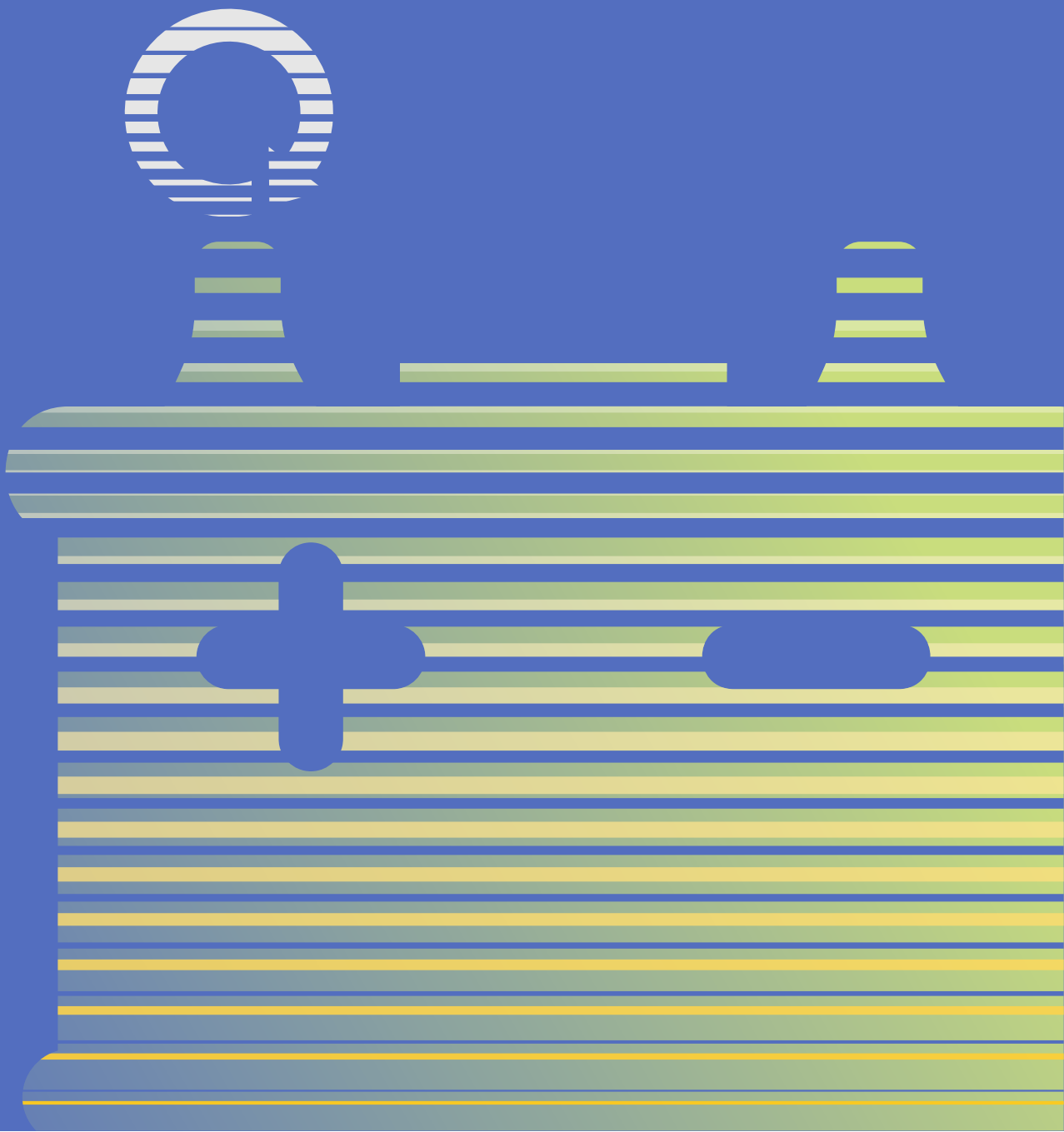
Extended Producer Responsibility (EPR) schemes for used lead-acid batteries (ULAB) in the Latin American and Caribbean region

Second Technical Report of the Intergovernmental Network on Chemicals and Waste

INTERGOVERNMENTAL NETWORK ON CHEMICALS AND WASTE FOR LATIN AMERICA AND THE CARIBBEAN

UN environment programme



Extended Producer Responsibility (EPR) schemes for used lead-acid batteries (ULAB) in the Latin American and Caribbean region

Second Technical Report of the Intergovernmental Network on Chemicals and Waste

Requested by the Intergovernmental Network on Chemicals and Waste for Latin America and the Caribbean, framed within the Chemicals, Waste and Air Quality Subprogramme Chemicals and Waste of the UN Environment Programme (UNEP), according to UNEP ROLAC Agreement (SSFA / CHM / 001-2020).

Prepared by

Alejandra Acosta and Ana Corallo

Basel Convention Regional Centre for the South American region in Argentina (CRBAS)
National institute of Industrial Technology (INTI) - Argentina

Supervision

Jordi Pon, María Candela Zaffiro Tacchetti,
Miguel Lizárraga and Carlos Añibarro Montero.

UNEP Office for Latin America and the Caribbean.

Gabriela Medina

Basel Convention Coordinating Centre, and Stockholm Convention Regional Centre for Latin America and the Caribbean.

INTERGOVERNMENTAL NETWORK ON CHEMICALS AND WASTE FOR LATIN AMERICA AND THE CARIBBEAN

UN environment programme

Summary

Approximately 85 % of the total world consumption of lead is intended for the production of Lead-Acid Batteries (LAB). These batteries are used primarily in motorized vehicles, for the storage of energy generated by photovoltaic cells and wind turbines, and to supply electrical standby power (both for the consumer market and for critical systems such as telecommunications and hospitals). In certain countries, LAB are also used for lighting and other electrical appliances.

Growth in the use of renewable energy and the concomitant need to have storage batteries, as well as growing demand for motor vehicles, indicate that demand for LAB will raise. This is reflected in the growing global demand for refined lead, which was estimated at 10.83 million metric tons (T) in 2016 (World Health Organization [WHO], 2017). This demand is met by increases in both the primary production of lead and the one obtained from recycling. Today, more than half of the world's production of lead comes from its recycling (WHO, 2017).

In an effort to collect lead in an environmentally sound manner while safeguarding human health, it is essential to establish sustainable systems that contemplate all phases of the sound management of used Lead-Acid Batteries (ULAB), starting from when the batteries become waste until the smelting process stage. In this context, Extended Producer Responsibility (EPR) schemes, which seek to hold producers and importers responsible for the impacts that their products have on health and the environment throughout their life-cycle, have contributed to increase recycling and collection rates, as well as the generation of resources to finance this type of activities.

This report seeks to provide recommendations, exchange experiences from the different stages of the life-cycle and promote technical assistance and regional cooperation regarding the sound management of ULAB. It is developed in the context of the programme of work of the Intergovernmental Network on Chemicals and Waste for Latin America and the Caribbean, framed within the Chemicals, Waste and Air Quality Subprogramme of the UN Environment Programme (UNEP), which aims to develop technical reports to strengthen the knowledge and capacities of the countries of the region.

EPR schemes specifically applied in the management of ULAB were identified in the region of Latin America and the Caribbean. Therefore, to identify lessons learned and the barriers for implementation, this document was prepared according to the following structure:

In **Section I** of the document, a brief introduction is made on the background of the management of ULAB in the framework of multilateral environmental agreements, international fora and regional contexts. Likewise, the objective and scope of this report are presented, describing the methodology for its development.

In **Section II** the impacts on health and the environment resulting from poor management of ULAB are analysed, while **Section III** highlights the need to achieve the sound management of ULAB emphasizing the use of two relevant documents elaborated within the framework of the **Basel Convention: the Technical Guidelines for the Environmentally Sound Management of Waste Lead-Acid Batteries**[1] and the **Training Manual for the Preparation of National Used Lead-Acid Batteries Environmentally Sound Management Plans** in the context of the implementation[2].

Section IV introduces the EPR model and its application in the region. Moreover, international management of ULAB systems with an EPR approach are analysed. **Section V** includes a comparative analysis of the management of ULAB systems in seven countries of the region: Brazil, Chile, Colombia, Costa Rica, Honduras, the Dominican Republic, and Uruguay.

[1] More information on the Technical Guidelines, available **here**
[2] More information on the Training Manual, available **here**

Table of contents

1. Introduction

1. Context

According to data from 2017 by the Institute for Health Metrics and Evaluation (IHME) of the University of Washington[3], exposure to lead was the cause of 1.06 million deaths and the loss of 24.4 million years of life adjusted according to disability due to long-term health effects (WHO, 2019). According to the World Health Organization (WHO), around 85 % of the world's lead consumption corresponds to the manufacture of LAB for motor vehicles (2019). When these batteries are handled incorrectly, releasing their components, such as lead, lead oxides, and sulfuric acid, and contaminating water, soil, and air, pose a threat to the environment and human health.

Adverse health consequences affect, to a greater extent, people or groups in vulnerable situations, such as children, elderly, and women. According to a recent study conducted by UNICEF and Pure Earth *"The Toxic Truth: Children's Exposure to Lead Pollution Undermines a Generation of Potential"* (2020), 1 in 3 children (around 800 million worldwide) have blood lead levels equal to or greater than 5 micrograms per deciliter (µg / dL), a value that, according to the WHO, may be associated with decreased intelligence in children, behavioural difficulties and learning problems. In this sense, the unsound recycling of used lead-acid batteries (ULAB) is presented as one of the main factors that contribute to lead poisoning in children living in low- and middle-income countries, where the number of vehicles has tripled since 2000.

ULAB are classified as hazardous waste under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. In this context, the **Technical Guidelines for the Environmentally Sound Management of Waste Lead-Acid Batteries** were developed in 2003. Likewise, the **Training Manual for the Preparation of National Used Lead-Acid Batteries Environmentally Sound Management Plans in the context of the implementation of the Basel Convention** was published, which provides practical advice and guidance for national authorities on the development of a legislative framework on the environmentally sound management of ULAB.

The United Nations Environment Assembly (UNEA) adopted in December 2017 the Resolution 3/9 on "*Eliminating Exposure to Lead Paint and Promoting the Environmentally Sound Management of Lead Acid Batteries*"[4], in which the need to continue reducing lead exposure through the promotion of the environmental sound management (ESM) of ULAB was reiterated. Member States were encouraged to continue their efforts in this regard by: a) developing national strategies to manage the collection of waste lead-acid batteries and addressing the issue of remediation of contaminated sites; b) adequately addressing releas-

[3] IHME is a research center that provides rigorous and comparable measurement of the world's most important health problems and evaluates the strategies used to address them. In 2015, the WHO and the IHME signed a memorandum of understanding with a view to improving the quality and use of global health estimates to measure the health problems that afflict humanity.

[4] Resolution adopted in its third session period, held in Nairobi on 4-6 December, 2016. Available **here**

es, emissions, and exposures from waste lead-acid batteries, including recycling, and utilizing appropriate standards and criteria; c) cooperating in collecting waste lead-acid batteries for environmentally sound processing at regional or national recycling facilities, consistent with the relevant provisions of the Basel Convention and relevant regional conventions. Moreover, governments were encouraged to develop, adopt and implement legislation and regulations, to support the development of private sector strategies to eliminate lead paint, and to undertake actions throughout the value chain, including disposal, in order to eliminate the risks posed by such paints pose.

In this context, in 2019, the report UNEP / EA. 4 / 14 was published on the "*Status of Implementation of Resolution 3/9 on Eliminating Exposure to Lead Paint and Promoting Environmentally Sound Management of Waste Lead Acid Batteries*"[5]. A needs assessment survey was conducted among the Strategic Approach focal points in those regions, which confirmed the need for technical assistance on the ESM of waste lead-acid batteries. Likewise, the report refers to a project proposal to enhance understanding of lead poisoning and of the use of best effective practices and measures to control exposure, focusing on waste lead-acid batteries under development.

Finally, it is highlighted that achieving an ESM of ULAB contributes to achieving the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda. Particularly, SDG 3 (ensure healthy lives and promote well-being for all at all ages); SDG 5 (achieve gender equality and empower all women and girls); SDG7 (ensure access to affordable, reliable, sustainable, and modern energy for all); SDG 8 (promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all); and SDG 12 (ensure sustainable consumption and production patterns).

The **Intergovernmental Network on Chemicals and Waste for Latin America and the Caribbean**[6] developed an Action Plan for the 2019-2020 biennium, updated for the 2021-2024 period, which includes six work areas alongside the following subtopics and relevant cooperation actions concerning ULAB:

- ✓ Reviewing and strengthening regulatory and institutional frameworks for chemicals and waste.
- ✓ Promoting actions to eliminate lead exposure (e.g., paints and lead-acid batteries).
- ✓ Developing systems to measure and characterize waste generation, including hazardous waste, and keeping up-to-date national inventories (including electronic waste).
- ✓ Promoting and applying the best practices and best technologies for the sound management of hazardous waste.
- ✓ Promoting Extended Producer Responsibility (EPR) plans.

[5] Report in its fourth session period, held in Nairobi on 11-15 March, 2019. Available **here**

[6] The Intergovernmental Network on Chemicals and Waste for Latin America and the Caribbean was established within the framework of the XX Meeting of the Forum of Ministers of the Environment of Latin America and the Caribbean (Cartagena, Colombia, March 28-31, 2016), through Decision 8, and its main objectives are: to contribute to the implementation of the 2030 Agenda for Sustainable Development; support the implementation of chemicals and waste international agreements; strengthen regional cooperation and facilitate exchange of information and best practices; promote technology transfer mechanisms and capacity building for the reduction of the use of chemical; and provide recommendations at policy and programme level for consideration of the Forum of Ministers of the Environment of Latin America and the Caribbean. More information **here**

2. Objective and Scope of the Report

The main objective of this report is to review ULAB experiences in Latin America and the Caribbean, particularly those cases that have included or plan to include EPR schemes, identifying the main lessons learned and challenges in their implementation.

The ultimate objective is to provide a series of recommendations that will serve the countries of Latin America and the Caribbean to introduce concrete improvements in the management of this waste stream, exchange experiences in the different stages of the life-cycle and promote technical assistance and regional cooperation.

3. Methodology

To carry out this report, an online survey (See **Annex I**) was disseminated to the national focal points of the Intergovernmental Network on Chemicals and Waste for Latin America and the Caribbean in August 2020, to assess their current regulations on ULAB, requesting them to indicate whether such regulations include EPR schemes and to identify the main challenges to achieve the ESM of ULAB.

