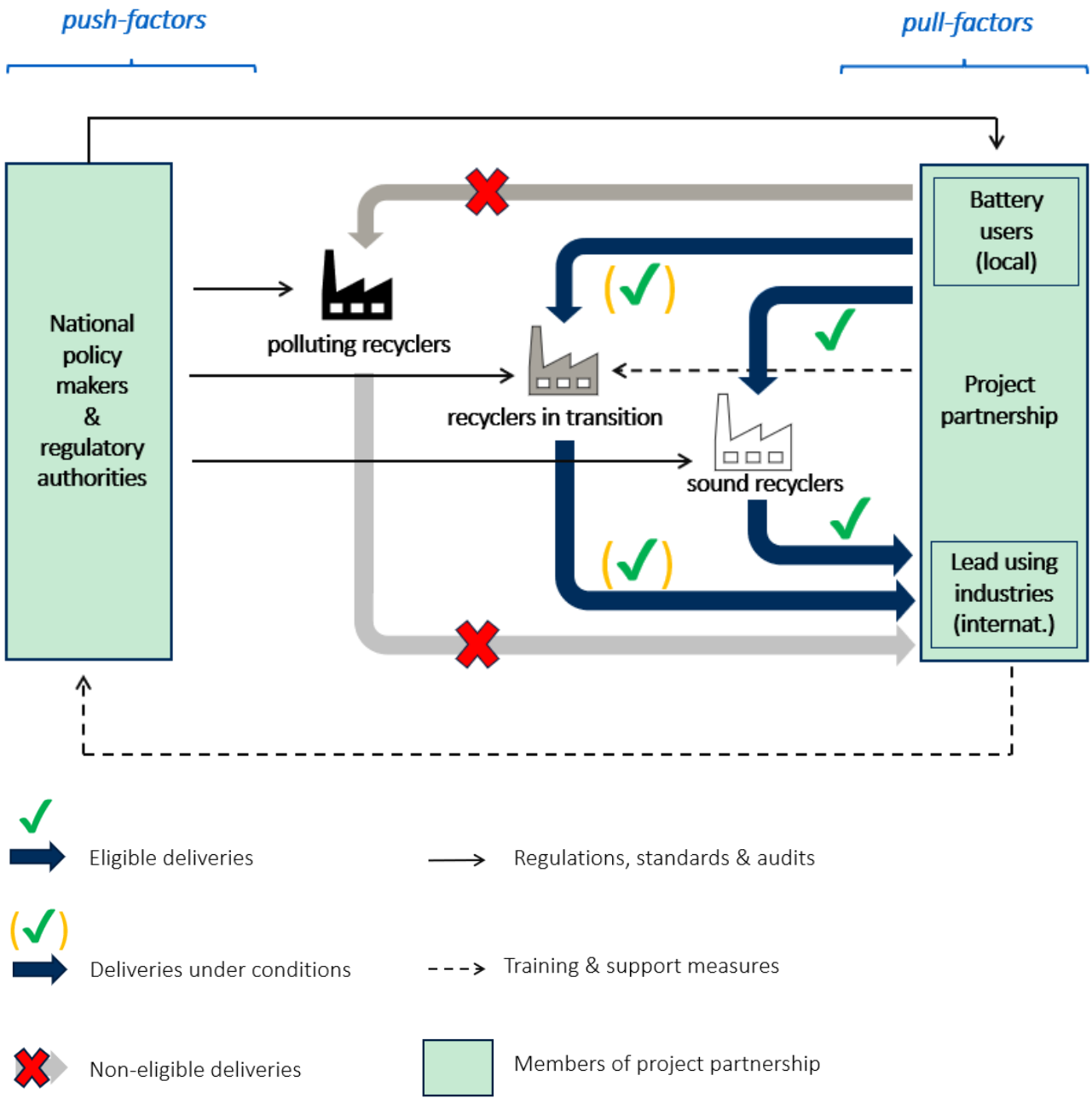
The project aims at building coalitions that can overcome the above-described situation: By partnering with regulatory authorities ***push-factors*** for improvements will be strengthened. Push-factors are considered all measures governments can take to incentivize and enforce improvements upon companies and sectors (e.g. standard setting, monitoring, sanctioning of non-compliances).

At the same time, the coalition will develop ***pull-factors*** based on the market demand for high-standard recycling: By combining the demand of solar companies for full responsible battery disposal solutions with the demand of European companies for secondary raw materials, recycling companies will be provided opportunities to invest into high-standard processes, and by doing-so, gain new customers and market opportunities.

The approach is sketched in Figure 3-1 and will be achieved through the core activities of Table 3-1.

[2] Limited capacities are related to limited availability of sufficient manpower for standard development, inspections and enforcement, but also related to technological expertise on specific recycling and smelting processes required for effective standard setting and monitoring.

Figure 3-1: Improvement strategy combining push- and pull-factors



Source: © Öko-Institut e.V.

Table 3-1: Planned core activities

Area	Activities
Support of and cooperation with policymakers & regulatory authorities	Support the identification of suitable benchmarks & standards and adapt them to local needs[3]
	Share know-how and lessons learned on successful sector reform policies (e.g. from other countries and world regions)
	Conduct training on facility assessment / auditing
	Support audits with independent industry experts (joint audits)
Support of and cooperation with recycling companies	Train plant managers in sound & efficient recycling operations, incl. environmental performance and industrial hygiene
	Develop improvement plans for each facility, including participatory means for improving health & safety
	Offering business opportunities for improved facilities/operations (recycling partnerships)
	Know-how transfer & support on demand (related to investment decisions, business links etc.)
Combining market demands for sound recycling	Develop joint benchmarks and ambitions for recycling partnerships (ideally linked to national benchmarks above)
	Develop assessment & verification procedures
	Identify suitable battery recycling partners in target countries that either fully comply with benchmarks, or that have convincing ambitions towards achieving them in a reasonable timeframe.
	Steer corporate end-of-life battery management and raw material sourcing practices towards cooperation with identified recyclers (recycling partnerships).

