

## Improving Batteries Waste Management in India

a policy brief addressing the mismanagement of used lead acid batteries and land-filling of household (small) batteries in India: an urgent call for action towards sustainable circular economy

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### Batteries in focus

The modern world runs on devices, many of those functioning on battery technologies. Advancement in technologies, coupled with increasing income and market access is leading to a phenomenal growth in consumption of devices deploying battery technology. This growth is reflected in a huge US\$ 120 billion global battery market projection in 2019. Batteries have wide-ranging usage from IT equipment to cars and inverters, medical devices, remotes, toys, torches, etc.

The two broad categories of batteries are primary or non-rechargeable and secondary or rechargeable. Primary or disposable batteries include zinc carbon batteries, zinc chloride, alkaline batteries, button cell batteries and lithium batteries. Secondary batteries or storage batteries include lead-acid (Pb), lithium ion (Li-ion), nickel cadmium (Ni-Cd) and nickel metal hydride (Ni-MH). Primary dry cell batteries and lead acid batteries have wide usage in India. The world consumption of dry cell batteries is over 15 billion per year of which Indian consumption accounts for 15 percent with 2.7 billion pieces sold yearly. Indian lead acid battery market is also huge and is estimated to grow as high as \$8 billion by 2022 from \$4.47 billion in 2016 with a CAGR of 8.36 percent.

Toxics Link in its long-standing efforts to trigger sound management of hazardous waste and sustainable circular economy initiatives, has recently conducted two consecutive assessment studies on end of life batteries management in India. The focus was on household or small batteries and lead acid batteries (LAB).

## Why regulated management of these batteries is urgent?

Different batteries have different chemistries and hence different compositions. But most batteries have hazardous contents and valuable resources at the end of their life. Household batteries can be made of a number of different heavy metals and chemical compounds depending on their types and composition, like, zinc, cadmium, manganese, nickel, lithium, potassium hydroxide, zinc chloride, etc. A lead acid battery, on the other hand, is composed mainly of lead, sulphuric acid, and plastic, with lead being the dominant constituent.

The heavy metals, rare elements and alloys used in these batteries remain when they are disposed and can be profitably extracted in environmentally safe and sustainable ways. For example, for a 97 percent (of dry cell batteries) Indian consumption of zinc carbon batteries, an effective recycling can recover 15 thousand tonnes of zinc and manganese each and 10 thousand tonnes of steel every year from the discarded mass. Similarly, lead acid batteries lead the list of highly recycled consumer products globally with a 98 percent recycling rate. Lead can indefinitely be recycled without any or little reduction in quality, making it perfect for a circular economy. Recycling metals reduces

consumption of energy, water, landfill space and greenhouse gas emissions than mining and processing of metal ores. Lead and zinc are traditionally mined together and then processed separately to produce refined lead and zinc metals. Reportedly, use of 100 percent recycled zinc reduces the environmental load by 90 percent and the percentage savings of energy and CO<sub>2</sub> can be as high as 76 percent. In a time when we overshoot our annual resources on the earth by the seventh month of the year, such retrievals are critical.

On the other hand, inferior or unregulated recycling and dumping of used/end of life batteries or their waste parts in landfill can have huge detrimental impact on the environment. Landfilled or openly dumped batteries or their parts can potentially leach heavy metals, toxics and other hazardous substances into the soil and thereby seep through ground and surface water. Lead contamination of soil, water, air and direct exposure to lead can happen at any stages of informal lead recycling. The metals associated with batteries can cause neurological impacts, brain damage, kidney damage, developmental disorders and cancer.

## What is the management situation in India?

The usual practice in India to dispose small (household) batteries is to throw them in the common household dustbin along with other waste. Segregation of this domestic hazardous waste at the household level is almost nil. In absence of any proper collection, disposal mechanism or recycling infrastructure, these waste batteries are currently ending up in the landfills. According to the study done by

Toxics Link, there was informal recycling of these batteries being done in Delhi few years back, but due to pollution complains and reducing profitability, these operations have shut down. There are no formal infrastructures available in the country to recycle the dry cell batteries, particularly the primary or non-rechargeable ones which has the highest market in India. Hence, the current landfill load of dry cell batteries in India is almost equal to the consumption amount - a whopping 2.4 billion pieces annually.

For lead acid batteries, studies indicate that almost 90 percent of used lead acid batteries are getting recycled in the informal sector currently. Open disposal of battery electrolyte (sulphuric acid), open smelting of lead and indiscriminate and open dumping and disposal of furnace residues, waste components of batteries (like separators) are common informal sector practices across the country. The operations are often in or near residential settlements, causing more concerns of exposure to toxic pollution. Lead is known as one of the most toxic metal and is a cumulative toxicant that affects multiple body systems and is particularly harmful to young children.

## Regulatory provisions and the implementation status

Batteries (Management and Handling) Rules, 2001 and Amendment Rules, 2010 are the regulations dealing with recycling ULABs. The Rules had set 90 percent collection (of the batteries sold) targets to the manufacturers and importers from the third year of its (Rule) introduction. Our findings during this study on large quantities of ULABs reaching informal sector and getting recycled in the most rudimentary manner, is an indication of the

failure of this Rule. Lack of accountability from battery manufacturers as well as the regulatory agencies (SPCBs) point out towards the lax attitude of the key stakeholders in dealing with this critical waste stream. Legal framework for ULABs has led to some formal infrastructure and limited processing of these leaded batteries in clean channel.