Based on the responses obtained and complemented by desk research, seven case studied countries were identified, as listed below[7]:

- **Brazil:** Law No. 12.305 establishes the National Solid Waste Policy[8], which defines the shared responsibility[9] of the producer and displays the obligation to implement reverse logistic systems for certain products, including batteries. In 2019, a sectorial agreement was signed between the Government, the private sector, and the Brazilian Institute of Recyclable Energy (IBER)[10] —as the managing body— to implement reverse logistic systems for ULAB.

- **Chile:** Framework Law for Waste Management, Extended Producer Responsibility, and Promotion of Recycling —commonly known as the EPR Law—, which includes batteries as a priority waste stream[11]. Likewise, by Decree No. 2/10[12] of the Ministry of Health, the transboundary movements of ULAB from Chile to third countries is prohibited, considering there are facilities in the country with the capacity to process this hazardous waste stream. Likewise, the country has a technical guideline on the management of ULAB prepared within the framework of the German Technical

[7] For the selection of case studies, countries with EPR schemes for management of ULAB were prioritized. When not available, the analysis focused on government programs, initiatives, or legislative projects with considerable progress (for example, presented to Congress or parliamentary bodies or subjected to public consultation processes).

[8] More information on Law No. 12.305 (National Solid Waste Policy), available **here**

[9] Shared responsibility for the life cycle of products: set of individualized and linked duties of manufacturers, importers, distributors and traders, consumers and owners of public urban cleaning and solid waste management services, to minimize the volume of solid waste generated, as well as to reduce the impacts caused to human health and environmental derived from the life cycle of the products.

[10] More information on the *Instituto Brasilero de Energía Reciclable* (IBER), available **here**

[11] More information on Law No. 20.920 (Waste Management Framework, Extended Producer Responsibility and Promotion of Recycling), available **here**

[12] More information on Decree No. 2/10 of the Ministry of Health (Transboundary Movements of Hazardous Waste consisting of Used Lead Batteries), available **here**

Cooperation (GTZ) with the participation of the National Commission for the Environment of the Government of Chile[13].

- **Colombia:** Manual of best environmental practices for the management of ULAB from 2008[14] and specific regulations from 2009 that include management plans for the post-consumer return of ULAB[15].

- **Costa Rica:** General Regulations for the Classification and Management of Hazardous Waste[16] and Regulation for the Declaration of Waste with Special Management Requirements[17], by which it is established that the producer or importer of LAB must provide options to ensure the collection of such waste and thus reduce the amount of ULAB that reaches final disposal sites.

- **Honduras:** In June 2020, the National Congress approved Legislative Decree No. 80/2020 that allows the importation of ULAB for treatment.

- **Dominican Republic:** Specific standard that approves a technical-environmental regulation for the management of ULAB[18].

- **Uruguay:** ULAB Regulation, currently under review, that establishes extended responsibility of the importer-manufacturer (Decree No. 373/003) [19].

Semi-structured bilateral interviews were held with government representatives responsible for the management of ULAB at the national level of the seven aforementioned countries in order to confirm the information collected and to deepen the analysis of each case study. Likewise, a treatment company located in one of the surveyed countries was interviewed. After the interviews, additional information was requested to expand on the key topics identified.

It is also noted that for the development of this report, reliable sources of information were considered, including decisions, guidelines and other documents prepared within the framework of the Basel Convention, the Stockholm Convention and the WHO; current national regulations and normative projects formally presented for their legislative treatment in the countries under analysis; national and regional reports on waste management, chemical substances in general and ULAB in particular; official information published by the countries of the region; and other relevant resources.

[13] More information on the Technical guideline on the management of ULAB in Chile, available **here**
[14] More information on the Manual of good environmental practices for the management of used lead acid batteries, available **here**
[15] More information on Resolution No. 0372 of 2009, modified by Resolution No. 361 of 2011, available **here**
[16] More information on the General Regulation No. 37788-S-MINAE, available **here**
[17] More information on Regulation for the Declaration of Waste with Special Management in Costa Rica, modified by Resolution 36/11, available **here**
[18] More information on Regulation No. 38272-S, available **here**
[19] More information on Decree 373/003 (Regulation of the handling and disposal of lead batteries), available **here**

2. Impacts on health and the environment derived from unsound management of ULAB

Unlike other hazardous waste streams, ULAB have an intrinsic economic advantage due to the value of lead, which can be collected through a smelting process. This translates into the development of informal channels for collection and trade, which generally lead to inadequate management resulting in negative impacts on health and the environment. Likewise, formal collection processes require due government control and supervision to ensure that the processes are carried out by environmental health and safety standards. The main consequences for health and the environment derived from improper handling of ULAB are shown below.

1. Health impacts

The chemicals contained in ULAB, posing great risks to human health are the following:

Lead

According to the WHO, no blood lead concentration level can be considered risk-free. Even a blood level of 5 µg / dl can affect children's intelligence, causing decreased intelligence, behavioural difficulties, and learning problems. The higher the level of exposure, the greater the diversity and severity of symptoms and associated effects. The IHME has estimated that, based on 2017 data, exposure to lead was the cause of 1.06 million deaths and the loss of 24.4 million years of life adjusted according to disability due to long-term health effects. The greatest burden is found in low- and middle-income countries. In addition, IHME estimated that, in 2016, lead exposure caused 63.2 % of idiopathic cases of impaired intellectual development, as well as 10.3 %, 5.6 % and 6.2 % of the global burden of hypertensive heart disease, ischemic heart disease, and stroke, respectively (WHO, 2019).

In addition, according to the study by UNICEF and Pure Earth "*The Toxic Truth: Children's exposure to lead pollution undermines a generation of potential*", informal and poor ULAB recycling is a major factor contributing to lead poisoning in children living in low-lying areas and middle-income countries, where the number of vehicles has tripled since 2000 (UNICEF, 2020). Many informal operations take place near shops and homes, especially in large cities, increasing the risk of lead exposure in the population. Increased vehicle ownership, combined with a lack of regulation and infrastructure for battery recycling, resulted in up to 50 % of ULAB being recycled in dangerous ways.

Sulfuric acid

Sulfuric acid is highly corrosive. It can cause irritation and burns to the skin and eyes. Inhalation can cause severe damage to the lungs and the entire respiratory tract, coughing, or shortness of breath; consequently, high levels of exposure can cause fluid to build up in the lungs.

The most important risks and effects of these substances are[20]:

Inhalation:

- *Sulfuric Acid:* breathing sulfuric acid fumes or mist can cause respiratory tract irritation.
- *Lead compounds:* inhalation of dust or fumes can irritate the respiratory tract and lungs.

Ingestion:

- *Sulfuric Acid:* it can cause severe irritation to the mouth, throat, esophagus, and stomach.
- *Lead compounds:* ingestion can cause severe abdominal pain, nausea, vomiting, diarrhoea, and cramps. Acute ingestion can quickly lead to systemic toxicity.

Skin contact:

- *Sulfuric Acid:* it causes burns, ulcers, and severe irritation.
- *Lead compounds:* they are not absorbed through the skin.

Eye contact:

- *Sulfuric Acid:* it causes severe irritation, burns, corneal damage, and blindness.
- *Lead compounds:* they can irritate.

Acute overexposure (once):

- *Sulfuric Acid:* severe skin irritation, damage to the corneas that can cause blindness, and irritation to the upper respiratory tract.
- *Lead compounds:* toxicity symptoms including headache, fatigue, abdominal pain, loss of appetite, muscle pain and weakness, changes in sleep patterns, and irritability.

Chronic overexposure (long-term):

- *Sulfuric Acid:* possible erosion of tooth enamel, inflammation of the nose, throat, and bronchial tubes.
- *Lead compounds:* anemia; neuropathy, particularly of the motor nerves; kidney damage and reproductive changes in men and women.

[20] Information gathered from the Technical guideline on the management of ULAB in Chile. More information available **here**

Carcinogenicity:

- *Sulfuric Acid:* occupational exposure to strong inorganic acid fumes containing sulfuric acid is classified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans (Group 1). This rating does not apply to battery electrolytes, however, recharging with excessively high currents for extended periods of batteries without the vent caps in place can create a harsh inorganic acid mist atmosphere containing sulfuric acid.

Fire and explosion:

- The release of hydrogen, even with the battery in a state of rest, is inherent in the chemical reaction that takes place in it; therefore, the emanation of this flammable gas is inevitable. The emanation of hydrogen and the proximity of a source of ignition (lit cigarette, flame, or spark) can cause a battery to explode with the violent projection of fragments from the case and the corrosive liquid electrolyte. Sparks can be produced internally within the battery by short circuits caused by a poor state of it, either by the release of active matter, by the accumulation of some impurities, by communication between the supports, or by deformations of these, as well as also due to breakdown in a separator; circumstances that may be due to manufacturing defects, incomplete maintenance, or treatment of the battery. External sparks occur from handling tools during assembly or disassembly, connecting emergency cable clips, static electricity, loose clamps, insufficient charge, overcharging, and leaving metal objects on top of the battery.

Reactivity:

- *Sulfuric Acid:* contact of the electrolyte with fuels and organic materials can cause fire and explosion. It also reacts violently with strong reducing agents, metals, sulfur trioxide gas, strong oxidants, and water. Contact with metals can produce toxic sulfur dioxide fumes and can release flammable hydrogen gas.
- *Lead compounds:* contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, and reducing agents should be avoided.

2. Environmental impact

Lead is a toxic metal naturally present in the earth's crust. Its widespread use has caused significant environmental pollution in many parts of the world. Among the main sources of environmental pollution, it is worth highlighting mining exploitation, metallurgy, the persistent use of lead in paints and gasoline, and, mainly, **ULAB manufacturing and recycling activities**. Likewise, this metal is also used in many other products such as pigments, spices, welding material, stained glass, glass tableware, ammunition, ceramic enamels, jewellery, toys, cosmetics, and medicines.

As provided in the **Training Manual for the Preparation of National Used Lead-Acid Batteries Environmentally Sound Management Plans in the context of the implementation of the Basel Convention**, although formal ULAB recycling facilities may need technical and operational improvements, contamination from recycling or collection of ULAB is mainly due to inappropriate practices in the informal sector, among which the following stand out:

- ✓ There are little or no facilities for the neutralization and safe disposal of battery electrolyte. Hence, acidic effluent will percolate into the water table, rivers and sanitary system;
- ✓ Occupational hygiene is poor and few operators wear little more than a wet towel to protect themselves from the lead fumes and dust;
- ✓ There are few furnace exhaust control systems to prevent atmospheric pollution;
- ✓ Furnace residues have a high lead content, are leachable and are dumped indiscriminately either around the premises of the unlicensed smelter or are sent to dumpsites or landfills;
- ✓ Many of the informal operations are located close to shops and homes, in particular in large cities, increasing the risk of non-point population lead exposure.

The improper ULAB handling can disperse or transport the lead contained in the battery to the different compartments of the environment, hence the need for a formal management system that includes all the steps from when the battery becomes waste to the casting process.

3. Need for sound management of ULAB

To ensure sound management of ULAB, a central objective of the Basel Convention is EPR, whose goal is to protect the environment and human health by minimizing the production of hazardous waste whenever possible.

Within this framework, the Basel Convention published two highly relevant documents which will be discussed below and whose reading is recommended:

- ✓ Technical Guidelines for the Environmentally Sound Management of Waste Lead-Acid Batteries.
- ✓ Training Manual for the Preparation of National Used Lead-Acid Batteries Environmentally Sound Management Plans in the context of the implementation of the Basel Convention.

1. Technical Guidelines for the Environmentally Sound Management of Waste Lead-Acid Batteries

In the **Technical Guidelines for the Environmentally Sound Management of Waste Lead-Acid Batteries**, the aspects to be taken into account in the phases before recycling (collection, transport, and storage), and during recycling (which includes the fragmentation of the battery and lead reduction and refining) are established. These stages are going to be considered when developing **Chapter V**I on lessons learned and recommendations identified for the region. The main aspects contained in the Guidelines are summarized below:

A. Steps before recycling ULAB

Collection

According to the Basel Guidelines, the only way to successfully run a ULAB recycling program is to install an appropriate and efficient collection infrastructure. Experience has shown that, as a general trend, the most spontaneous process of ULAB collection occurs through the **dual system of distribution and collection** when manufacturers, retailers, wholesalers, service stations, or other retailing points provide new batteries to users and retain the used ones to be forwarded to recycling plants. This process has its viability based on the economic value associated with the lead content in the used lead-acid batteries. Regarding this stage, the guidelines recommend:

- ✓ ULAB should not be drained at collection points.
- ✓ Batteries must be stored in proper places at collection points.

- ✓ Collection points must not store large amounts of ULAB.
- ✓ Collectors must not sell their ULAB to unlicensed lead smelters.

Packaging for transport

The good condition of each battery must be visually checked, verifying that there are no damages, such as perforations in their boxes or covers. Likewise, it must be ensured that ULAB are properly packaged before being sent to a recycling plant as a basic measure to protect the health and safety of workers and the environment. Before packing ULAB, it should be verified that all vent caps are closed to prevent further spillage. When possible, missing plugs should be replaced.

Leaking batteries should be stored individually in acid-resistant plastic containers (e.g., plastic buckets with lids).

ULAB with liquid electrolyte that do not leak:

- ✓ Should be stacked in a vertical position on pallets up to, in general, no more than 3 units high, to prevent the pile from becoming unstable and the weight breaking the lower batteries, always placing batteries of the same size in the different layers.
- ✓ A thick sheet of corrugated cardboard should be placed between each layer of batteries to reduce their movement, absorb any electrolyte that may leak, and prevent battery terminals from piercing the casing of batteries stacked on top of them.
- ✓ To minimize movements during transit, the entire package must be wrapped with stretch film and strapped.

Transport

The vehicles used to transport ULAB must comply with the regulations applicable to the transport of hazardous waste applicable in each country.

According to the Basel Guidelines, the main problem in the transport of ULAB is the electrolyte that can spill from used batteries, which requires control measures to minimize possible spills and determine how to proceed in the event of an accident.

- ✓ ULAB must be transported in containers that must be well packed to the transport vehicle.
- ✓ The transport vehicle must be identified with the appropriate symbols to indicate that it is transporting corrosive and dangerous products. If ULAB are being transported outside the country, it will be necessary to comply with the requirements established in the Basel Convention. In addition, the requirements established for air and maritime transport in the Dangerous Goods Regula-

tions of the International Air Transport Association (IATA) and the International Maritime Dangerous Goods Code (International Maritime Dangerous Goods Code, IMDG) may apply.