Source: Own compilation

Through these activities and intervention logic, it is aimed to build reliable **recycling partnerships** between operators in the target countries, battery using industries (e.g. solar companies) and metals using downstream industries. These partnerships aim at operating in-line with, and in support of ambitious national and international standards, and to yield tangible economic and sustainability benefits for all involved parties.

In terms of outreach, it is – amongst others – planned to use the applied processes to develop a platform listing responsible recyclers assessed through this effort. This **Responsible Recyclers Information System** will allow parties not directly linked to this project to also make use of the process and identify suitable recycling partners in the target countries (also see section 5.5).

[3] In various fields, this process is already ongoing. Amongst others, the Swiss-funded SRI-project has already developed *Standard Operating Procedures for Environmentally Sound Management of Used Lead-acid Batteries,* which are backed by major international industry associations and have been adopted as national minimum standard for ULAB recycling in Ghana and Nigeria already. Furthermore, the International Lead Association is creating a certification programme for lead-acid battery recycling plants (“Lead360”) that entails benchmarks and verification routines.

4 The benefits

The approach will yield various benefits:

- **Workers and population in the partner country** will benefit from improved recycling processes, safer working conditions and sound and holistic emission control systems. Considering the observed low standards in many current battery recycling facilities, the potential health benefits for workers and neighbouring communities can hardly be underestimated. For the wider population and societies of Sub-Sahara African countries, it is estimated that childhood lead-exposure is responsible for around 4% GDP loss (Attina and Trasande 2013), indicating that improvements will also benefit the societies of partner countries as a whole. An estimation on the number of potential beneficiaries amongst workers and neighbouring communities is presented in Table 4-1.

- **Government of the partner country** will benefit from a concerted support of their efforts to upgrade their national recycling landscape for batteries. This would support government partners to act in-line with international conventions such as the UNEA-Resolution on improving lead-acid battery recycling (UNEA/EA.3/Res.9). They will particularly benefit from training of auditors and joint inspections of facilities (national auditors + experiences international experts), which will add a strong practical capacity building element. The government will also benefit from an active implementation of government policies in a way they are not perceived as being solely used against industry, but in turn used as a positive means to support high-standard industrial development and job creation.

- **Battery recycling industries in the partner country** will benefit from a clear and uniform benchmark and guidance on the expected minimum standards. It is aimed that all relevant stakeholders (government, business partners) will refer to the same standard / SOPs and use a joint audit and verification procedure, which will result in clear guidance for the sector. At the same time, recycling industries operating at high standards and/or committed to invest in required improvements are given security that they will maintain access to end-of-life battery volumes, while getting access to buyers of recycling outputs (lead and other non-ferrous metals).

- **Battery using sectors in the partner country** will benefit from a clear and robust assessment of lead-acid battery disposal options, and a clear guidance on what recyclers they can use for this purpose. Such clarity is increasingly important for solar power companies operating in low- and middle-income countries as donors of energy access projects (e.g., development banks) also recognised the issue and request sound and credible end-of-life management strategies from implementing companies.

- **Non-ferrous metal consuming industries** will benefit from the scheme by gaining access to secondary raw materials (lead, tin, antimony) without bearing the risks of being linked to sub-standard processes. As supply chain due diligence is getting increasingly relevant, the initiative opens opportunities for non-ferrous metal industries in Germany and globally to build-up responsibly supply relationships for secondary raw materials with African partners.

Table 4-1: Estimated number of people directly affected by lead-acid battery recycling practices

	Number of industrial recycling plants	Estimated number of workers in recycling plants[4]	Estimated number of workers in battery collection[5]	Estimated population size in 2.5 km radius[6]	Total number of affected persons
Cameroon	2	260	2,000	6,280	8,540
Ethiopia	2	260	2,000	6,280	8,540
Ghana	3	390	3,000	9,420	12,810
Kenya	1	130	1,000	3,140	4,270
Nigeria	10	1,300	10,000	31,400	42,700
Rwanda	1	130	1,000	3,140	4,270
Senegal	1	130	1,000	3,140	4,270
Tanzania	4	520	4,000	12,560	17,080
Uganda	2	260	2,000	6,280	8,540
Total	**24**	**3,120**	**24,000**	**75,360**	**102,480**

The country marked in yellow (Nigeria) is in scope of this proposal

In the country marked in green (Ghana) the concept will be implemented through the Swiss-funded Sustainable Recycling Industries project (SRI) in a synchronised manner (see section 5.1).

Source: © Öko-Institut e.V.