However, these rules are only applicable for 'used, damaged and old lead acid batteries' and not to any 'primary or other secondary batteries'. The Solid Waste Management Rules, 2016 finds mention of 'used batteries' as domestic hazardous waste' clubbed with various other hazardous wastes. They are recommended to source segregate and treat in hazardous waste disposal facility. Setting up of waste deposition centres is also recommended for the domestic hazardous waste. But a separate segregation, recycling or extended producer responsibility (EPR) for these batteries is never mentioned in the rules. And in absence of that, the batteries are being disposed off as part of the mixed household waste, ultimately reaching the landfill.

Successful collection and recycling models for dry cell batteries are being pulled off in many European Union countries, USA, Canada, Japan, Australia, etc.

## What are our recommendations?

It is evident that there are serious gaps in the legislative framework, accountability of battery waste management and implementation of the Batteries Rules in managing ULABs in the current Indian scenario. Household batteries management

is unregulated in absence of any technology and the assigned responsibility. Battery waste and its management is a crucial issue and needs immediate attention for its potential to impact environment and health, prospects of resource recovery and the ever increasing consumption rate. Our recommendations to improve the situation are:

## LEAD ACID BATTERIES

Regulatory frameworks for batteries waste management need to be relooked at to create an inclusive, defined and accountable ecosystem for their sound management. Strengthening and stricter implementation, monitoring and compliance of existing regulations with heavy penalties for violations of rules is also important. The following provisions can be looked into:

- Extended Producer Responsibility(EPR) authorization and submission of annual EPR plan should be made compulsory for the Lead Acid Battery manufacturers. The plan shall comprise of the details of their collection and channelization system in place. Manufacturers with no EPR authorization should not be allowed to sell products in the Indian market. Recyclers should be part of this channelization system.
- Revised collection targets and its strict monitoring.
- The manufacturers, producers, importers, dismantlers and recyclers should be penalized on not meeting the decided target and for violation of any provisions under these rules.
- Recycling target, specifying lead recovery percentage, should also be mandated to ensure proper recycling of the batteries.
- The process of safe recycling and disposal of acid and other waste components shall be

recommended through official guidelines. Downstream recycling capacity shall be brought under EPR authorization and their monitoring ensured.

- It must also be ensured that the other recyclables and non-recyclables from lead acid batteries are effectively sanitised and sold to registered recycling units.
- Producers should be mandated to provide information on hazards of improper handling, disposal/recycling, instructions for proper handling, information on collection and take back systems to consumers through websites, toll-free numbers and other awareness initiatives.
- To promote circular economy green tax should be levied on manufacturers making batteries out of primary metals or a subsidy given to manufacturers reusing secondary or recovered metals to make new batteries.
- Push for an improved, convenient and regular collection system from dealers as this is the main leakage point.
- Identifying and closing down of informal recycling operations for over a prolonged period requires to be done in order to prevent them mushrooming repeatedly.

## DRY CELL BATTERIES

Small batteries have been given only a mention in the solid waste management rules and need to be expanded. It would be appropriate to cover management of different types of batteries under one comprehensive regulations, currently dry cell batteries are not covered under any rules.

- Dry cell batteries shall be defined and categorized in the regulatory instrument covering all areas of their applications, types and compositions.
- Extended Producer Responsibility for battery manufacturers shall be introduced

- for collection/take-back and proper channelization of end of life dry cell batteries to authorised recyclers with phase wise collection targets, mandatory authorization and annual reporting.
- Designated collection /drop off points for dry cell batteries shall be made available at publicly accessible locations/infrastructure such as schools, markets, petrol pumps, shopping malls, showrooms, etc. as part of the EPR plan.
- Disposal of dry cell batteries in landfills or by incineration shall be prohibited. Conditional disposal restriction exempting disposal of residues of any batteries post treatment and recycling can drive recovery facilities/technology investments
- Identification of recycling technology and standards of recycling shall be prescribed.
- Recycler registration for dry cell batteries should be introduced. Standards for recycling and disposal of batteries should be adopted.
- Demonstrated public education programmes along with public notifications should be carried out to sensitize community and other stakeholders and involve them in the collection chain.
- In order to achieve sustainable segregation, better resource recovery and lesser toxic impacts, upstream regulation shall be brought in for improved battery constituents, design and labeling requirements.
- A uniform, national labeling requirement for both the products containing batteries and the batteries itself mentioning the battery type, disposal criteria and recyclability should be mandated at production.
- Use of mercury in any form shall be prohibited from being used in any types of batteries.

## General

- Creation of independent body to carry out effectiveness evaluation of the rules at periodic intervals so that some of the gaps that come to fore are presented in the highest legislative body and remedial measures are initiated.
- State level assessments of battery waste management situation in the country, analysis of heavy metal contamination from battery waste of all potential environmental pathways (air, water, soil), human-health monitoring, etc. should be taken up.

## Source

The detailed reports on Lead Acid Battery and Household (dry cell) Batteries documenting the primary study, best practices and original sources are available as:

- **LOADED BATTERIES**, Mapping the Toxic Waste Trail, 2019. Priti Mahesh, Toxics Link. Weblink: <http://toxicslink.org/docs/Lead%20Acid%20Batteries%20Report.pdf>
- **DEAD AND BURIED**, A Situation Analysis of the Battery Waste Management in India, 2019. Priti Mahesh and Manjusha Mukherjee, Toxics Link. Weblink: <http://toxicslink.org/docs/HH-Battery.pdf>

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