- ✓ Transportation personnel and helpers must have the minimum equipment necessary to deal with any accident or spill problem. Additionally, they should receive proper training in emergency procedures, including fires, spills, and skin burns; and know how to contact emergency teams and competent authorities.

- ✓ People in charge of transport must use personal protection elements (PPE) such as goggles, gloves and neoprene boots, and must know how to use them in the event of an accident.

- ✓ Hazardous waste transport should always choose routes that minimize the risk of possible accidents or other specific problems. This is made possible if they follow a certain predefined path and restrict themselves to a known schedule.

Storing

According to the Basel Guidelines, after being transported, the batteries should now arrive at the recycling plant. Although some protection measures are very similar to the storage requirements at the collection points, the striking difference between them is that the number of batteries that is stored at these facilities could easily reach several thousands of tons. Therefore, a different approach should be adopted here:

- ✓ Batteries should be drained and prepared for recycling.

- ✓ ULAB should be identified and segregated.

- ✓ Batteries must be stored in a proper building or covered place, with the following characteristics:

    - Acid-resistant and waterproof floors;
    - An efficient water collection system that directs spilled solutions toward the effluent or acid electrolyte treatment plant;
    - Only one entrance and one exit, which should stay closed unless otherwise necessary, to avoid dust release;
    - A special gas collection system, which filters the air to remove lead dusts and, at the same time, renews the air inside the hangar to avoid the concentration of toxic gases;
    - Appropriate firefighting equipment;
    - Only authorized personnel should be allowed to enter the storage area.

It is noted that the considerations described above, mentioned in the Basel Guidelines, are general considerations that must be adapted to the specific requirements of each recycling plant.

B. Recycling of ULAB

The main steps of the ULAB recycling process are described below, as indicated in the **Technical Guidelines for the Environmentally Sound Management of Waste Lead-Acid Batteries**:

1. **Battery breaking or breakage.** The batteries are fragmented in the mill crusher and separated into three main components —lead, plastic, and acid— by sieving and separation by gravity. Each of the components enters a separate processing chain. After initial processing, collected lead and other leaded wastes are stored in a specially designed containment structure to prevent spillage. This structure must have double floor coverage and a leak detection system.

2. **Lead reduction.** Battery scrap obtained from the separation process is a mixture of several substances: metallic lead, lead oxide (PbO), lead sulfate (PbSO4) and other metals such as calcium (Ca), copper (Cu), antimony (Sb), arsenic (As), tin (Sn) and sometimes silver (Ag). In order to isolate the metallic lead from this mixture, two methods may be applied: pyrometallurgical processes, also known as fusion-reduction methods, and hydrometallurgical processes, or electrolytic methods. It is also possible to combine the two and use a hybrid process.

3. **Lead refining**. If a smelting plant stops at the stage of the fusion-reduction plant, it will produce what is known as hard or antimonial lead. If the plant is meant to produce soft lead, the crude lead bullion must undergo a refining process. The objective of the refining process is to remove almost all copper (Cu), antimony (Sb), arsenic (As), and tin (Sn), since the soft lead standard does not allow more than 10 g per ton of these metals. There are two methods of refining lead: hydrometallurgical methods and pyrometallurgical or thermal processes. Once melted in blast furnaces, the collected lead is mixed with other materials to produce lead alloys. The refined lead is cast into molds and cooled off. Bullion molds come in three sizes: large blocks, rectangular bars, or loaves and rods.

4. **Purification**. The wastewater treatment and purification system neutralize and purifies sulfuric acid to a neutral pH liquid, which can be discharged into the sewer system in accordance with local laws and regulations. In some cases, the acid can be purified and reused, usually as an electrolyte for use in new batteries.

2. Training Manual for the Preparation of National Used Lead-Acid Batteries Environmentally Sound Management Plans

This document constitutes an operational tool to assist in the implementation of the aforementioned Guidelines, providing elements for the preparation and implementation of national ULAB ESM plans.

In this sense, the Manual proposes the following instances:

- ✔ Assessment of the management of ULAB at the national level.
- ✔ Set up of an environmentally sound collection, storage, transportation and shipping scheme at the national level.
- ✔ Control strategies and policies for the recycling of ULAB in the formal and informal sectors. The latter must contain a view to enhance their environmental performance and improve health standards.
- ✔ Communication and information systems.
- ✔ Strategies for remediation of lead contaminated soils.
- ✔ Occupational health and safety procedures.
- ✔ Transboundary movements of ULAB.

4. Extended Producer Responsibility for ULAB

International experience has shown that to ensure sound management of ULAB, EPR schemes can be great allies. This chapter provides a theoretical introduction to the subject and analyzes the different EPR schemes at both regional and global level used for the management of ULAB.

1. Introduction to EPR systems and their application in the region

The EPR principle is based on producers (or importers) being responsible for the impacts that their products generate on health and the environment throughout their life-cycle; from their design until the product becomes waste. The EPR was defined by the Organization for Economic Cooperation and Development (OECD) as: *"An environmental policy in which the responsibility of the producer for his product is extended until the moment of post-consumption*". In this sense, EPR policies seek to shift the burden of waste management from governments and taxpayers to producers, in line with the "*polluter pays principle*"[21]. EPR first appeared in the early 1990s in Europe, applied primarily in packaging waste policies, and has spread to other countries and other waste streams since then, including ULAB.

It is clarified that for the purposes of this report, the EPR principle will be addressed in its broadest sense, understanding the producer as the responsible person for placing the product on the market as well as its manufacturer or importer.

Historically, EPR systems have helped to increase recycling and collection rates, as well as to generate resources to finance these activities. To design an EPR system for ULAB, it is necessary to take into account the various instruments that can be used. According to *the "Draft Practical Manuals on EPR and financing systems for ESM"*[22], there are four broad categories of EPR instruments, which can be used independently or in combination:

Instrument 1: Product take-back requirements

The take-back policies are aimed at collecting the product at the post-consumption stage. This objective can be achieved through setting recycling or collection targets for the product or material, and through incentives for consumers to return the used product to the point of sale. Responsibility can be assigned to

[21] The United Nations Conference on Environment and Development of 1882 ('Earth Summit', Rio de Janeiro, Brazil) adopted principle 16, that states: *"National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment"*.

[22] More information on the Draft document made by the Basel Convention (2018), available **here**

producers, to take care of the management of their products once they have become waste; to retailers, to receive post-consumer products; or to governments, to charge a fee and manage the entire system.

Instrument 2: Economic and market-based instruments

These instruments provide a financial incentive to implement the EPR policy, among which it is possible to identify, for example:

- ✔ Deposit-refund: an initial payment (deposit) is made at the time of purchase and is fully or partially refunded when the product is returned to a specific location.

- ✔ Advance disposal fee (ADF): fees charged on certain products at the time of purchase based on estimated collection and treatment costs. The fees can be collected by public or private entities and be used to finance post-consumer treatment of designated products. Unused fees can be returned to consumers.

Instrument 3: Regulations and performance standards

- ✔ These measures, such as the minimum recycled content, can be mandatory or applied by the industries themselves through voluntary programs. When used in conjunction with a tax, such standards can strengthen incentives for product redesign or the market for recycled materials.

Instrument 4: Information-based instruments

- ✔ These policies are intended to indirectly support EPR programs through public awareness. Such measures imply that the producers report on aspects related to the contained materials of the products, the producer's responsibility for waste management, separation of waste by the consumer, among others.

After this general summary of the 4 typical EPR systems, it is necessary to take into account that the implementation of a sustainable management policy must be adapted according to the reality of each country. Likewise, it is important to note that the different types of EPR instruments can be used in combination and that there is no one-size-fits-all solution.

Regarding the management of the systems, on one hand there is the system of collective responsibility of the producers (Producer Responsibility Organization [PRO]), where the financing of the system is achieved through a direct payment of the producers to a managing entity, in the proportion that corresponds to their participation in the market. On the other hand, there are the Individual Producer Responsibility (IPR) systems, where each producer looks after the management of his own products.

The strategy of one country, region and industry will be different from that of another. Governments must not only identify the best alternatives to manage their waste, but also choose the most appropriate EPR system based on their needs and their social, economic, legal and cultural contexts.

In Latin America and the Caribbean, there has not been a similar approach regarding the inclusion of EPR systems into legislation. Indeed, some examples of different systems in countries of the region are described below:

- **Argentina** included EPR schemes with regard to the management of empty phytosanitary containers, requiring a differentiated and conditioned management due to the toxicity of the product they contained[23].

- In **Brazil** after 21 years of deliberations in the National Congress, Law No. 12,305 was enacted in 2010, establishing the national solid waste policy, through which the **shared responsibility system** is instituted. Producers, sellers, consumers, and discharge agents of selected products are required by law to properly collect and treat waste products. In February 2020, Decree No. 10,240 was approved, which establishes rules for the implementation of **a mandatory reverse logistics system** for Waste Electrical and Electronic Equipment (WEEE). Regarding ULAB in particular, the EPR scheme uses a PRO model that is governed by a sectoral agreement signed in August 2019 and is implemented through IBER[24].

- In **Chile**, the figure of the EPR was officially recognized through the Law for Waste Management, Extended Producer Responsibility and Promotion of Recycling. The standard establishes the EPR for priority streams, such as lubricating oils, electrical and electronic devices, containers and packaging, tires, and batteries[25]. This Law was promulgated and entered into force in 2016; however, the proposed model has been used as a global reference before being legally recognized, since in practice it has been exercised before its legitimization (German Agency for International Cooperation [GIZ], 2018).

- **Colombia** addressed various strategies aimed at promoting the sound management of waste through the application of the EPR principle in its internal regulations for certain types of waste, such as pesticide containers, expired drugs, batteries —including ULAB—, used tires, light bulbs, computers, peripherals, containers and packaging. Likewise, there are voluntary programs from the private sector with the support of public entities for refrigerators, air conditioners, microwave ovens, disused cell phones and used oils for household use (Ministry of Environment of Colombia, 2017). Regarding ULAB, they have a specific standard that regulates post-consumer product return management plans[26].

- **Costa Rica** published the Regulation for the Declaration of Waste with Special Management Requirements No. 38272-S[27], by which it is established that the producer or importer of goods,

[23] Law No. 27,279 on minimum environmental protection budgets for the management of empty phytosanitary containers. Available **here**
[24] More information on the *Instituto Brasilero de Energía Reciclable* (IBER), available **here**
[25] More information on Law No. 20.920 (Waste Management Framework, Extended Producer Responsibility and Promotion of Recycling), available **here**
[26] More information on Resolution 372 of 2009, modified by Resolution 361 of 2011, available **here**
[27] More information on Regulation for the Declaration of Special Handling Waste No. 38272-S, available **here**

whose final waste is included in Annex I[28], together with the value chain, must offer options to ensure the collection of such waste and thus reduce the amount that reaches final disposal sites.

- ✓ **Mexico** followed the **shared responsibility** model, defined as the principle by which it is recognized that urban solid waste and waste with special management requirements are generated by activities that satisfy the needs of the society. This concept implies sound management as a joint social responsibility, with the participation of producers, distributors, consumers, users of by-products, among others, under a scheme of market feasibility and environmental, technological, economic, and social efficiency (Robayo, 2020).

- ✓ In **Honduras**, EPR is implemented through a one-to -one private initiative (the used battery is delivered when the new one is purchased).

- ✓ In **Uruguay**, the EPR is applied by making compulsory for producers and importers to submit a Master Plan on management of ULAB.

2. International analysis of EPR systems applied to ULAB

As mentioned above, the nature of the components of ULAB means that they are considered hazardous waste and must therefore be treated with special care during handling, storage, and transport. At the international level, different legal and management systems were adopted to ensure proper management. Some examples are described below.

European Union

Since 2006, the European Union has the Directive No. 2006/66/CE[29], on batteries and accumulators and the environmental management of their waste. This regulation incorporates the principles of "*polluter pays*" and "*Extended Producer Responsibility*", so that producers putting these products on the market for the first time, being their manufacturers, importers, or intra-community acquirers, are obliged to become responsible of its collection and management. The regulations apply to all types of batteries and accumulators, regardless of their shape, volume, weight, material composition, or use. It also includes batteries and accumulators from end-of-life vehicles and electrical and electronic equipment. The only exceptions are batteries and accumulators used in equipment designed for military purposes or intended to be sent into space, which are excluded from this regulation.

The Directive establishes that producers must be registered and finance the costs of collecting, treating and recycling ULAB, as well as any net costs arising from public information campaigns of these arrangements. It should be noted that small producers may be exempted from this obligation.

[28] **Annex 1** of the Regulation for the Declaration of Waste with Special Management Requirements No. 38272-S of Costa Rica: 1. Waste Tires, 2. Lead acid batteries, 3. Watch batteries, batteries: carbon-manganese, carbon-zinc, lithium- cadmium, lithium and zinc, 4. Air conditioners, refrigerators, cold transport and industrial refrigeration equipment, 5. Used lubricating oil, 6. Plastic containers to contain lubricating oils, 7. Metal, plastic and glass containers to contain agrochemicals (after of the triple wash), 8. Electrical devices (white line), 9. Electronic devices (regulated by Executive Decree No. 35933-S of February 12, 2010 "Regulation for the Integral Management of Electronic Waste"), 10. Fluorescent and compact light bulbs, 11. Refrigerants, 12. Mattresses, 13. Polystyrene (stereo) 14. Scrap metal.

[29] More information on Directive 2006/66/ec of the European Parliament and the European Council (2006) on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC, available **here**

Likewise, ULAB collection rates were established of at least 25 % for 2012 and 45 % for 2016, and recycling targets of 65 %, defined in terms of average weight. The Directive requires providing information on batteries about their feasibility of reuse and safe disposal, and for Member States to take measures to ensure that manufacturers design products so that they can be removed quickly and safely.

Three alternatives for the system to be implemented in the Member States were established:

- ✔ The industry is responsible for the collection, sorting, recycling, awareness program, and achievement of mandatory collection targets.
- ✔ Municipalities and industry share collection responsibilities, but the industry is responsible for meeting collection targets.
- ✔ Retailers and municipalities share responsibility for charging consumers.

Regarding the role of consumers, it is established that final users may dispose of ULAB at designated collection points for this purpose free of charge.