5 Implementation plan

5.1 Geographic scope

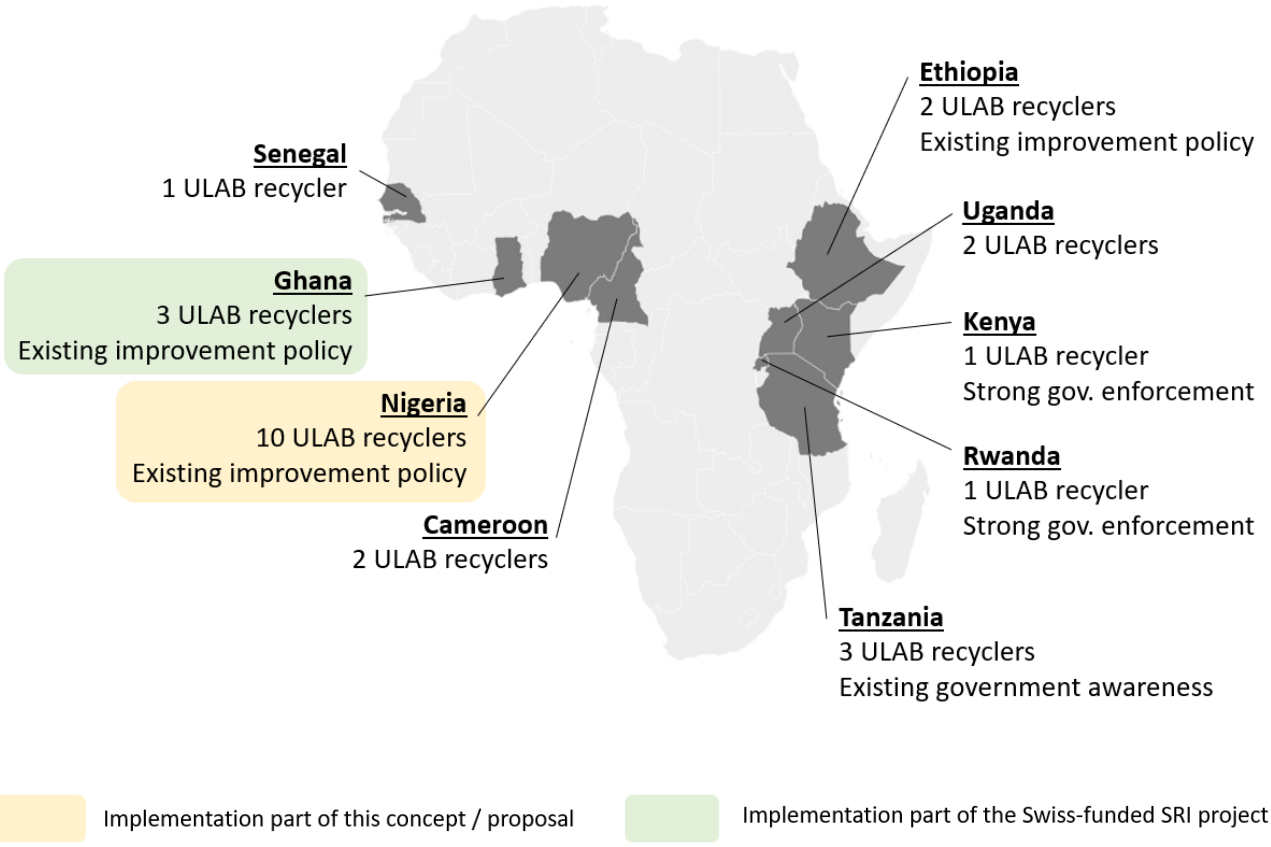
The project scope is on partner countries in Sub-Sahara Africa that have a relevant and growing industrial base, as well as a demonstrated willingness in upgrading local industry and battery recycling sector. Although the concept is applicable to a broad variety of countries and settings it is suggested to focus on Nigeria. The focus on one major African economy will allow a thorough development of methods, routines and communication pathways, while still allowing to achieve a relevant scale of impacts. At the same time, there are established links to government authorities, industries and experts in Nigeria already. In case of a successful implementation, the geographical scope can be expanded to further countries in follow-up activities[7].

4 Workforce per plant: 60-200 (av. 130)
5 Battery throughput per plant: 10,000 – 30,000 t/a (av. 20,000 t/a); 1 worker for 20 t/a
6 Lead dust from stack-emissions typically fall out within a vicinity of 2.5 km from the source, assuming no strong prevailing winds (Brian Wilson, oral communication 2023). Assumption on population density: Semi-urban with 200 per km^2.
7 Such follow-up activities are not considered in the project timeline and budget presented in sections 5.6 and 5.9.

It is planned to implement this project closely aligned with the ongoing Swiss-funded SRI-project in Ghana that uses a very similar approach and that addresses the lead-acid battery issue since 2017, including the methodology and standard related foundations of this concept (see section 5.4).

Figure 5-1 gives an overview on African countries where the subject has a high relevance, including the planned partner country marked in yellow and the country covered through the Swiss-funded SRI-project marked in green. The extended country selection is not part of this project proposal but may be relevant for future considerations on concept expansion.

Figure 5-1: Country overview



ULAB = Used Lead-Acid Batteries

Source: © Oeko-Institut e.V.

Nigeria is host to one of the largest lead-acid battery recycling industries in Sub-Sahara Africa with at least ten facilities conducting battery recycling on an industrial scale, mainly for exporting recovered non-ferrous metals. A pollution scandal around one of these recyclers hit the industry hard, as many off-takers suspended trade relationships with Nigerian suppliers in response to it (Anyaogu 2018b). The government introduced improvements policies[8][9] and promotes battery take-back schemes organised through the producer responsibility organisation (PRO) *Alliance for Responsible Battery Recycling (ARBR)*. Nigerian authorities are currently reviewing the *Standard*

8 Also with GIZ support organised through the Nigerian Energy Support Programme
9 Policy National Environmental (Battery Control) Regulation 2020.

Operating Procedures developed within the SRI project and global industry support[10] and consider them as binding national standard for the sector. The *National Environmental Standards and Regulations Enforcement Agency (NESREA)* is the main government body in charge of environmental industry oversight and control.

