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Comparative Regulatory Review

Assessment of Regulations on ULAB in Bangladesh, and Recommendations for Legislation

ESDO

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BLACKSMITH INSTITUTE

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Disclaimer

"This report is prepared based on secondary information, journal review and analyses, vigorous study of existing reports and online findings to ensure environmental protection by creating public awareness. It was supported and collaborated with UNEP and Pure Earth."

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This report is produced by ESDO in collaboration with Pure Earth. The overall objective is to find out gaps in the existing regulations and provide recommendations to fill in the gaps.

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EXECUTIVE SUMMARY

Lead-acid Batteries (LAB) and Used Lead-acid Batteries (ULAB) are some of the burning concerns related to environmental pollution and population exposure. These categories of batteries have long been used due to their efficiency to store energy for sufficiently long periods and also for their capacity to provide a high cranking power for short periods. Since LAB are recycled and reused in several sectors being termed as ULAB, the recycling is often associated with a great deal of lead pollution in soil, and water that ultimately causes harm to human health. A large number of contaminated sites are found in Bangladesh where ULAB recycling continues by both informal and formal sector. To address this huge potential health risk and environmental pollution, proper legislation and environmentally sound management (ESM) are high priorities at this point.

Ensuring economic growth, and industrialization, the environmental problems from LAB and its waste are the emerging threats to public health and environment in Bangladesh. The environmental policies for waste batteries are lagging behind the growth of the battery industry. The government authorities and environmental researchers have recognized the environmental problems caused by the waste LAB. However, some policies relating to the lead battery industry have been implemented to contribute to the development of waste battery policy in Bangladesh. This assessment presents the environmental problems associated with Lead and LAB in Bangladesh and evaluates the environmental policies of ULAB recycling and LAB management.

Based on the assessment objectives, the study addresses the following major questions:

- What are the environmental problems associated with Lead and ULAB in Bangladesh?
- What are the existing policies on LAB and ULAB recycling?
- What policies and regulations could be adopted to strengthen ULAB management?

This report aims to compile relevant information to provide an overview of the current situation of ULAB management in Bangladesh. It also establishes a baseline for regulatory review on LAB recycling.

Referring to the experience of other countries, it is clear that to achieve the environmentally sound management of ULAB in Bangladesh it is necessary to introduce effective legislation, regulations, and guidelines, as well as financial incentives and instruments that keep the LAB life cycle in a formalized licensed sector, that is overseen, with an active monitoring and enforcement regime for ULAB collection, handling, transporting, and end-life management. It is also suggested that policies are to be designed to follow take back mechanisms and the polluter pays principle as well as an extended producer responsibility (EPR) scheme, all of which are appropriate to improve the legislative framework. The occupational health hazards caused by improper ULAB handling, recycling and reuse should be taken into consideration along with immediate taking of adequate measures.

BACKGROUND on LEAD ACID BATTERIES (LAB)

In modern times, the use of the LAB is increasing due to the massive increase in the use of grid electricity and mostly for utility, transportation, industrial, commercial and residential sectors, which eventually results in a greater demand on electrical supplies, especially green solar energy and more LAB consumption to provide power when the sun sets or when there are supply outages. In turn, this increases in the demand for the energy storage in LAB which leads to more use of ULAB and makes it a fast-growing market, especially in Asian countries like Bangladesh, India, China, Vietnam, Indonesia, etc. This was exhibited in the increased global demand for the refined lead metal, which was estimated at 10.83 million tons in 2016[1] and up until 2020 over 12 million tons per annum.[2]

This project is focused on UNEP's project 5.lll "Accelerating the implementation of the chemicals, and waste multilateral environmental agreements, and achieving the targets of related sustainable Development Goals for improved human health and a clean environment". As part of the output 2 of the UNEP project "Technical assistance and capacity building on lead", this project will result in a national strategy for the ESM of ULAB in Bangladesh. This project will also contribute to the implementation of the UN Environment Assembly (UNEA) 3 Resolution 9 titled, "Eliminating exposure to lead paint, and promote the environmentally sound management of waste lead-acid batteries". Bangladesh lacs a coherent plan regarding the ESM of ULAB. ESDO, in collaboration with Pure Earth, a nongovernmental organization will channel these efforts, and develop a coordinated plan to implement an ESM plan for ULAB in the country. In addition, the International Lead Association (ILA), the Department of Geology of University of Dhaka (local partner of Pure Earth), the International Center for Diarrheal Disease Research', Bangladesh (icddr,b) and Stanford University will provide an in-kind contribution in the implementation of this pilot project in their capacities. ESDO has been selected as a lead partner for this pilot project based on its experience and expertise in addressing pollution problems in Bangladesh. As electricity is not supplied efficiently as per demand LAB is used for energy storage in Bangladesh. Another major sector, which is using LAB and producing ULAB, is the telecommunication sector. A recent study spotted 59 lead-contaminated locations out of 147 battery recycling zones in six divisions of the country, namely Dhaka, Rajshahi, Khulna, Chattogram, Rangpur and Mymensingh.[3]

These informal recycling practices result in population lead exposure and poisoning, with young children being particularly at risk. Undoubtedly, the government should pay more attention to this issue. Although the Ministry of Environment, Forest, and Climate Change (MoEFCC) has already published a gazette on Used Lead-acid Battery (ULAB) Handling and Management Rules in 2006, but this still needs strong enforcement to control the illegal and uncontrolled growth of informal sector recycling. In contrast, neighboring countries like India and Sri Lanka have already adopted required management rules, and guidelines for battery management, and Bangladesh is yet to establish a proper set of rules for this sector.