In the EU, each Member State has to transpose the Directives into national legislation. Such is the case in the Netherlands, where a decree for the disposal of batteries is enacted since 1995, which resulted in producers and importers establishing the non-profit organization "*Stibat*" to comply with their legal obligations. As of 2006, national legislation was adapted to the Directive and a minimum collection percentage of 45 % per year was established, which remains in force until the present day. Producers are responsible for establishing a national collection network, collecting ULAB that they place on the market, recycling batteries with the most advanced and environmentally friendly processing techniques available, and educating end users on the importance of separate battery collection. The collection fees (transportation, storage, classification, removal and recycling) and education to end users are paid to "*Stibat*" by the producers or importers. Likewise, the norm requires that batteries be designed with the fewest adverse effects on the environment and human health, containing the least number of dangerous substances and employing the least dangerous ones.

Finally, it should be noted that in October 2017, the "*European Battery Alliance*" [30] was launched. This alliance aims to ensure that all Europeans benefit from safer traffic, cleaner vehicles and more sustainable technology solutions by creating a competitive and sustainable battery manufacturing value chain.

United States of America

In 1996, Law No. 104-142 of the United States Environmental Protection Agency (US EPA) of May 13, established the guidelines to eliminate the use of mercury in batteries and facilitate an efficient recycling or proper disposal of rechargeable batteries, such as those of nickel-cadmium, lead-acid and regulated ones (National Institute of Industrial Technology [INTI, in Spanish], 2016). A recent study (2009-2013), commis-

[30] More information on the European Battery Alliance, available **here**

sioned by the Battery Council International, concluded that the recycling rate for ULAB in the United States is estimated to be 99 % (Commission for Environmental Cooperation [CEC], 2016).

ULAB are subject to mandatory deposit systems in several states and voluntary deposit systems in many others. The lead used in batteries has a positive economic value for battery manufacturers. The number of the deposits varies between US $ 5 and US $ 10 per battery. The customer gets back his deposit by returning the used battery and the deposit receipt to the same seller, within a period of between 7 and 30 days after the purchase of a new one (Basel Convention Secretariat, 2004).

An alternative to the scheme described above is the purchase discount system, which operates similarly to deposit-refund schemes, but requires the user to pay only the sale price the first time they purchase a battery. However, when the battery reaches the end of its useful life and is returned to the seller, the consumer receives a discount on the cost of a new battery, while the seller retains the ULAB and recycles it (Basel Convention Secretariat, 2004).

Japan

Within the framework of the Law for the Promotion of the Effective Use of Resources, by ministerial ordinance, promulgated in June 2000, two types of products are stipulated as "*recycled products of specified resources*", for which producers are obliged to promote the collection and recycling:

- ✔ Compact rechargeable batteries (sealed LAB, sealed nickel cadmium, sealed nickel metal hydride, and lithium).

- ✔ Personal computers (including cathode ray tubes and liquid crystal displays).

This Law stipulated recycling targets of 50 %, in the case of sealed ULAB. As a result, the recycling plan established by legislation for these designated products is based on the concept of EPR.

In this context, the Ministerial Ordinance of March 2001 established the collection and recycling criteria to be utilized by manufacturers of sealed batteries and manufacturers of items that contain them. This Ordinance stipulates those manufacturers of sealed batteries (a concept that also includes importers of batteries) and manufacturers of products that require batteries must "*carry out the collection of waste batteries by designating collection points, installing collection boxes or the adoption of other measures necessary for collection*". The ordinance requires manufacturers of products that use batteries to deliver the waste they collected to their manufacturers along with sealed battery manufacturers to recycle collected waste.

The legislation designates compact rechargeable batteries as "*specified labelling products*". That is to say that their manufacturers must label them according to their type to aid in the classification process. On the other hand, products that use compact rechargeable batteries are designated as "*products promoted by specified reuse*". This means that manufacturers must build them in such a way that they are easily removed from the equipment in which they are installed.

Batteries producers and manufacturers of devices that employ them are required to disclose information on their collection and recycling on a fiscal year-by-year basis.

Retailers are not required to collect and recycle batteries but are expected to cooperate with manufacturers in their collection.

PROs were established, as is the case with the Japan Portable Rechargeable Battery Recycling Center (JBRC), an organization that brings together manufacturers of rechargeable batteries and products that use batteries in order to jointly carry out recycling activities. In 2013, the JBRC had 306 member manufacturers who paid annual membership fees in proportion to the number of batteries produced and sold.

5. Management of ULAB in studied countries

The following table illustrates the different scenarios that occur in the studied countries of the region regarding the management of ULAB and whose information was obtained as a result of the interviews held.

	Specific Regulations on ULAB	National LAB Production	LAB importation	Treatment in-country	EPR for ULAB	ULAB exportations	Importation of ULAB status	Specific fee collection	Main challenges
Brazil	☑ Law No. 12,305, regulates the national solid waste policy, defines shared responsibility, and establishes the obligation to set up the reverse logistics system for certain products, including batteries[31]. There is a complementary decree.	☑ There are 55 national manufacturers. Annually, they produce 300 thousand T of batteries.	☑ Most come from China. IBER is currently working on an agreement with IBAMA to obtain specific data regarding imports.	☑ 83 % of the batteries that are generated are collected.	☑ In 2019, a sectoral agreement was signed through which this system is implemented for ULAB, with IBER[32] being the managing body that brings together more than 200 companies (manufacturers, importers, recyclers, distributors, and merchants).	☑ Most of the treatment companies have subsidiaries abroad.	☒ Importation is restricted by Law No. 12,305.	☒ Although they do not charge a specific fee, IBER charges an association fee[33] for the certification process.	- Ensure that retailers participate in the system. - Strengthen the inspection.
Chile	☑ Art. 10 of Law No. 20,920[34] includes batteries as a priority product (Regulatory Decree on batteries pending).	☒	☑ 2.34 and 2.21 million units for the years 2018 and 2019, respectively[35] **Tariff Items[36]:** 8507.1010 8507.1090 8507.2000.	☑ There is a single recycling company (RAM-Recimat) that collects around 95 % of the batteries[37]	☑ Included as a priority product in Law No. 20,920 (in the process of being regulated).	☒ Prohibited by Regulation of the Ministry of Health S2 2010.	☑ To date, no applications have been received.	☒ Funding is expected to be through management plans.	Preparation of the new regulation on EPR for ULAB.

[31] More information on Law No. 12,305 (National Solid Waste Policy), available **here**
[32] More information on the *Instituto Brasilero de Energía Reciclable* (IBER), available **here**
[33] The association fee has a value of between USD 25 and 30 paid by producers, importers, traders (currently retailers are exempt from payment to stimulate their participation in the system).
[34] More information on Law No. 20.920 (Waste Management Framework, Extended Producer Responsibility and Promotion of Recycling), available **here**
[35] *"Updating of base information and specific environmental impacts of the priority product batteries, contained in Law No. 20,920"*, Dictuc S.A. (Study requested by the Undersecretariat of the Environment), 17 February 2021. Available **here**
[36] *"Diagnosis of Import and Distribution of Batteries and handling of used lead acid batteries"*, National Commission for the Environment and German Technical Cooperation (GTZ), November 2019. Available **here**
[37] More information on Recimat, available **here**

	Specific Regulations on ULAB	National LAB Production	LAB importation	Treatment in-country	EPR for ULAB	ULAB exportations	Importation of ULAB status	Specific fee collection	Main challenges
Colombia	☑ Resolution No. 372 of 2009[38] establishes the elements that must be included by manufacturers or importers of LAB for the vehicle fleet in the Management Plans for the Return of Post-consumer.	☑	☑ Imports represent 20 % of the market **Tariff Item:** 8507.10.00.00.	☑ There are three recycling companies, one of which is a leader located in Jumbo.	☑ Obligation of producers and importers to present a Management Plan (from 300 units per year).	☒	☒ Law No. 1,252/2008[39] prohibits the introduction, importation or trafficking of hazardous waste in its article 4.	☒	- Improve the quality of data regarding the informal sector - Promote the growth of EPR systems.
Costa Rica	☑ The Law for Comprehensive Waste Management No. 8,839[40], establishes the EPR for Special Handling Waste (RME). Regulation for the Declaration of Waste with Special Management Requirements No. 38272-S of Costa Rica[41].	☒	☑ In 2019, 9,445 T of new LAB were imported.	☑ There is only one company[42]. In 2019, 14,133 T. were collected. The collection rate is 94 %.	☑ Obligation of producers and importers to present management plans called Compliance Units (not implemented).	☒	☑ In 2019, 5,253 T of ULAB were imported.	☒ There is a fee to access the registry of US $ 50 that lasts 5 years.	- Make mandatory the EPR system for ULAB in articulation with Customs - Improve the quality of data from the informal sector.

[38] More information on Resolution 372 of 2009, modified by Resolution 361 of 2011, available **here**
[39] More information on Law 1252 of 2008, by which prohibitive norms are dictated in environmental matters, referring to residues and hazardous waste and other provisions are dictated, available **here**
[40] More information on Law No. 8839 (Comprehensive Waste Management), available **here**
[41] More information on the Regulation for the Declaration of Special Management of Waste in Costa Rica, available **here**
[42] More information on PBMETALS, available **here**

	Specific Regulations on ULAB	National LAB Production	LAB importation	Treatment in-country	EPR for ULAB	ULAB exportations	Importation of ULAB status	Specific fee collection	Main challenges
Honduras	☒ Regulations in process of elaboration.	☒	☑	☑ There is only one recycling company[43]	☑ 1-to-1 private initiative (the used battery is delivered when you buy the new one)[44].	☑ Main destinations: Guatemala, Mexico, South Korea.	☑ In 2010, the highest percentage of ULAB came from Mexico, the USA and Colombia. Currently, the regulations are under review.	☒	- Improve the quality of data regarding the informal sector - Take advantage of the installed capacity of the recycling company.
Dominican Republic	☑ Resolution No. 008-2015 approves the technical environmental regulation for the management of ULAB[45].	☑	☑	☑ There is only one recycling company[46].	☒ It was incorporated into the Draft Chemical Substances Regulations (not yet approved). Currently: Cometa (the only importer with a REP system).	☒ It is prohibited through a Constitutional Court Resolution.	☒ Constitutional[47] and legal[48] prohibition.	☒	- Ensure compliance with environmental criteria.

[43] More information on Molden, available **here**
[44] Cometa Group Company, importer that sends used batteries to the United States (Everofocus Techonlogy)
[45] More information on Resolution No. 008-2015, which approves the technical environmental regulation for the management of ULAB, available **here**
[46] Ecoverde industrial recycling company
[47] More information on the Constitution of the Dominican Republic, available **here**
[48] More information on Law No. 218, which prohibits the introduction into the country, by any means, of human or animal excrement, household or municipal garbage and its derivatives, sewage sludge, treated or not, as well as toxic waste from industrial processes, available **here**

	Specific Regulations on ULAB	National LAB Production	LAB importation	Treatment in-country	EPR for ULAB	ULAB exportations	Importation of ULAB status	Specific fee collection	Main challenges
Uruguay	☑ Decree No. 373/003[49] regulates the handling and disposal of used or discarded LAB. Due to the appearance on the market of batteries other than ULAB for electric mobility. The regulations are in the process of being modified.	☒ Currently there are two companies that carry out assembly. The last company that manufactured LAB closed in 2013.	☑ Between 5,000 and 5,500 T LAB / year. There are around 30 importing companies. **Tariff Items:** 8507.1010.00 8507.10.90.10 8507.10.90.90 8507.20.10.00 8507.20.90.00.	☒	☑ Obligation of producers and importers to present a Master Management Plan.	☑ Currently the main destination is Israel[50] .	☒ **Tariff Item:** 8548101000	☒ Financing is done through the Master Plans.	- Approve the new regulation on ULAB - Improve collection levels, including at the points of sale in the reception of ULAB.

[49] More information on Decree 373/003 (Regulation of the handling and disposal of ULAB), available **here**
[50] More information on Hakurnas Lead Works Ltd, available **here**

According to the analysis carried out, the approach used by the different countries to legislate on ULAB is different. Some included it in their waste regulations, establishing ULAB as a priority stream, while others opted for a specific and independent standard.

In regard to the origin of new batteries, some of the countries have national manufacture and assembly while others import them.

With regard to treatment, various scenarios are also presented. In particular, those countries that possess treatment technologies face the challenge of ensuring good environmental performance with limitations in the capacity of inspection and control, something that was identified as a common concern in all the countries studied. Conversely, those countries that do not have installed capacity export ULAB under the Basel Convention provisions, to different destinations, among others: South Korea, Guatemala, Israel and Mexico.

The countries analysed that have implemented EPR schemes for ULAB share common characteristics, which mainly consist of the **presentation of management plans by producers / importers**. Under these schemes, the financing of the system is in charge of the private companies while the enforcement authority acts as the controlling body. Likewise, the modality of Brazil stands out, which has the signing of a specific Sectorial Agreement for ULAB in which the Government, the private sector and a non-governmental non-profit organization participates as the managing body. A positive aspect to highlight is that some countries that have not yet implemented EPR systems for ULAB have experiences in other waste streams, such as WEEE or tires.

As far as the import and export of batteries are concerned, different scenarios are outlined in light of the adopted policies:

- ✓ Countries with treatment companies that prohibit the entry of hazardous waste.
- ✓ Countries with treatment companies that admit ULAB imports.
- ✓ Countries without installed capacity for treatment in the country that export under the Basel Convention provisions at the lowest cost.

Finally, it is emphasized that given the intrinsic value that this waste stream has, there is great interest on behalf of the informal sector in participating in the collection of ULAB, with the risks associated for health and the environment. Although EPR systems have absorbed informality in some cases, challenges remain in this regard, mainly in terms of generating concrete data and formalization and inclusion programs.

In **Annex II** of this document, summary sheets of each of the studied countries were included, which reflect the data obtained as a result of the interviews held and an exhaustive analysis of the legal instruments identified, instruments accessible through official websites, and published literature on the matter.

6. Lessons learned and recommendations for the region

Based on the information gathered, the consultation process carried out and an exhaustive analysis of the available literature, the following lessons learned and recommendations were identified for study and reflection by the countries of the region, in order to promote a sound management of ULAB.