5.2 Cooperation principles

The project aims at cooperation built on mutual trust and respect and in a way industries as well as societies of the partner countries have tangible benefits from reduced environmental pollution, better working conditions, as well as sound industrial development. Industry partners from European countries shall also benefit from the cooperation through more reliable raw material supplies, as well as effective means of compliance with supply chain due diligence regulations.

The project and resulting recycling partnerships aim at building upon their joint interests for improving recycling operations but are also aware that potential differences in priorities will require open dialogue, mutual understanding and a constructive way for advancing solution development. Differences in priorities might particularly be found in the fact that European manufacturing companies are likely to prioritize the development of stable sources of secondary raw materials, while the key interest of policymakers and industries in the partner country is to develop national industries, including investments in higher performance and more local value addition.

The project members are committed to resolve such priority differences in a constructive and balanced manner. All project members are aware that one-sided outcomes and activities (e.g. a pure focus on securing access to raw materials, or a pure focus on promotion investments in facilities) are neither realistic nor intended.

5.3 Role of informal sector operators

Informal sector operators play an important role in waste management and recycling of many low- and middle-income countries. Nevertheless, many of the industry-scale recycling process are in the hands of mid- and large-scale registered enterprises, which are the primary focus of this project. Research in lead-acid battery recycling revealed that these industrial recyclers are often a major source of pollution (Gottesfeld et al. 2018; Manhart et al. 2016; Atiemo et al. 2016), while having been insufficiently addressed by cooperation projects so far. In addition, industrial recyclers have influence on informal players in their supply chain (e.g. informal suppliers of used lead-acid batteries). By considering such relationships, cooperation with industrial recyclers can also have positive impacts on informal collection networks.

Therefore, this project will primarily cooperate with registered industrial recyclers (lead-acid battery recyclers). But this cooperation will also encompass issues around the supply of used batteries and scraps to ensure that suppliers (including informal collection networks) are upgraded and enabled to comply with health and safety principles and avoid polluting practices prior to delivery.

[10] The SOPs have been developed to guide low- and middle-income countries in improving this sector. Oeko-Institut as well as various industry associations have been centrally involved in compiling these SOPs.

5.4 Interlinks with existing projects and initiatives

Issues around lead-acid battery recycling have already been addressed by some few other projects and initiatives in the region, which laid significant foundations for further actions to be taken. This project aims at building upon these efforts and focus project activities on countries where there is already sufficient policy- and industry-awareness to allow a quick-start of activities:

In **Nigeria**, the topic of lead-acid battery recycling was first addressed through an activity by Heinrich-Boell Foundation and Oeko-Institut in 2016 and 2017. After a pollution scandal in 2018 (Anyaogu 2018a; Anyaogu et al. 2018), the GIZ Nigerian Energy Support Programme launched an activity with the Nigerian environmental authorities that led to formulation of a battery policy. The involved experts are well interconnected with Oeko-Institut, which were repeatedly consulted in this process. Amongst others Oeko-Institut was invited to a meeting where Wirtschaftsvereinigung Metalle received a Nigerian delegation (policymakers and recyclers) in September 2022 in Berlin to co-develop aspects of the intervention logic illustrated in Figure 3-1.

According to our assessments all the above listed projects made significant contributions to advance the topic in each of the countries, including country baseline assessments, awareness creation and policy development. These achievements provide a highly suitable starting point for solution orientated action as proposed in this concept. The organisations involved in this project concept have been involved in many of these activities and developed close ties to projects, industry and government representatives. We are convinced that the concept as presented here can further advance the achieved outcomes and bring them up-to a level of tangible industry cooperation.

It is noteworthy that there are ongoing activities on lead-acid battery recycling in Ghana, which have been supported through the Swiss-funded SRI-project since 2018. Amongst others, the project (supported by industry involvement) resulted in establishing the *Standard Operating Procedures* for this sector, which is an important stepping-stone for implementing this project concept. The SRI project is about to be extended until mid-2025 and it is planned to closely interact with the project to tap synergies and align implementation. As Oeko-Institut has a coordinating role in the SRI-implementation, constant exchange and know-how transfer is secured.

It is also noteworthy that the International Lead Association (ILA) launched a material stewardship program “Lead 360” - a global initiative to promote and recognise good practices in lead battery value chains, from lead mining through to lead battery manufacturing and recycling. Oeko-Institut is in close exchange with ILA and this initiative and aims to use conceptual synergies.

5.5 Outcomes & outputs

The overall aim of the project is to reduce lead poisoning in recycling processes in Nigeria. Therefore, the project will yield various outcomes, many of them of high relevance to key stakeholders. This will entail outputs such as trainings and related training material, standards and assessment procedures, facility improvement plans and networking with international off-takers and business partners. This section aims at highlighting outcomes and outputs with relevance for know-how generation, outreach and impact.

Outcome 1: Facility assessments & improvement plans are carried out

All plants willing to cooperate with the project will be assessed at least once during the project implementation period. Each assessment will follow a proven process and methodology and will be thoroughly documented. Assessments will be led by proven industry experts (assigned through sub-