1. Evaluation and Diagnosis

The first step to establish a sound management of ULAB is to have a comprehensive diagnosis of the national situation. The Latin American and Caribbean region faces great challenges in terms of generating concise data, mainly in relation to cost analysis and the involvement of the informal sector. In this sense, the **Training Manual for the Preparation of National Used Lead-Acid Batteries Environmentally Sound Management Plans**, establishes at least eight factors that will facilitate the achievement of their sound management, which are summarized below and can be consulted in the aforementioned document:

A. Inventory

This stage is to complete an inventory of the likely uses for LAB, domestically sourced and imported LAB and the sources of ULAB. It is particularly important to establish the quantities, collection mechanisms, collection rates and possible trends in LAB consumption and ULAB disposal. The inventory should also include a list of licensed secondary lead plants with a summary of smelting capacities, environmental control systems and occupational welfare provisions. Legitimate battery retailers and battery service centers should also be recorded together with summaries of their operations, noting in particular any environmental threats posed by inadequate storage of ULAB. If possible, the location and the number of unlicensed batteries reconditioners and illegal smelters or melters of ULAB should also be recorded.

B. Retailers - Sales and collection mechanisms

Surveys are required to determine both the quantities and types of batteries sold. If the retailers are collecting ULAB, then there is a need to assess how they are being stored and transported to the recycler, and whether the collection, storage and transport procedures are in compliance with the Basel Convention Technical Guidelines.

C. Recycling processes

ULAB collecting operations produce effluents, dust, discharges and residues. As the components of ULAB are toxic, it is essential that the surveys mentioned in section 1.1.2 aim to determine the extent of recycling, the processes involved and the environmental, safety and health precautions used to minimize any potential adverse impacts, as well as who are responsible for managing the processes and

procedures. These questionnaires should be sent to ULAB recyclers, reconditioners and any company involved in ULAB collection.

D. Health and safety

In addition to the information gathered about environmental management, it is also crucial to confirm the measures conducted and the procedures in place to safeguard the health of those working in the industry and people living close to ULAB collecting operations. This questionnaire should include questions about the workforce, its age, gender and length of service; process ventilation systems; personal safety equipment, that is, what is issued and what is used; washing and eating facilities and whether there is a medical surveillance program.

E. Public education and awareness

ULAB collection schemes will only be effective if the public is aware of them and the benefits of recycling together with an appreciation of the dangers of allowing ULAB to be dumped in the environment or recycled by unlicensed operators working in the informal sector. Public education and awareness can be carried out in different ways, but the key is to reach the target population groups; especially those likely to be at risk if the ESM of ULAB is not achieved, and that these groups understand the health and environmental threats.

F. Policy development - Regulations / instruments

All lead smelting operations must be licensed by the government in one way or another. This means that there will be regulations about the way the plant can operate and there will be government departments with responsibilities for monitoring the environmental, health and safety performance of the plant.

G. Consolidation of informal activity

For those countries without ULAB smelting capacity, the ULAB collected should be exported for recycling to an appropriate smelter. It is vital to determine whether the ULAB from the informal sector are exported or recycled, because if they are not, they may wind up in landfills or dumpsites. The export of ULAB will be covered by the regulations for the transboundary movement of hazardous waste, and the required Prior Informed Consent (PIC) procedures used in the context of the Basel Convention. To check if there is any illegal smelting of ULAB in the informal sector or illegal disposal in dumpsites, a comparison can be made between the tons of exported ULAB recorded as exports by Customs and the estimate total weight of the ULAB generated domestically.

H. Determining whether the national ULAB collection scheme is Environmentally Sound

The purpose of this information gathering exercise will be to consolidate the life-cycle diagram showing LAB amounts, uses, health and environmental threats, sources and collection routes for ULAB. Information and data gaps will also be identified more systematically. Tracing the different paths that LAB can follow from its manufacture or entry into the country to its collection and disposal, involves intermediate steps, such as reconditioning and maintenance, from which the ULAB can be returned for use. The completion of such a chart will reveal the paths taken by ULAB in the informal sector, but will also provide the preferred pathways through the formal sector if properly completed. Obviously, the preferred option would be to recycle all ULAB through the formal sector, ensuring environmentally sound collection.

2. Establishment of an adequate scheme of management of ULAB

As developed in **Chapter III** "*Need for a sound management of ULAB*", and throughout the entire document, there are numerous variables to consider while implementing an ESM in ULAB, among which the following stand out: (i) successful ULAB collection infrastructure; (ii) adequate legal framework; (iii) establishment of an environmentally sound collection scheme; (iv) labelling; (v) adequate collection methods; (vi) ULAB storage; (vii) packaging; and (viii) transportation.

Another factor that contributes to the proper management of ULAB is the establishment of EPR schemes. At a global level, it has been shown that these instruments contribute to improving the management of certain waste streams, including ULAB (see **Chapter IV**). In general, according to the schemes surveyed in the region, modalities were chosen through which producers / importers present management plans and are responsible for the financing of the system, while, on the other hand, States intervene mainly in the control of the system. However, as developed in the next section, there are different alternatives.

2.1 Selecting the EPR scheme

To design an EPR system for ULAB, it is necessary to take into account the different instruments that can be used, mentioned in section IV.1 of the document, recalling that they are not mutually exclusive and can be used in combination. There is no one-size-fits-all solution for all countries and waste streams. Each strategy will be different from the other, depending on political priorities, and the social, economic, legal and cultural context.

In order to collaborate with the analysis for the selection of the EPR scheme, the following tables present a SWOT Analysis (Strengths, Weaknesses, Opportunities and Threats) for two of the main EPR schemes applicable to ULAB: (i) take-back systems; and (ii) economic and market-based instruments.

Table 1: SWOT Analysis of EPR take-back systems

TAKE-BACK SYSTEMS		
INTERNAL	STRENGTHS	WEAKNESSES
	✓ It is the most widely used EPR instrument (72 % worldwide). ✓ Higher collection and recycling rates are achieved. ✓ Consumers participate in the system, fostering a sustainable culture and behaviour. ✓ If there are few importers and producers, coordination between them is facilitated. ✓ Reduces waste management costs borne by governments and / or taxpayers.	✓ It requires the installation of infrastructure and / or the establishment of the necessary mechanisms to ensure adequate waste management. ✓ Requires availability of storage space in retail stores or collection points. ✓ High monitoring and surveillance costs, requiring a dedicated structure. ✓ Need to establish sanctions in case of non-compliance.
EXTERNAL	STRENGTHS	WEAKNESSES
	✓ Promotes the prioritization of waste management. ✓ Facilitates the transition to a circular economy. ✓ Allows for the inclusion and improvement of existing recycling initiatives. ✓ Generates job opportunities for stakeholders, including informal recyclers. ✓ Formalizes the workforce of recyclers in accordance with health and safety standards. ✓ Mitigates the dangers to health and the environment derived from the ULAB mismanagement.	✓ It may involve the establishment of a new infrastructure that competes with the existing one, especially the informal sector. ✓ Resistance of producers, importers and retailers to participate. ✓ The government or the private sector must assume a new role to start the management scheme. ✓ Private sector versus public sector: difficulty in establishing a clear division of tasks and roles.

Source: self-made.

Table 2: SWOT analysis of EPR systems based on economic and commercial instruments

ECONOMIC AND MARKET-BASED INSTRUMENTS		
	STRENGTHS	**WEAKNESSES**
INTERNAL	✓ Provides adequate geographic coverage both in the country and in the cities. ✓ Easily implemented. ✓ In the absence of national manufacturing, it is easier way to control those that are not reached by the system and the leaks.	✓ If there is no local production of LAB and the market is small in relation to the global market, the recommended economic and commercial instrument is the ADF. ✓ High level of resistance from producers, importers and consumers to taxes, opposition to the polluter pays principle. ✓ Experience of environmental charges collected that are not used for environmental purposes. ✓ Lack of consumer participation in management of ULAB. ✓ It does not address the problem of the informal sector. ✓ Difficulty in assessing the real costs of ULAB life-cycle management and therefore charging accordingly.
	STRENGTHS	**WEAKNESSES**
EXTERNAL	✓ Reduce waste management costs borne by governments and / or taxpayers. ✓ Collect fees at customs, not at retail, to avoid under-collection if informal sales are made.	✓ The distribution of tax collection between the national government and sub-national governments may require the participation of different authorities. ✓ Risk of being considered a technical barrier to trade.

Source: self-made.

3. Policy development - Regulations / instruments

When creating ULAB regulations, several critical elements must be considered. Taking into account the aspects indicated in the aforementioned Practical Manual on Extended Producer Responsibility and the findings of the interviews, it was decided that a legal system promoting environmentally appropriate ULAB recycling should contemplate the following:

- ✓ Establish regulatory frameworks that are clear, explicit, and easily accessible to the general public.
- ✓ Involve all stakeholders and society at large in the development of regulations, through an informed and participatory process, to ensure compliance and proper dissemination.

- ✓ Incorporate a life-cycle approach to LAB development, collection, and elimination, adhering to environmentally sound practices and procedures in compliance with applicable international conventions, guidelines, and additional international regulations.

- ✓ Adopt the EPR approach.

- ✓ Assign responsibilities to each stakeholder by clearly defining the roles of governmental organizations and the private sector, including the responsibilities of retailers and distributors.

- ✓ Establish environmental standards for releases and emissions to the environment, as well as occupational health and safety guidelines that apply to all stages of ULAB collection, storage, and transportation, as well as sampling and analytical techniques.

- ✓ Promote the progressive minimization of waste through mechanisms to extend the useful life and reuse of ULAB.

- ✓ Provide inspection and control mechanisms as indicated in the following section.

- ✓ Contemplate awareness and education policies on the matter.

- ✓ Guarantee access to justice.

4. Supervision and control strategies in both the formal and informal sectors

It is extremely crucial for countries that have already implemented EPR and those that have not yet done so to strengthen inspection and control capacities to ensure compliance with the regulations' provisions, including the prohibitions on indiscriminate dumping and disposal of ULAB in dumpsites or other unauthorized sites. In this regard, the following is recommended:

- ✓ Establish and maintain a database that includes quantities of LAB produced and imported; commercialized LAB; ULAB collected and recycled; ULAB imported and exported for recycling; informal recycling of ULAB. In this sense, the statistics of the International Lead and Zinc Study Group (ILZSG) 51 can be useful.

- ✓ Create and uphold a registry of the stakeholders involved throughout the value chain.

- ✓ Carry out inspections on a regular basis in all instances of the life-cycle, through agreements and strategic alliances between the competent government areas, at the entrance and exit of the country, during the transportation of LAB and ULAB, and at the production, treatment and collection facilities.

[51] More information on the International Lead and Zinc Study Group, available **here**

- ✔ Strengthen national capacity to improve the analysis and monitoring of the management plans presented by the producers and importers of LAB, as well as all other inspection and control activities.

- ✔ Form partnerships and agreements with the stakeholders involved to ensure the treatment companies' safety and hygiene standards are met.

- ✔ Promote compliance with the Basel Convention on transboundary movements through training for the areas involved (mainly the environment and customs sectors).

- ✔ Establish an effective sanctions regime.

5. Communication and information systems

To avoid human exposure and lead contamination caused by improper handling of ULAB, it is necessary to sensitize all stakeholders: the ULAB industry, its users, and especially, workers in the informal sector and vulnerable populations. This includes sellers, collectors, transporters and recyclers, as well as the public who stores, handles, and disposes them in an environmentally unsound manner.

According to the **Technical Guidelines for the Environmentally Sound Management of Waste Lead-Acid Batteries** developed within the Basel Convention framework, lead recycling processes are considered a possible source of environmental contamination and exposure of the population. For this reason, lead smelters often raise concerns among the communities that live near them. In this sense, information campaigns can be invaluable allies in fostering local confidence. It is important to collaborate on the following high-priority issues: a) health and protection of the population, both in and out of the workplace, including children lead exposure; b) protection of the environment, in particular with regard to waste management, including the treatment of effluents and the extraction of any solid waste; and c) measures that promote viable business activity and sustainable employment.

Likewise, in reference to EPR schemes, and especially if one opts for take-back systems, it is paramount to engage the population. In this sense, it must be ensured that consumers have access to the necessary information on the collection systems available, including the collection points and the proper way of disposal.

For the different information and communication actions, it is recommended to take into account the following aspects:

- ✔ Promote the collaboration of the different sectors involved (public health authorities, environmental authorities and non-governmental organizations, educational entities, manufacturers, exporters, importers and recyclers) to guarantee an adequate level of awareness campaigns for the target audience and thus to ensure their success.

- ✓ Define the target audience and, if necessary, segment the message according to the recipient (population living in close proximity to a smelter, mechanical workshops, importers, the general public, others).

- ✓ Be precise in the message so as not to create confusion and discourage public participation.

- ✓ Keep consistency in the campaigns and communication channels generated to build commitments with citizens, including measures to evaluate the impact and improve their effectiveness.

- ✓ Employ the most effective communication channels to reach the target audience (interactive websites, posters for schools and health centers; brochures for battery repairers and recycling communities; battery labels; service instructions and battery recharging in appropriate formats; among others).

- ✓ In the case of EPR schemes, the development of mobile applications such as Colombia and Brazil did (see **Annex II**) has proven to be an excellent complement in terms of reporting georeferenced collection points and serving as a channel of communication with citizens..

6. Occupational Health and Safety procedures

In accordance with the provisions of the Basel Guidelines and complementary bibliography, there are various control measures to prevent or minimize the risk of lead contamination, among which the following stand out:

a. **PPE.** Each worker must have their own PPE, which must be tailored to the specific needs of each area of the recycling facility. Additionally, it is vital to train employees on how to properly operate the equipment in accordance with the manufacturer's standards. Each section of the recycling plant must clearly and visibly identify the PPE that employees must wear while working there. It is suggested that you wear acid-resistant goggles, work clothing, and rubber or plastic gloves.

b. **Work practices.** These include: (i) Prohibiting cigarette / tobacco in the workplace; (ii) Separating work areas from the dining rooms; (iii) Enforcing mandatory showering at the end of the workday; (iv) Mandatory changing before returning home; (v) Daily changing and washing of work clothes; (vi) Daily checking and cleaning of respirators.

   Although many regulatory organizations require monitoring of lead levels in the air and apply limits, what really determines the risk of adverse health effects is the lead levels in the blood of employees. In this sense, the air and ingestion constitute the primary routes of exposure in the workplace, while dermal absorption of inorganic lead through healthy skin is considered minimal and does not represent a risk to workers.

c. **Opening, reduction and refining operations inside closed buildings.** Dust collection must be carried out, in its entirety, by means of a suitable filtering system, avoiding the release of contaminated dust into the atmosphere.

d. **Uncovered areas.** All uncovered areas of the recycling facility should have a hard and smooth surface, if possible paved with waterproof material, easy to wash and clean. All swept material must be collected and sent to the reduction furnace in order to recycle lead dust or other metals it may contain.

e. **Internal transport.** It must be performed on covered conveyor belts, to avoid the unnecessary emission of dust. In the event that this is not possible, the shipping container should be adequately covered. The internal means of transport must be distinct from external transport.

f. **Slag storage.** Hazardous materials should be stored with the same care as used accumulators, as they contain numerous hazardous materials and substances that can leach out or cause other health and environmental problems. Therefore, slags, residues, foams and other by-products, as well as waste and hazardous materials, will be subject to the same control measures as those adopted for the storage of accumulators (paved floor, covering, etc.).

g. **Air filtration system.** It must be as close to the ventilation area as possible, and all extraction systems must form a closed system to avoid a dust emission.

h. **Outdoor operations.** Outdoor operations must be conducted wet as humidification avoids the formation of dust. Therefore, all operations carried out outside enclosed buildings, such as sweeping, street cleaning, transport on unpaved roads, transport in open containers, baghouse gases and dust extraction, transport of dust, etc., should be performed with damp materials.

i. **Trucks and other means of transport.** They must be washed before leaving the recycling plant, especially the wheels and the undersides of the vehicles, to avoid the spread of lead dust outside the recycling plant, while the interior of the cabinets should be vacuumed regularly. All vehicles must leave the recycling plant through a single controlled exit.

j. **Stored coal.** If the recycling facility uses coal as fuel or reducer, it should be stored in an isolated and covered area. Special firefighting equipment and personnel training will also be required in this area.

k. **Rainwater harvesting.** Given the potential for harmful leachates from rainwater, a specifically engineered water harvesting system should be used to direct all water to the effluent treatment facility.

Ten Golden Rules to Minimize Lead Exposure and Hand-to-Mouth Contact[52]:

1. Remove rings, chains, and other metallic items before handling ULAB; then only handle ULAB with acid resistant rubber or neoprene gloves and have dust masks or respirators available to wear if necessary.
2. Operators must only wear work clothes in the workplace.
3. Shower and wash after a day's work or whenever contamination risks have been high.
4. Change into clean workwear every day or shift.
5. Avoid procedures that generate high levels of lead exposure.
6. Segregate ULAB working areas and the non-leaded offices and eating areas.
7. Keep eating and drinking areas clean and lead free.
8. Wash hands and face prior to eating at work.
9. Keep homes clean and lead free; do not take work-wear home.
10. Keep sparks and flames away from ULAB and do not smoke in a ULAB collection, storage or delivery center.

[52] Information gathered from the Training Manual, available **here**

7. Transboundary Movements

Unlike what happens with other hazardous waste streams in which treatment has a cost, ULAB have a commercial value. Consequently, the exporter will not seek the lowest price but the highest profit. The challenge will then be to combine the different challenges: (i) ensure that the transboundary movement of ULAB is minimized (ii) ensure the sound management of ULAB in a way that protects human health and the environment from the effects harmful that may arise from that movements; (iii) allow the export of ULAB only if the country does not have the technical capacity and the required services or adequate disposal sites to dispose wastes in an environmentally sound and efficient manner, or the wastes in question are needed as raw materials for recycling and collection industries in the State of import; (iii) counteract the "*Not In My Back Yard*" (NIMBY) effect, which consists of the negative reaction that occurs among citizens to the installation in their immediate environment of certain activities or facilities perceived as dangerous, especially if the country allows the import of ULAB; and (iv) meet the demand of national treatment companies that need to take advantage of installed capacity.

In relation to the transboundary movements of ULAB, the following stand out among the best management practices:

- ✓ Define the import and export policy of hazardous waste in general and ULAB in particular, involving the different actors, including government agencies (Environment, Customs, Commerce) and the private sector (manufacturers and importers of batteries, formal and informal recyclers, etc.).

- ✓ When authorizing the import and export of ULAB, consider the different environmental, social and economic aspects, bearing in mind that, unlike other waste streams, ULAB have a commercial value *per se*.

- ✓ Comply with the guiding principles of the Basel Convention and international environmental declarations, such as prevention, minimization, precaution, proximity, among others; and make an analysis of installed capacity for the treatment of ULAB in the region.

- ✓ Work on the identification of tariff items for new and used batteries. For this, it is recommended to exchange information with the countries of the region.

7. References

CCA (2016), Environmentally Sound Management of Spent Lead Acid Batteries in North America: Technical Guidelines, Commission for Environmental Cooperation, , Montreal, 102 pp.

http://www3.cec.org/islandora/en/item/11665-environmentally-sound-management-spent-lead-acid-batteries-in-north-america-en.pdf

Children's exposure to lead pollution undermines a generation of potential

https://www.unicef.org/reports/toxic-truth-childrens-exposure-to-lead-pollution-2020

Colombia (2017) Principles of post-consumer waste management, Post-consumer waste Bulletin No. 001

https://www.minambiente.gov.co/images/AsuntosambientalesySectorialyUrbana/pdf/Programa_y_consumo_sostenible/programas_posconumo_2017/Boletin_posconsumo_2017/001.pdf

CRU Consulting (2018) Characterization and analysis of the international mineral market in the short, medium and long term, valid for the year 2035

http://www1.upme.gov.co/simco/Cifras-Sectoriales/Datos/mercado inter/Producto2_Plomo_FINAL_12DIC2018.pdf

German Agency for International Cooperation (GIZ) (2018), Estudio Regional sobre la figura REP en Latinoamérica en comparación con Alemania y España bajo el Marco Legal de la Unión Europea

https://www.giz.de/en/downloads/giz2018-es-rep-dominicana.pdf

UNEP/EA.4/14, Status of Implementation of Resolution 3/9 on Eliminating Exposure to Lead Paint and Promoting the Environmentally Sound Management of Lead Acid Batteries".

https://wedocs.unep.org/bitstream/handle/20.500.11822/27177/7b%20Status%20of%20Resolution%20on%20Eliminating%20Exposure%20to%20Lead%20Paint%20and%20Promoting%20the%20Environmentally%20Sound%20Management%20of%20Lead%20Acid%20Batteries.pdf?sequence=13&isAllowed=y

Technical guideline on management of ULAB in Chile, National Commission for the Environment and German Technical Cooperation GTZ,

https://www.respel.cl/ResiduosPeligrosos/wp-content/uploads/2017/10/RESPEL-GTZ-BATERIAS_PLOMO_ACIDO_USADAS.pdf

Ingenieros Consultores (RYA) (2009) Diagnosis of import and distribution of batteries and handling of used lead acid batteries in Chile

https://mma.gob.cl/wp-content/uploads/2015/07/Diagnostico-baterias-2009.pdf

International Lead Association

https://www.ila-lead.org

National Institute of Industrial Technology (INTI) (2016), "Gestión de pilas y baterías eléctricas en Argentina https://www.google.es/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjx7Ime953tAhUoHrkGHROe-B4UQFjAAegQIARAC&url=https%3A%2F%2Fwww.inti.gob.ar%2Fpublicaciones%2Fdescargac%2F20&usg=AOvVaw3FNtWpCvKoDIO-683jvm7T4

Ministry of Environment of Colombia (2017), Principios de la gestión de Residuos posconsumo, Boletín Residuos Posconsumo de Colombia. https://www.minambiente.gov.co/images/AsuntosambientalesySectorialyUrbana/pdf/Programa_y_consumo_sostenible/programas_posconumo_2017/Boletin_posconsumo_2017/001.pdf

WHO (2017) Recycling used lead-acid batteries: health considerations https://apps.who.int/iris/bitstream/handle/10665/259447/9789241512855-eng.pdf?sequence=1&isAllowed=y

WHO (2019) Lead poisoning and health
https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health

UNEP - Priority issues on chemicals and waste management for Latin America and the Caribbean and potential priority cooperation activities for 2021-20202
https://wedocs.unep.org/bitstream/handle/20.500.11822/34802/PICHEN.pdf?sequence=4&isAllowed=y

Pure Earth
https://www.pureearth.org/global-lead-program/

Robayo, L. (2020). "Legislación: La Responsabilidad Extendida del Productor cambia el paradigma de los residuos".
https://www.mundopmmi.com/empaque/sustentabilidad/article/21139011/legislacin-la-responsabilidad-extendida-del-productor-cambia-el-paradigma-de-los-residuos

UNEP and the Secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (2003) Technical Guidelines for the Environmentally Sound Management of Waste Lead-Acid Batteries
https://digitallibrary.un.org/record/699690

UNICEF (2020), The Toxic Truth: Children's Exposure to Lead Pollution Undermines a Generation of Future Potential,
https://www.unicef.org/reports/toxic-truth-childrens-exposure-to-lead-pollution-2020

Secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (2003), Training Manual for the Preparation of National Used Lead-Acid Batteries Environmentally Sound Management Plans in the context of the implementation of the Basel Convention
http://www.basel.int/Portals/4/Basel%20Convention/docs/meetings/sbc/workdoc/tm-ulab/tm_ulab.pdf

8. Acronyms

ADF	Advanced disposal fee
CRBAS	Basel Convention Regional Centre for the South American region in Argentina (in Spanish: Centro Regional Basilea para América del Sur de Capacitación y Transferencia de Tecnología)
DINAMA	National Environment Directorate (in Spanish: Dirección Nacional de Medio Ambiente)
EPR	Extended Producer Responsibility
ESM	Environmentally sound management
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IBER	Brazilian Institute of Recyclable Energy
IHME	Institute for Health Metrics and Evaluation
ILZSG	International Lead and Zinc Study Group
IMDG	International Maritime Dangerous Goods Code
INTI	Instituto Nacional de Tecnología Industrial (Argentina)
IPR	Individual producer responsibility
JBRC	Japan Portable Rechargeable Battery Recycling Center
LAB	Lead-acid batteries
OECD	Organization for Economic Cooperation and Development
PPE	Personal protection elements
PRO	Producer responsibility organization
SGD	Sustainable Development Goals
T	Metric ton
ULAB	Used lead-acid batteries
UNEP	United Nations Environmental Programme
UdC	Compliance Units (in Spanish: Unidades de Cumplimiento)
U.S. EPA	U.S. Environmental Protection Agency
USD	United States Dollar
WEE	Waste Electrical and Electronic Equipment
WHO	World Health Organization

Annexes

Annex I: Consultation process in the Latin American and Caribbean region

In this Annex, the information exchange activities are described. It includes the questionnaire sent to the national focal points of the Intergovernmental Network on Chemicals and Waste for Latin America and the Caribbean, as well as the list of stakeholders interviewed in the seven studied countries.

Questionnaire sent to the national focal points of the Intergovernmental Network on Chemicals and Waste for Latin America and the Caribbean

Identification of examples of legal and policy instruments in Latin America and the Caribbean - Section B: Extended Producer Responsibility (EPR) schemes for Used Lead-Acid Batteries (ULAB).

Country:

Name, position, organization:

Section B: ULAB

- ✓ **Type of policy or legal instrument:** (e.g., law, decree, project, other) and reference number or title.
- ✓ **Issued by:** Country and Responsible Government Agency (e.g., Environment, Health, etc.).
- ✓ **Year of publication:** (if it is a draft standard not yet in force, also clarify in which instance it is to date).
- ✓ Indicate if the standard incorporates the principle of **EPR**.
- ✓ Indicate the **access link** to the policy / legal instrument and if it is not possible, attach copies of it.
- ✓ **Name and email** of the person to contact in case of requiring more information (telephone interview).

What challenges do you consider most relevant to achieve an effective implementation of EPR systems for ULAB in your country? (Please indicate the main 3)

a. Collection, transport and logistics
b. Resistance from Producers / Importers
c. Coordination between the Public and Private Sector
d. Lack of political will to prioritize this waste stream
e. Inclusion of the informal sector
f. Involvement of society
g. Technologies available for adequate treatment and final disposal
h. Inspection and control
i. Other (Please specify)

List interviews in the seven studied countries.

País	Nombre y apellido	Organismo/Área	Mail
Brazil	Luiz Gustavo Gallo Vilela	Department of Environmental Quality and Waste Management, Ministry of the Environment	gustavo.vilela@mma.gov.br
	Amanda Schneider	Brazilian Institute of Recyclable Energy	amanda@iberbrasil.org.br
Chile	Cecilia Aburto Schweitzer	Ministry of Environment (Office for International Affairs and Focal Point of the Intergovernmental Network on Chemicals and Waste)	caburto@mma.gob.cl
	Joost Meijer	Ministry of Environment	jmeijer@mma.gob.cl
	Felipe Andrés Gajardo León	Ministry of Environment	FGajardo@mma.gob.cl
	Germaine Moller	Recimat	fgajardo@mma.gob.cl
	Antonio Carracedo	Recimat	acd@recimat.cl
Colombia	Rodolfo Iván Alarcón Mora	Chemical Substances. Ministry of the Environment	ralarcon@minambiente.gov.co
	Diego Escobar Ocampo	Coordinator of the Chemical Substances, Hazardous Waste and UTO group of the Ministry of Environment and Sustainable Development.	diescobar@minambiente.gov.co
	Fabián Mauricio Pinzon Rincon	Consultant on Chemical Substances, Hazardous Waste and UTO group of the Ministry of Environment and Sustainable Development.	Información no disponible
	María Fernanda Velez Ramirez	International Affairs Office of the Ministry of Environment and Sustainable Development Advisor	mvelez@minambiente.gov.co
	Ángel Eduardo Camacho Lozano	Consultant on Chemical Substances, Hazardous Waste and UTO group of the Ministry of Environment and Sustainable Development.	Información no disponible

País	Nombre y apellido	Organismo/Área	Mail
Costa Rica	Ricardo Morales Vargas	Ministry of Health of Costa Rica	ricardo.morales@misalud.go.cr
	Cintia Pérez	Ministry of Health of Costa Rica	Información no disponible
	Eugenio Androvetto	Ministry of Health of Costa Rica	eugenio.androvetto@misalud.go.cr
	Víctor Manuel Mata	Ministry of Health. Costa Rica	victor.mata@misalud.go.cr
Honduras	Carlos Thompson	Center for the Study and Control of Pollutants (CESCCO), Ministry of Energy, Natural Resources, Environment, and Mines (Honduras). Focal Point of the Intergovernmental Network on Chemicals and Waste	carlosalbertothompson@yahoo.com
	Luis Zamora	Environmental Monitoring (CESCCO)	Información no disponible
	Marco Tuilo Calix	Legal Advisor (CESCCO)	matcalix@gmail.com
	Elio Alvarenga	CESCCO	Información no disponible
	Emily Chavez	CESCCO	emily27_63@hotmail.com
	Breysi Cabrera	Customs office	Información no disponible
Dominican Republic	Alexander Moretta	Ministry of Environment. Focal Point of the Intergovernmental Network on Chemicals and Waste	Alexander.Moreta@ambiente.gob.do
	Elsa Ferreras	Ministry of Environment. Focal Point of the Intergovernmental Network on Chemicals and Waste	Elsa.Ferreras@ambiente.gob.do
Uruguay	Silvana Martínez	Board of Strategic Planning, National Board of Environmental Quality and Assessment. Ministry of Environment	Elsa.Ferreras@ambiente.gob.do

Annex II: Summary sheets of the studied countries

This Annex compiles the summary sheets of each of the studied countries, taking as a source of information the interviews held and information from secondary sources.