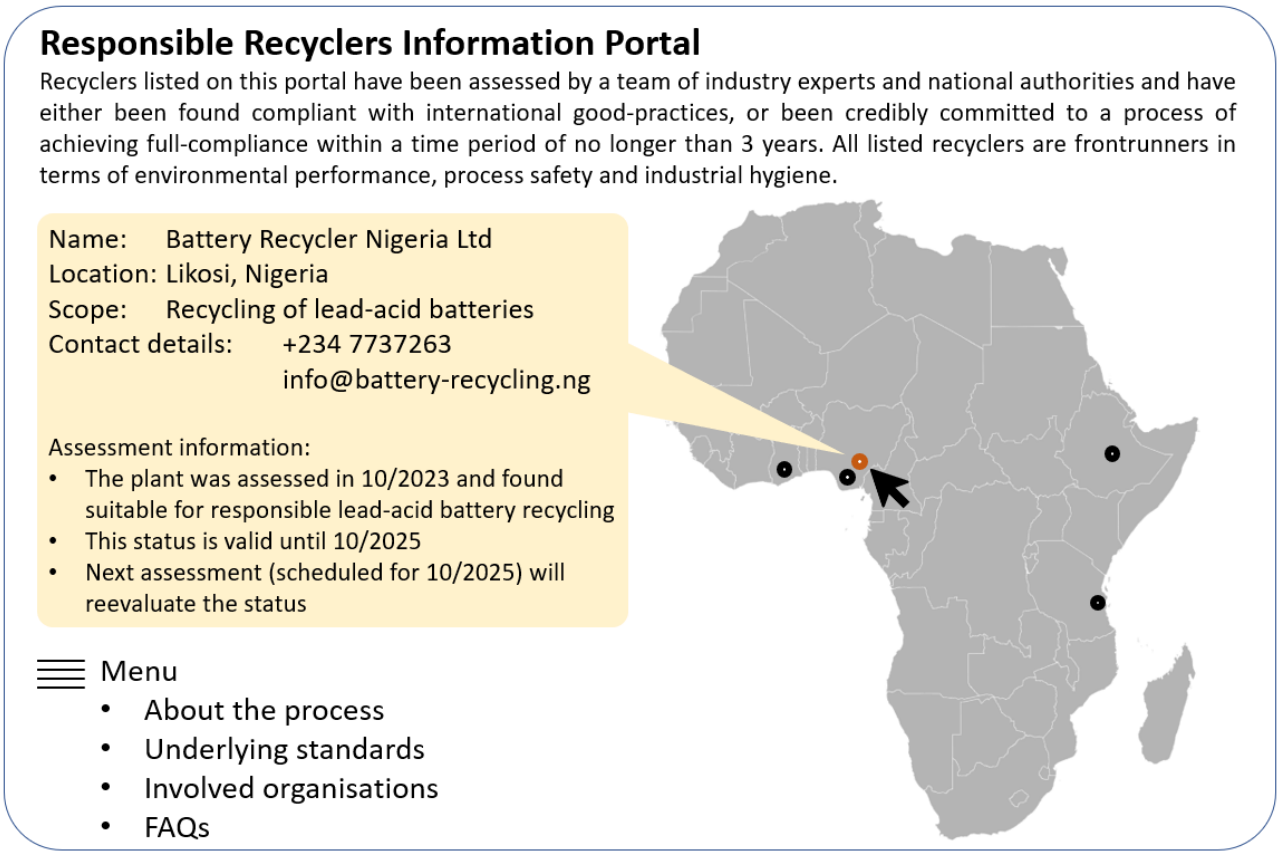
contracting – see section 5.9) and in close coordination with inspectors from the national environmental authorities (NESREA in Nigeria). The process will not only yield assessment documents but will also be coupled to thorough plant specific improvement plans, detailing organisational points and technical aspects requiring improvements in order to become compliant with given standards. Facility assessment reports and improvement plans will entail numerous details not suitable for publication (business interna) and will only be provided to the assessed companies and the regulatory authorities. Only generic information will be used for communication to the wider public (see next point).

Output 1.1: Facility assessment reports Output 1.2: Plant specific improvement plans

Outcome 2: Responsible recyclers information system is set-up

Positive results of facility assessments will be used in a generic manner for a *Responsible Recyclers Information System* informing about responsible disposal options for batteries, as well as potential partner companies for secondary raw material supply. The system will either be realised via other existing information channels (e.g. tied to existing websites or newsletters with wide outreach to key sectors such as non-ferrous-metals industry and renewable energy). The system shall be publicly available and be based on prior assessed companies. It will only list companies assessed positive (no publication of companies found unsuitable for cooperation) and not specify detailed assessment results. Instead, it will transparently inform about underlying benchmarks and procedures, thereby ensuring system credibility.

Figure 5-2: Indicative format of the Responsible Recyclers Information System



Source: © Öko-Institut e.V.

Output 2.1: Set-up of a responsible recyclers information system

Output 2.2: Integration of the results from Outcome 1 into the information system

Outcome 3: Partnership agreements are established

Based on the cooperative approach of the project, it is envisaged to initiate partnerships between battery using companies, recyclers in target countries and metal using industries in other world regions (Germany, Europe, other world regions). While the project itself has no authority to enforce such agreements upon business players, it is envisaged to stimulate and enable such cooperation agreements between the involved partners. Amongst others, the following types of agreements appear possible:

- Commitments by battery using industries and sectors (e.g. solar sector) on principles and benchmarks for battery decommissioning and recycling (including commitments to give used lead-acid batteries only to positively evaluated recycling partners).
- Cooperation agreements between battery using companies (e.g. solar companies) and one or more positively evaluated battery recycling companies on battery decommissioning and recycling.
- Cooperation agreement between one or more positively evaluated battery recycling companies and non-ferrous metals using companies in Germany or the EU on direct supply relationships.

If successful, any such agreement would have tangible benefits also beyond the immediate project implementation period. Below, the possible types of agreements are translated into outputs of the documents. However, it must be highlighted that, depending on the needs of the stakeholders, it is possible that only one type of agreement will be enabled.

Output 1a: A commitment document for the battery industries and sectors prepared, or.