Brazil

Characteristics of the battery market. Brazil is a producer of batteries. In 2019, 300,000 tons were manufactured. The batteries that are imported come mostly from China.

Recycling and disposal of ULAB. Treatment exists at the national level, and exports are also made for treatment, either because the treatment plants have subsidiaries abroad or because they are independent. Currently 83 % of the batteries generated, are collected.

Legal and institutional framework. Law No. 12.305 of 2010, which regulates the national solid waste policy, defines shared responsibility. In its article 33, it establishes that manufacturers, importers, distributors and merchants are obliged to design and implement reverse logistics systems, through the return of the following products, after their use by the consumer, regardless of the public urban cleaning and waste management service solids: i) pesticides; ii) cells and batteries; iii) tires; iv) lubricating oils, their waste and packaging; v) fluorescent lamps, sodium and mercury vapour and mixed light; and vi) electronic products and their components. There are complementary regulations of relevance, Decree No. 7404/2010 (on reverse logistics systems) [53] and Decree No. 9177/2017 (referring to rules for inspection and compliance with the obligations imputed to manufacturers, importers, distributors and traders of products, their waste and its packaging subject to mandatory reverse logistics) [54].

EPR elected system. So far, there are 12 reverse logistics systems implemented (including for ULAB), and three modalities to implement them in Brazil: i) sectorial agreements of national scope, which involve most of the sectors represented from each waste stream; ii) decrees at the government level; iii) terms of commitment that apply to specific cases and usually function as pilot projects in a specific region, or in a specific situation.

The shared responsibility of ULAB is regulated through a sectoral agreement of national application signed in August 2019 between the Government of Brazil (Ministry of the Environment), and representatives of manufacturers, manufacturers, recyclers, distributors and the IBER[55] as managing entity, non-profit, non-governmental organization. IBER groups more than 200 companies and its mission is to act as an intermediary in the implementation of the ULAB reverse logistics system, disseminating information, assisting companies in complying with the legislation and seeking to get more companies to adhere to the system. Each stakeholder in the chain must register and pay a membership fee of between 25 and 30 US

[53] More information on Decree No. 7,404 on reverse logistics (2010), available **here**
[54] More information on Decree No. 9,177 on rules for the inspection and fulfillment of the obligations imputed to manufacturers, importers, distributors and merchants of products, their waste and their packaging subject to mandatory reverse logistics (2017), available **here**
[55] More information on the *Instituto Brasilero de Energía Reciclable* (IBER), available **here**

dollars (USD). This rate does not cover infrastructure costs, which are financed by each actor. If the environmental criteria are met, IBER grants an annual certification.

Challenges in implementation. Challenges identified include ensuring that traders participate in the system, for example, by not charging an association fee, and strengthening oversight to ensure that all producers, importers, distributors, and traders participate in the reverse logistics system.

Other information. IBER is the managing body in charge of implementing the reverse logistics system for ULAP in Brazil. They have three monitoring and communication tools: (i) website; (ii) web platform (through which companies submit information and can issue their own certification); and (iii) mobile application (for retailers and consumers).

Chile

Characteristics of the battery market. Currently, LAB are not manufactured, the total demand is satisfied by batteries manufactured abroad, mainly in China, South Korea and Colombia, and imported as spare parts, parts of equipment, or motor vehicles[56]. The battery market has been on the rise in recent years, probably due to the increase in the number of vehicles[57]. As reported by government officials responsible for carrying out management of ULAB at the national level, the net income from ULAB was 2.34 and 2.21 million units for the years 2018 and 2019, respectively[58].

Recycling and disposal of ULAB. Currently, there is a single ULAB recycling company[59], which is estimated to collect 70 % (approximately 1,750,000 batteries). By Decree No. 2/10 of the Ministry of Health, export is prohibited. According to the Technical guideline on management of ULAB in Chile[60], an important number of ULAB generated in the country was eliminated abroad in 2007, exporting to Venezuela and Peru 6,964,489 kg of waste and scrap of batteries and cell phones, an amount that can represent, assuming an average weight of 13 kg for a drained lead battery, approximately 500,000 batteries.

Legal and institutional framework. Chile´s Law No. 20,920 of 2016 establishes the legal framework for waste management, Extended Producer Responsibility and promotion of recycling. [61] The purpose of the Law is to reduce the generation of waste and promote its reuse, recycling and other types of collection, through the establishment of EPR and other waste management instruments, in order to protect people's health and the environment. This Law establishes in its article 10 that the EPR will apply to the categories or subcategories defined in the respective Supreme Decrees that establish goals and other associated obligations for priority products, among which ULAB are included. Currently, Chile has advanced with the issuance of Supreme Decrees for other priority products such as tires and hopes that by the end of 2021

[56] More information on the Diagnosis of Import and Distribution of Batteries and handling of used lead acid batteries, available **here**
[57] More information on the Technical guideline on the management of ULAB in Chile, available **here**
[58] Updating of base information and specific environmental impacts of the priority product batteries, contained in Law No. 20,920, Dictuc S.A. (Study requested by the Undersecretariat of the Environment), available **here**
[59] More information on Recimat, available **here**
[60] More information on the Technical guideline on the management of ULAB in Chile, available **here**
[61] More information on Law No. 20.920 (Waste Management Framework, Extended Producer Responsibility and Promotion of Recycling), available **here**

progress will be made on the Decree for batteries. Specifically with regard to ULAB, it has a regulation from the Ministry of Health of 2010, which prohibits the export of ULAB.

EPR elected system. Like other countries in the region, Chile adopted a EPR system for ULAB that consists of the presentation of management plans by importers. Although the Supreme Decree was not prepared, they have experiences from other streams considered as priorities in the EPR Law.

Challenges in the implementation. Among the challenges in the implementation is the elaboration of the regulation for ULAB, having to go through different administrative instances but counting on the experience of other waste streams that have already been regulated.

Other information: Chile has a technical guide on management of ULAB, developed within the framework of bilateral cooperation between the Governments of Chile and the Federal Republic of Germany, prepared by professionals from the National Environmental Commission (CONAMA) and the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) (German Technical Cooperation)[62].

Colombia

Characteristics of the battery market. There is a leading company that is manufacturer, importer of batteries and ULAB manager. This company manufactures 80 % of the LAB, the remaining 20 % come from importing companies. In total, there are 76 LAB importing companies.

Recycling and disposal of ULAB. Colombia has three companies that manage ULAB. The three companies only treat ULAB that are generated in the country, since Congress approved Law 1252/2008[63], which expressly prohibits the importation of hazardous waste. These treatment companies have an environmental license granted by the Environmental Authorities and, although in this sense they would comply with environmental regulations, informal complaints have been registered. Hence, there is a challenge of doing a proper follow-up through the inspection and control of operations and facilities. In Colombia 32,000 T of ULAB are collected per year and its exportation is not allowed. Lead waste obtained from recycling ULAB could be being exported to the United States and Ecuador.

Legal and institutional framework. Colombia has the Decree No. 4741 of 2005[64], which aims to prevent the generation of hazardous waste, as well as regulate the management of waste generated to protect human health and the environment. There are many regulations that contemplate the EPR and, in the case of ULAB, there is Resolution No. 0372 of 2009[65], which was prepared in dialogue with the industry.

[62] More information on the Technical guideline on the management of ULAB in Chile, available **here**

[63] More information on Law 1252 of 2008, by which prohibitive norms are dictated in environmental matters, referring to residues and hazardous waste and other provisions are dictated, available **here**

[64] More information on Decree No. 4741, which partially regulates the prevention and management of waste or hazardous waste generated within the framework of comprehensive management (2005), available **here**

[65] More information on Resolution 0372 of 2009, modified by Resolution 361 of 2011, available **here**

EPR elected system. Colombia is one of the forerunner countries in EPR systems in the region. The standard that regulates management of ULAB establishes that those who manufacture or import 300 or more batteries per year must submit a Management Plan to the Ministry of the Environment. According to the standard, 90 % of the batteries must be collected. The Ministry of Environment and Sustainable Development evaluated the hazardous waste policy 2007-2017, and as a result regarding ULAB schemes, seventy-five individual Management Plans and a collective Management plan were identified.

Challenges in implementation. One of the most significant challenges is gaining political backing, which requires technical expertise in determining thresholds, collection targets, geographic coverage, and other types of data necessary for decision making. On the other hand, producers must understand the responsibility they have in relation to waste. User perception in this regard is also a key to consider.

EPR systems are required to grow, for which the dissemination of information is essential. Control and surveillance is another of the key challenges in Colombia. Regarding the control of informality, they do not have precise numbers or percentages. It is proposed as a challenge to regulate informality and there is an interest in having a methodology to measure it, in order to evaluate it from an economic perspective. Having accurate figures is a great challenge in Colombia, as well as the control in transport.

Other data:

- ✓ Colombia has a Manual of Good Environmental Practices for the ULAB Management from 2008[66].
- ✓ From the Ministry of the Environment and Sustainable Development, they designed a mobile application (RedPosconsumo, in Spanish), which has recently been redesigned and is in the process of updating information for its relaunch.

Costa Rica

Characteristics of the battery market. There is currently no national production of new LAB in Costa Rica, though there used to be in the past. All new LAB and ULAB are imported. Regarding the export of ULAB, although they do not have a specific standard for this, they are based on the Proximity Principle contemplated in the Basel Convention to prohibit it.

[66] More information on the Manual of good environmental practices for the management of used lead acid batteries, written by Bogotá Mayor's Office, District Secretary for the Environment (2008), available **here**

Year	New imported batteries (T)
2017	9724
2018	9399
2019	9445

Source: Directorate of Radiation Protection and Environmental Health, Ministry of Health of Costa Rica, 2020.

Recycling and disposal of ULAB. There is a single lead smelter that has been in operation for 7 years and employs between 15 and 20 people (PBMETALS). According to what was reported by the Costa Rican authorities, the technology applied for the process is first class, controlled and monitored by computer systems, generating high standards of quality and protection of the environment, and complying with national and international environmental regulations such as the Basel Convention.

The batteries are conducted as they are received by a forklift to a crusher – meaning that they may or may not contain acids – and in a humid environment they are crushed. Wastewater is generated and carries the acids contained in the batteries to the treatment system, where they are neutralized and purified before being recirculated via the crushing and cooling processes of the various equipment. PP, a thermoplastic polymer component of LAB, is separated from the crusher into small pieces – it floats in the upper layer – for its subsequent neutralization, drainage, packaging and export. On the other hand, lead in the form of lead oxide, lead sulfate and metallic lead is sent to the smelting furnace for collection, where a pyrometallurgical treatment is performed at high temperatures.

The emissions generated by this process are controlled by a dust and fine particle capture system (Bag House), which prevents them from being sent into the atmosphere. The neutralization of the acids will occur through the addition of Calcium Hydroxide. This occurs in a series of computer-controlled reactors. After a certain period in this solution, the acids are neutralized (pH between 7 and 8) and converted into Calcium Sulfate, the treated water (without acid) is directed to the grinding machine again.

Water is never discharged; it is always recirculated throughout the process. Finally, the *'Calcium Sulfate'* sewage sludge is a raw material used for the manufacture of cement. The company has Green Lead certification for collection systems, emission control systems and the non-generation of hazardous waste.

The company has an installed capacity of 21,600 T of ULAB per year and is authorized to manage 7,200 T per year (the Ministry of Foreign Trade and Customs is in charge of updating these quotas).

As far as the controls are concerned, the Ministry of Health grants the sanitary operating permits, and the company presents the blood lead tests of the workers. Likewise, the National University conducts samplings.

Year	ULAB collected in Costa Rica (T)	Collection rate in Costa Rica	Imported ULAB (T)	Total ULAB recovered (T)	Collection vs installed capacity
2017	9699	100 %	6827	16526	77 %
2018	8903	95 %	7499	16402	76 %
2019	8880	94 %	5253	14133	65 %

Source: Directorate of Radiation Protection and Environmental Health, Ministry of Health of Costa Rica, 2020.

Legal and institutional framework. EPR is defined by the Law for Comprehensive Waste Management, Law No. 8839, published on July 13, 2010[67]. The regulation establishes that the EPR applies to waste with special handling requirements by means of a Decree published by the Ministry of Health. In September 2014, the Declaration of Waste with Special Handling Requirements was published and ULAB were included in that Decree[68].

EPR elected system. According to current regulations, ULAB importers are registered in what is called "*Compliance Units or UdC*". The UdC is a legal entity made up of one or more importers or manufacturers of products capable of generating waste with special handling requirements, such as batteries, refrigeration systems or electronic devices, which must be registered with the Directorate of Human Environment Protection from the Ministry of Health, in order to guarantee the mechanisms and actions that ensure the sound management of this waste once the useful life of the product has ended.

The UdC list is available on the website of the Ministry of Health[69]. To enter the registry, a fee equivalent to USD 50 is charged, which is valid for 5 years (one payment per UdC). In this framework, the importer must present information on the collected waste, the contract with the manager, and a note with the treated quantities issued by the manager. The collection goal is set by the importer. In Costa Rica there are 332 UdCs in general, of which 4 belong to ULAB. To implement the EPR system for ULAB, it is necessary to define the tariff items in order to publish a Technical Note for Customs. At the time of maintaining the interview with the Costa Rican authorities, for the effective implementation of the EPR system in ULAB, it remained to issue the pertinent resolution and the technical note to Customs.

Challenges in the implementation. Among the challenges in the implementation stand out, on the one hand, making the EPR system mandatory for ULAB through the Technical Note to Customs with the tariff items that apply to the ULAB (at the time of conducting the interview the EPR system in ULAB in Costa Rica is voluntary). Likewise, it is necessary to improve the diagnosis regarding informal recycling. In relation to the inspection of imports, although on-site inspections are not carried out (since the operation is self-declared), Customs has its own laboratory. The Ministry of Health has the power of control, despite the fact that they encounter significant obstacles in accomplishing their mission due to a lack of sufficient personnel.