Output 1b: A cooperation agreement document between battery using companies and one or more positively evaluated battery recycling companies is prepared, or

Output 1c: Cooperation agreement document between one or more positively evaluated battery recycling companies and non-ferrous metals using companies in Germany or the EU is prepared.

5.6 Phases & timeline

Implementation will follow five main phases, which will partly overlap (see Table 5-1):

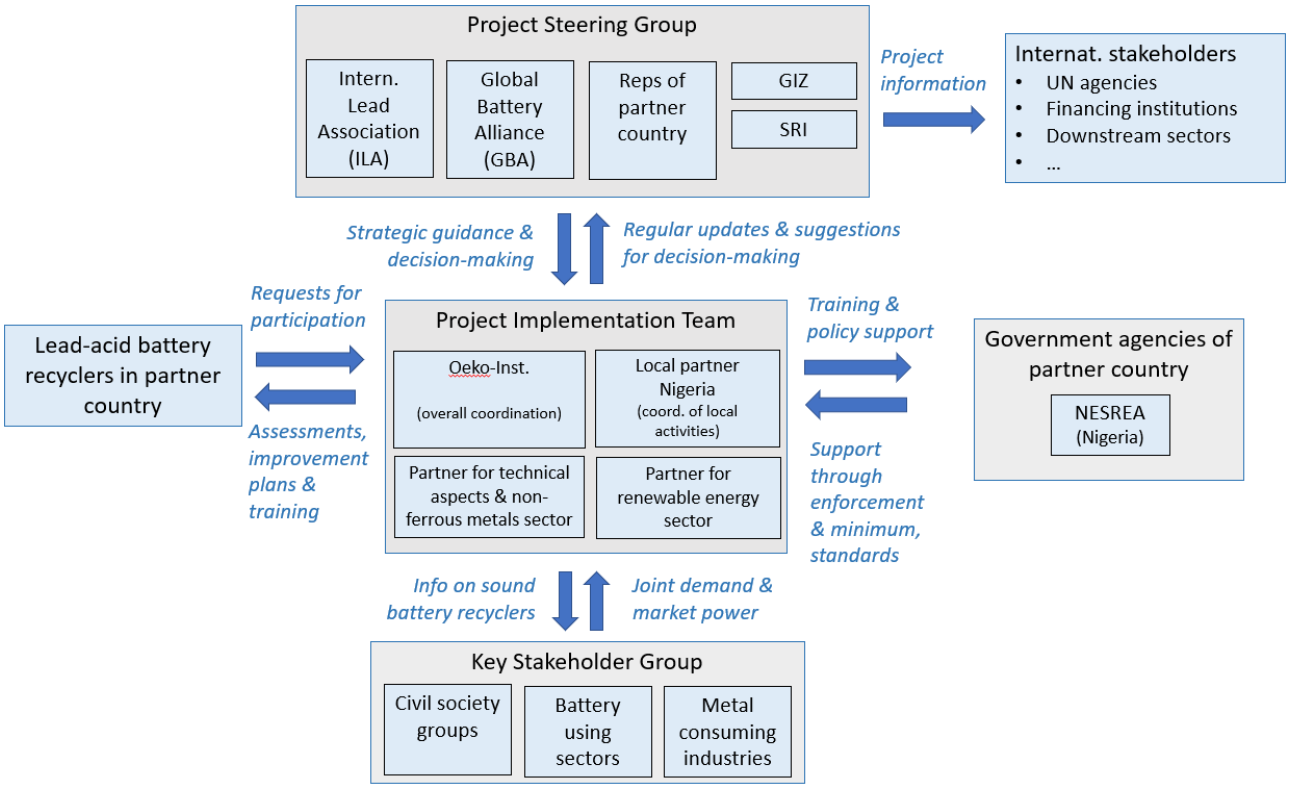
1) A **project set-up phase** aimed at establishing a functional working structure with a focus on selection and contracting or project partners, as well as onboarding of key stakeholders in Nigeria and beyond.
2) A **development phase** aimed at choosing and compiling methodologies, standards and procedures required for assessing, benchmarking and supporting recycling industries in partner countries. This phase will also be used to establish contacts with recyclers in the partner country and enter in (preliminary) agreements for next steps. This phase will also

include first systematic information activities to renewable energy/solar companies and non-ferrous metals using industries.

3) A **start-up and feasibility phase** where developed methods and procedures from phase 2 will be presented and applied in Nigeria and lead to first assessments and improvement plans for plants there. It is expected that this project phase will yield a lot of insights in ground realities, which might require slight adaptations to applied methodologies, processes and probably even the implementation plan. This phase will likely include the formation of a lead-acid battery collection and pooling group within the renewable/solar energy sector to join forces.
4) An **implementation phase** where co-operations from phase 3 are extended to further support and follow-up activities. This phase will also entail the start on a wider communication to third parties, in particularly to further recyclers potentially interested in participation, and also further companies.
5) An **outreach phase** will communicate the approach to further battery using sectors (e.g. automotive) and recycling and metal-using industries, as well as the wider interested public. Related activities will be already initiated in the first half of the project. In the final project months, it will also entail an evaluation of key results and insights. While long-term sustainability of the project approach will be a cross-cutting element throughout the whole project, this phase will again take a critical look onto the developed approach and systems and recommend steps for long-term actions to sustain and leverage positive effects. This phase will also include a call to further battery recycling industries in other low- and middle-income countries for adopting high technical standards and procedures.

5.7 Project set-up & decision-making

Figure 5-3: Proposed project organisational structure



Source: © Öko-Institut e.V.