[67] More information on Law No. 8839 on comprehensive waste management and efficient use of resources, available **here**
[68] More information on the General Regulation for the Classification and Management of Hazardous Waste No. 37788-S-MINAE, available **here**
[69] More information on the Compliance units in waste management special handling, from the Ministry of Health of Costa Rica, available **here**

Other data:

- ✓ In contrast to other countries in the region, the Ministry of Health is the Enforcement Authority for ULAB.
- ✓ The country has EPR policies for waste streams that are already in place: tires, WEE and refrigerant gases, which could be useful to put into practice these lessons learned.
- ✓ The process that manufacturers and importers of waste with special handling requirements must follow, as well as any pertinent information about their treatment and, in particular, ULAB, are available on the Ministry of Health's website.[70].

Honduras

Characteristics of the battery market Regarding the national manufacture of LAB, previously there were two factories which have closed. All LAB that enter the country do so through importation.

Quantity in units and country of origin of ULAB imported in 2010.

Country	Mexico	USA	Colombia	Others
Units	1,303,11	896.2	883.3	262.9
Percentage	38.90 %	26.78 %	26.40 %	7.85 %

Source: "Current management of ULAB in the Central District in 2010", CESSCO.

In June 2020, the National Congress approved a Decree that allows the importation of ULAB for treatment. This decree is under review by the Executive Branch since there is a prohibition on the entry of hazardous waste in the General Environmental Law of Honduras.

According to Honduran authorities, a potential alternative would be to investigate ways to expand the company's battery handling capacity at the national level in order to minimize idle capacity.

Recycling and disposal of ULAB. In Honduras, there is a single plant that recycles ULAB, which has an Environmental License 2008/2009. The Environmental Control Directorate carries out audits that include health controls of workers and compliance with environmental regulations. The recycling company treats 600 T of used batteries per month, representing 50 % of its capacity. The recycling process consists of the separation of lead for its smelting and the transformation of acid in reactors. Almost all the battery material is used, with no rejection in the process. Not all ULAB are processed in this one authorized facility in Honduras; some are sold on the informal market and some are exported to other countries (South Korea, Costa Rica, Guatemala, and Mexico).

70 More information on the Registry of Health Managers, carried out by the Ministry of Health of Costa Rica, available here

As for informal recyclers, they do not have data on how many workers are involved.

In terms of compliance with the Basel Convention, CESCCO is the Technical Focal Point. In this sense, they state that there is a lot of illegal trade, with Korea being the main market.

Legal and institutional framework. As specified in Article 17, Second Section, within the special solid waste of the "*Regulation for the Integral Management of Solid Waste*"[71], ULAB are classified as Special Domestic Waste and are determined as "*waste of domiciliary and institutional origin with highly dangerous characteristics*". Honduras does not have legislation on EPR, although the aforementioned Regulation establishes in its article 23 that generators are obliged to establish take-back mechanisms. In June 2020, the National Congress approved a Decree in which an interpretation was exercised to several articles contained in the General Environmental Law to allow the importation, manufacture and recycling of LAB, whether they are new, sealed or used. Currently, Honduras is in the process of preparing two documents related to the object of the Project: (i) regulations for the ESM of ULAB; and (ii) regulations to regulate lead in paint in Honduras.

Regarding the regulatory objectives on ULAB, the team from the Honduran environmental authority highlighted:

- ✓ Regulate the entire ULAB cycle to increase the recycling percentage.
- ✓ Control LAB imports to apply EPR.
- ✓ Include informal collectors and scrap dealers, since they suffer a great impact on their health by not complying with good environmental practices.
- ✓ Work to collect information on import, recycling and export to increase the ULAB collection rate.

Regarding intergovernmental or inter-sectorial spaces, where the design and implementation of an EPR system for ULAB could be discussed, the team from Honduras comments that inter-sectorial working groups were installed. The Waste Committee, which was in the process of reactivation before to the COVID-19 pandemic but was placed on standby, would be the venue for discussion.

EPR elected System. There is a new battery importer (Johnson Control) that has a one-to-one business policy: they sell a new battery in exchange for delivery of a used one. While it is not a mandatory EPR system, it could be identified as a first initiative from which lessons learned could be drawn and used in the standard development process.

Challenges in implementation. Cases of illegal importation of ULAB were identified in Honduras. Customs has collaborated and the Environmental Prosecutor's Office has also been part of these arrests.

[71] More information on the Regulation for the integral management of solid waste, Secretariat of Natural Resources and Environment, available **here**

Another challenge is linked to informal recyclers, for whom there is no accurate data regarding the quantity and conditions in which they handle 6ULAB. Likewise, there is pressure from certain sectors not to allow the importation of ULAB. On the other hand, the recycling company states that its treatment capacity is greater than the volumes generated in Honduras.

Other data: According to the Report "*Current Management of lead-acid batteries used in the Central District in 2010*" prepared by CESCCO, 63.2 % of establishments that are dedicated to the commercialization, repair, reconditioning and storage of new and used LAB are located in residential areas of the Capital city, which shows that a large number of the population is directly exposed to lead contamination, affecting their quality of life.

Dominican Republic

Characteristics of the battery market. The Dominican Republic has a LAB manufacturer. Likewise, there are LAB that come from the international market through various importers. The importation of ULAB is not allowed given that Law No. 218 of 1984 prohibits the introduction into the country, by any means, of human or animal excrement, household or municipal garbage and its derivatives, sewage sludge, treated or not, as well as waste toxic from industrial processes[72]. In addition, the National Constitution in its article 67 inc. 2, prohibits the import of nuclear, toxic and dangerous waste[73].

Recycling and disposal of ULAB. When batteries lose their useful life, there are two possible destinations in the Dominican Republic: Cometa (the only importer that has an EPR system) and Ecoverde (the only treatment plant).

The "*Ecoverde reciclaje industrial*" recycling plant was a small company that has been growing. No data was found regarding the amounts of ULAB collected and the installed capacity for treatment. The company has an environmental permit that is issued every 5 years and submits a compliance report every 6 months. The environmental authority makes periodic visits. Regarding the type of treatment, 100 % of ULAB would not be collected and there would be slag problems.

Regarding the informal collection of ULAB, there are no exact numbers, but with all the actions performed, the reports of intoxication decreased.

One of the achievements highlighted by the authorities is the establishment of the voluntary system for changing batteries by companies, in which people deliver used batteries and companies give them a new one at a discount.

[72] More information on Law No. 218, which prohibits the introduction into the country, by any means, of human or animal excrement, household or municipal garbage and its derivatives, sewage sludge, treated or not, as well as toxic waste from industrial processes, available **here**
[73] More information on the Constitution of the Dominican Republic, available **here**

The authorities stated that, despite not conducting controls on the transport from the collection point to the two destinations, no complaints are received, considering that the regulation that establishes the transport guidelines is effective.

Legal and institutional framework. ULAB has been a topic of discussion since 2007. Previously, there was no regulation in place and informal collectors were heavily involved.

Currently, the country has issued Resolution 008-2015 that approves the Technical Environmental Regulation for the management of ULAB[74]. Likewise, through the Special Program[75], they worked on a draft of the Environmental Technical Regulation for the Management of Hazardous Chemical Substances and Wastes in the Dominican Republic[76] that, if approved, the country would have an updated general framework on the matter.

EPR elected system. There is a voluntary EPR system implemented by the Grupo Cometa company through which the used batteries are sent to ENVEROFOCUS TECHNLOGY, a company located in Tampa, United States, which sends back a new battery. In the new regulation of chemical substances, an attempt was made to place the EPR in a general sense for waste or export of batteries. In addition, there is a Draft Law on Waste Management that includes the EPR, in which priority wastes such as ULAB and tires are listed. Currently, there is a scheme in which importers and producers present a management plan, and since ULAB can no longer be exported, the final destination must be national.

Challenges in implementation. If imports are permitted, there would be an excess of waste, and this will reduce the cost of ULAB. As demonstrated in the Dominican Republic's experience, it is vital to work diligently and engage in communication with the industry and all stakeholders. Likewise, it is necessary to reinforce the inspection and control tasks so that the environmental criteria are met.

Other data: In Haina, Dominican Republic, a study was conducted on the detection of lead in 116 children who lived near a lead-acid battery recycling smelter (Kaul & Mukerjee, 1999). Significantly high blood lead concentrations were detected with a mean value of 71 µg / dL. Soon after, the government closed the recycling plant.

Six months later, a follow-up study was carried out in 146 lead poisoned children in the same community (Kaul *et al.*, 1999). It was discovered that, despite large reductions in blood lead levels, with a mean of 32 µg / dL (a range of 6 to 130 µg / dL), these levels remained elevated. Only 9 % of the children had blood lead concentrations below 10 µg / dL and 28 % of the children had them above 40 µg / dL. For comparison, a study was also conducted in 63 children from a nearby community, who had similar demographic characteristics, but without the presence of a smelting furnace. In this case, the mean blood lead concentration was 14 µg / dL (a range of 20 to 99 µg / dL) and 42 % of the children had levels <10 µg / dL[77].

[74] More information on Resolution No. 008-2015, which approves the technical environmental regulation for the management of ULAB, available **here**

[75] More information on the Special Programme by UNEP, available **here**

[76] More information on the Draft of the "Technical Environmental Regulation for the Management of Hazardous Chemical Substances and Wastes in the Dominican Republic", conducted by the Ministry of the Environment and Natural Resources, available **here**

[77] More information on Recycling used lead-acid batteries: health considerations (WHO, 2017), available **here**

Uruguay

Characteristics of the battery market. Since 2013, batteries have not been manufactured in Uruguay. Currently they are assembled, through two companies, or imported (30-35 companies). On average, about 5,000 tons are imported per year, although it has reached 5,400/5,700 tons per year. Uruguay does not allow the entry of ULAB through Law No. 17.220 (1999), which prohibits the entry and transit of hazardous waste[78].

Recycling and disposal of ULAB. In Uruguay there are no plants that process lead and acid from ULAB, so they are exported at a percentage that generally exceeds 80 % (in 2018, collection reached 98% and in 2019, 75 %). Previously it was exported to Europe and Asia, but now, since Morocco does not allow transit, everything is exported to Israel.

In 2007, ULAB collection levels did not exceed 7 %. At that time, Brazil regulated and prohibited the importation of RRPP, and this improved the collection levels in Uruguay.

As for the informal sector, the Law is committed to formality. In theory, Master Plans cannot receive ULAB from the informal market and are obliged to present annual reports and indicate if something reaches them through the informal channel.

Legal and institutional framework. Uruguay has Law No. 17,775 of 2004 on the prevention of lead contamination, which establishes a reverse logistics system[79]. In its article 16, it establishes that all waste batteries containing lead must be delivered to their respective manufacturers or importers and / or to those who act in their representation, in order for them to proceed according to what is established in the pertinent regulations. Holders of waste batteries who do not have access to the formal commercial circuit must deliver them in the places that the Municipalities and Local Boards have. The Ministry of Housing, Land Management and Environment, in coordination with the Municipal Governments and Local Boards, will determine places to ensure the final collection of discarded batteries in safety conditions and in accordance with what is established by the regulations. Likewise, Decree 373/003, approves the Regulation of lead acid batteries used or to be discarded[80]. This Decree was the first that brought the figure of the EPR and, among its strengths, includes the attribution of responsibilities throughout the management chain.

From Uruguay, they are promoting an update of the regulation that allows increasing the levels of returnability of these batteries through a formal market including other batteries other than lead-acid in the scope. Among other aspects, it is expected to:

- ✓ Incorporate batteries used in electric mobility and stationary storage.
- ✓ Prohibit the sale of a new battery if the buyer does not deliver a used one or does not present a certificate proving that he managed the used battery through authorized channels. Otherwise,

[78] More information on Law No. 17.229 on the introduction of hazardous waste, available **here**
[79] More information on Law No. 17,775 on Declaration of general interest - regulation of lead contamination, available **here**
[80] More information on Decree 373/003 Regulation of the handling and disposal of lead batteries, available **here**

it will be necessary to implement a returnability system that must be defined in the approved Master Plans.

Regarding institutional aspects, as in most countries in the region, the control capacities of the National Directorate for Environmental Quality and Assessment (DINAMA) are limited.

EPR elected system. Every importer or large consumer of LAB must have or adhere to a Master Plan approved by DINAMA, in accordance with the provisions of Decree 373/2003 that approves the Regulation of lead-acid batteries used or to be discarded[81]. This Decree provides the extended responsibility to the importer-manufacturer. For this purpose, those responsible must have or adhere to a management master plan approved by the Ministry that includes returnability and final destination (art. 2).

On the other hand, points of sale and distributors that have systems or reception centers that enable the return of the battery used and discarded by the consumer were established in a mandatory manner. Additionally, those who provide battery replacement service will have the duty to offer the user or end consumer the possibility of retaining the used battery, unless otherwise decided by the customer (art. 4).

Under article 8 it is required that the ULAB primary reception centers form part of at least one approved Master Plan and have DINAMA authorization, and through article 12 that transitory deposits also have DINAMA authorization. Battery recycling and management plants must have authorization from the current Ministry of the Environment (formerly the Ministry of Housing, Land Management and Environment (MVOTMA) (art. 13-15). Likewise, a special user or consumer[82] was defined, but it was never regulated (art. 6). The monitoring and control is carried out through the registration and mandatory declarations of the manufacturers and importers (art. 17). Regarding ULAB, there are 7 Master Plans, of which two are the most representative.

Challenges in implementation. The prohibition of entry of hazardous waste in the region is a central issue. It could be analyzed whether the entry of ULAB from Uruguay would contribute to reducing illegal trade. This was indicated for other waste streams in the MERCOSUR area, yet a solution has not been reached.

Other data: As in most of the countries in the region, waste management in Uruguay has a high level of informality. Specifically in the management of batteries, in 2019 a marked decrease in collection was identified (1,500 T in 2019), possibly due to diversifying towards other countries, especially Brazil.

[81] *Idem*

[82] Special user: Any natural or legal person, who acquires for their use or for non-commercial or professional resale, lead-acid batteries or electric accumulators, in an amount equal to or greater than that established by the Ministry of Housing, Territorial Planning and Environment, will be considered special users or consumers for the purposes of this decree.

INTERGOVERNMENTAL NETWORK
ON CHEMICALS AND WASTE FOR
LATIN AMERICA AND THE CARIBBEAN

UN environment programme