The **Project Steering Group** will be composed of representatives from GIZ, partner countries (Nigeria, Tanzania) and representatives from battery sectors (e.g. Global Battery Alliance) and non-ferrous metals consuming industries (e.g. International Lead Association). The group shall maintain complete oversight of the project activities and will receive regular project update briefs from the Project Implementation Team. The Project Steering Group will act as decision-making body on all major decisions of strategic importance. In that context the group shall meet every 3 months (indicatively) to interact with the Project Implementation Team and may ask for more frequent interaction if necessary. Project Steering Group meetings will be primarily held virtually (videoconferencing), or – if possible – back-to-back with international conferences/events. Members of the Project Steering Group might be tasked with presenting the project and key outcomes to international stakeholders such as UN bodies. It is envisaged to keep the size of the Project Steering Group limited so to allow smooth decision-making processes (8-10 members maximum).

The **Project Implementation Team** will be in charge of day-to-day project management and implementation. The members of this group will implement the project on part-time or full-time basis and carry the main responsibility for conducting all project tasks in a timely and high-quality manner, in-line with this project concept and the guidance from the Project Steering Group. The Project Implementation Team will hold regular internal exchange calls (biweekly meetings) and prepare update-briefings and suggestions for decision-making for the Project Steering Group meetings. The Project Implementation Team will also be responsible for interactions with key stakeholders, including partner country agencies, civil society groups, battery recyclers, battery using industries and non-ferrous metal using industries.

Government agencies of partner country will be involved through one representative in the Project Steering Group (see above). In addition, government agencies will be the first entry point for all interactions on the level of the partner country. This will involve contacting of local recyclers, workshops, auditing and capacity-development activities.

The local partner of the Project Implementation Team for Nigeria will take over day-to-day interaction with government agencies and ensure that project activities are aligned with national policy- and decision-making on waste management and recycling. Government agencies are also meant to benefit from project activities in terms of capacity development, which will be achieved through trainings, practical know-how transfer during joint facility assessments (combined audits with national inspectors and experienced industry experts) and a study tour to one or more high-standard recyclers.

Recyclers in the partner country will be the main target group of the project. They will be informed on the project activities via the partner country agency and the local member of the Project Implementation Team. They will receive comprehensive information on the project approach and – once willing to participate – will sign a joint agreement with the project partners, outlining rules on processes, data use, confidentiality and further relevant conditions. Cooperating recyclers will receive facility assessment teams and must commit to cooperate with these teams as stipulated in the joint agreement. The plant management will further receive training from experienced industry experts and – in case this is concluded and recommended by the facility assessment teams – will be listed as recommended disposal option for lead-acid batteries in the respective country through project communication platforms (e.g. newsletters, website).

Key stakeholders will be involved through workshops (in partner countries) newsletter or website. While this material will generally inform on the project developments, it will particularly inform on

recycling companies that – after running through the facility assessments, and improvement processes – can be recommended as disposal option for batteries, as well as business partners for the supply of non-ferrous metals. While this information will inform on the general recommendations, underlying approaches, applied standards and processes, company and facility specific findings (e.g. from facility assessments) will be kept internal to ensure a high level of trust with cooperating recyclers.

International stakeholders such as UN-organisations, funding agencies and governments of other countries will be informed through project communication platform and materials but are also an important target group for outreach activities. While the Project Implementation Team will conduct and support such outreach activities, Members of the Project Steering Group are also requested to actively participate in this field.

5.8 Required support

Successful project implementation depends to a large extent on the support and buy-in of regulatory agencies, particularly those agencies that have the mandate for environmental inspection and enforcement. In Nigeria, this mandate is allocated at the **National Environmental Standards & Regulations Enforcement Agency (NESREA)**. Oeko-Institut maintains contact with this agency and had the possibility to exchange battery related recycling issues during previous engagements and interactions. The organisation welcome the project approach as improvements of the lead-acid battery recycling sector falls within governments' and agencies' priorities in Nigeria. NESREA is therefore willing to support implementation through their own capacities in the fields of contacting/onboarding of recyclers, development and application of industry performance standards, as well as engagement processes with in-country stakeholders (workshops, trainings etc.).

Beyond the national environmental agency, Oeko-Institut will integrate further partners to conduct specific tasks and support project implementation. The selection of these partners will be based on a tendering process involving at least three potential candidates for each of the following roles.

- Local partner for coordinating Nigeria activities
- Experienced partner for technical aspects and coordination of non-ferrous metals industry
- Experienced partner for coordination of renewable energy industry

The roles and responsibilities of these partners are described in section 5.9. In terms of experiences, know-how and capacities, the following profiles will be required:

Local partner in Nigeria: This organisation must have a strong background in the fields of hazardous waste management (ideally waste battery management), industry standards and national regulatory frameworks. It is of high relevance that this background is rooted in the local context with well-developed links and networks to key stakeholder such as recycling enterprises, national industry associations and regulatory authorities. The organisation must have strong organisational skills, experiences in implementing hazardous waste and pollution related projects in Nigeria and be respected players for facilitating and catalysing environmental improvement processes. The local partner shall have a permanent local presence in the target country.

The **partner for technical aspects and coordination of non-ferrous metals industry** must be able to provide cutting-edge technical expertise on lead-acid battery recycling processes, including

environmental, health & safety assessments of recycling plants and development of improvement plans. In addition, the partner must be able to provide the content of related training events in Nigeria, which includes the ability to travel to Nigeria and actively participate in facility assessments, workshops, trainings and further interactions with key stakeholders. In addition, the partner must maintain a well-developed network to German, European and international industry players with a demand for lead-acid battery recycling outputs (lead, tin, antimony) and interest to engage in pro-active measures for building-up responsible supply chains from African recycling sources. The partner must be in the position to use this network in a way relevant shares of the respective non-ferrous metals industry are reached.

The **partner for coordination of renewable energy industry** must maintain a well-developed network to German, European and international companies that are active in the roll-out of renewable energy projects in Africa, including Nigeria. The partner must be able to conduct and roll-out awareness raining measures to this target group with a view to a) reach relevant shares of this sector, and b) rally support for proactive approaches for sound battery end-of-life management, including commitments for sound end-of-life strategies and pooling of battery volumes to realise and strengthen sound recycling. The partner must have the ability to travel to Nigeria and actively participate in workshops and organise own stakeholder interactions to support a strong demand for sound lead-acid battery recycling solutions in Nigeria from the side of the renewable energy sector.

5.9 Roles & responsibilities

The roles and responsibilities of the project partners are illustrated in Table 5-2.

Öko-Institut will take over the project coordination and be responsible for sound project implementation as described in this document. The Institute will also take a leading role in the set-up and outreach phases of project implementation and coordinate all partner activities in a coherent manner and ensure that activities and tasks are aligned, conducted in a timely manner and well communicated between project partners and key stakeholders. In that context, Öko-Institut also has major support tasks in the development, start-up and implementation phase.

The **Non-ferrous metals sector partner** will hold key responsibilities in the development, set-up and implementation phases, particularly related in the selection and application of auditing methods, standards and documentation formats for facility assessments and improvement plans. Application will mean the leading role in facility assessments, improvement plans as well as related activities in terms of training of local authorities/auditors and plant managers. The partner will also be responsible to organise and conduct the outreach to the German and international non-ferrous metals industry in a way the project is recognised as major pilot initiative to develop sound and responsible supply chains for secondary lead, tin and antimony from African settings.

The **Renewable energy sector partner** will be responsible for the outreach to the renewable energy sectors active in Nigeria (as well as in other African countries) to raise awareness for the issue, to organise a pooling of end-of-life battery volumes to exert market power as described in section 3, and to work on circularity and/or recycling guidelines for solar batteries that are suitable for wider sector commitments.

Table 5-1: Project roles and responsibilities

Project phases & tasks		Roles & responsibilities				
		Oeko-Institut	NFM sector partner	RE sector partner	Local partner	Local authoritis
1	Set-up phase					
1a	Set-up of organisational structure	L				
1b	Development of project description & information elements	L	(S)	(S)		
1c	Start of communication & decision-making routines	L				
1d	Onboarding of stakeholders	L	S	S	S	
1e	Kick-off workshops with partner country (virtual)	L	(S)	(S)	S	
2	Development phase					
2a	Developing/selection of auditing methods & standards	S	L			S
2b	Documentation formats (incl. data protection standards)	S	L			
2c	Contacting of recyclers in partner country		S		L	S
2d	Agreement templates with participating recyclers		L			
2e	Development of communication & advocacy tools (e.g. newsletter)		L (NFM sector)	L (RE sector)		
2f	Information campaign to RE and NFM sectors		L (NFM sector)	L (RE sector)		
3	Start-up & feasibility phase					
3a	Partner country workshop	S	(S)	(S)	L	S
3b	Initial facility assessments	S	L		S	S
3c	Specification of facility improvement plans	S	L			S
3d	Development of recycling / circularity guidelines for RE sector	S		L	S	
3e	In-country training	S	L		S	
4	Implementation phase					
4a	Follow-up facility assessments	S	L		S	S
4b	Outreach to further recyclers	S	S		L	S
4c	Collection of RE company committments to rec. / circularity guidelines			L		
4d	Policy-support measures	L			S	
4e	Information updates to RE and NFM sectors		L (NFM sector)	L (RE sector)		
5	Outreach phase					
5a	Public communication & outreach (incl. further sectors)	L	S	S		
5b	Conference session / cross-sectoral learning workshop	L	S	S		S
5c	Feasibility study on expansion to further facilities and countries	L	S	S	S	
5d	Review of achievements & lessons learned	L	S	S	S	S
6	Project management					
6a	Project management	L				

RE sector = Renewable energy sector
NFM sector = Non-ferrous metals sector

L = Lead
S = Support
(S) = Minor support

The **local partner organisation** in Nigeria will be responsible for establishing and maintaining the interlinks with local stakeholders, including government bodies, recycling industry and civil society and academia. It will further be responsible for organising activities in the country, including visits to recyclers, stakeholder meetings and workshops and any further necessary local interactions. Beyond this, the local partner hold manifold experiences and know-how on local contexts, including the regulatory frameworks, recycling landscapes and histories from previous interventions. This know-how will be crucial to support various other project activities.

The **local environmental authority** (NESREA) committed to support the project implementation with own resources. This support is particularly relevant for aligning developed facility assessment tools and processes with national compliance verification systems, and to support and actively back ambitious minimum benchmarks for the lead-acid battery recycling industry in their national sphere of influence. This also includes an active role in onboarding of recyclers, including the conduct of workshops, systematic facility assessments and development and enforcement of improvement plans.

5.10 Security

In the case of an uncertain security and/or health situation in Nigeria, a full implementation of project-related travels might not be possible within the planned schedule or might be even impossible. In the case of a deteriorating security and/or health situation, the project team will evaluate travel risks jointly with GIZ and discuss options which might include (but might not be limited to) an implementation strategy mostly based on remote interaction via tele- and videoconferencing or temporary or regional shift of travels. The basis for assessing the security situation is the evaluation of the German Foreign Office (Auswaertiges Amt)[11].

[11] Published and updated under: http://www.auswaertiges-amt.de

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