[1] https://apps.who.int/iris/bitstream/handle/10665/259447/9789241512855-eng.pdf;jsessionid=DE707557C9481D70B0254A6C19800F1A?sequence=1
[2] https://www.ilzsg.org/static/statistics.aspx
[3] http://www.newagebd.net/article/32824/lead-acid-battery-recycling-poses-health-hazard

CHAPTER 1: POLICY, REGULATORY AND INSTITUTIONAL FRAMEWORK ASSESSMENT

ESDO has conducted a regulatory review, through analyzing Bangladeshi laws and referring to the regulations of other relevant countries and has also made recommendations for improvements on ULAB management. A detailed draft on legal and regulatory framework of Bangladesh is provided in this report. These assessments have identified the gaps in the current regulatory and institutional framework that need to be addressed to ensure the environmentally sound management of chemicals, including lead battery waste.

1.1 Objective and Scope for the Review of Laws

1.1.1 Objective

The overall objective is to ensure the integrity of the environment and public health against the potential adverse impacts of leaded wastes along with the specific objectives to:

• Provide a current situation analysis of the management of ULAB in Bangladesh.

• Establish a baseline for a policy and regulatory review on LAB recycling, and the proper management of ULAB in Bangladesh.

• Refer the regulations of relevant countries.

• Prepare recommendations for legislative improvements in the LAB recycling and management rules of Bangladesh.

1.1.2 Scope

It provides an overview of the management of ULAB at various stages in the supply chain.

1.1.3 Need for the Review of Regulations

The Environment and Social Development Organization - ESDO in association with UNEP has conducted research and analysis of the current situation analysis and reviewed the existing practices for dealing with lead and ULAB at the national and regional levels. It is undeniable that a proper regulatory regime is needed for making a sustainable and safe functioning ULAB sector. Moreover, there is a specific need to address:

(a) The Mismanagement of Recycling:

There is no proper management of and implementation of the Rules relating to LAB and ULAB in Bangladesh. There are gaps in the 'Lead-acid Battery Recycling and Management Rules, 2006' and the government has the power to enact such Rules efficiently under the Bangladesh Environment Conservation Act 1995, section 20 (C) which states that "Government can make Rules to determine the safe procedures for the use, storage and transportation of hazardous substances". However, this Rule has set some standards for lead battery usage, disposal and retailing procedures.

(b) Safe Handling of Toxic Components:

ULAB contains certain toxic components such as lead and dilute sulfuric acid, which are required to be handled safely but which is not properly addressed in Bangladesh.

c) Lack of Environmentally Sound Recycling Infrastructure:

The existing recycling procedures in Bangladesh are not environmentally sound. The major dismantling operations are undertaken by the informal sector in a unsafe and hazardous manner.

d) Public Health and Environmental Exposure:

According to the findings of the Global Burden of Disease Study by the Institute for Health Metrics, and Evaluation, in Bangladesh- more than 38,000 deaths annually are attributed to exposure to lead— nearly 4.3% of all deaths nationally, making Bangladesh one of the most severely lead-impacted countries on the earth.[4]

1.2 Existing National Legislations

Bangladesh has a wide range of laws and regulations related to environmental protection and natural resources conservation, which will be relevant under this context. This Chapter has a summary of existing policies and regulatory frameworks (in place and under development) and relevant institutions involved in the Lead management in Bangladesh. It also provides a brief account of the existing gaps that need to be addressed to ensure compliance with the required actions for proper sustainable management.

The MoEFCC of the government of Bangladesh has already published a gazette on Used Lead-acid Battery (ULAB) Handling and Management Rules in 2006, where prior environmental certification before recycling any ULAB is mandated. It emphasizes that no outdated or ineffective battery can be stored or dumped in open ground, soil, water or waste disposal sites. It mentions that the battery users must handover used batteries to the dealers, retailers or distributors who are contracted with and to the government-certified recycling plants. The dealers, retailers or distributors must take the used batteries from the buyers when selling new batteries and send the ULAB to the certified recycling plants. Refusal to follow or comply with any of the above rules can result in sanctions. The government redrafted the 'Used Lead-acid Battery (ULAB) Handling and Management Rules' in 2018 and this latest draft is still under review to be updated by the concerned authority. It is also mentioned that in the case of importing batteries from abroad and at the beginning of the recycling process of an expired battery, taking permission from the MoEFCC is mandatory. Without its approval, the import and recycling of these batteries cannot begin. All LAB, either imported or local, must have written the Country Code Number, Serial Number, Company Code, Digital identification, and Bar Code Numbers onto the battery's body or case. The manufacturing company needs to receive a membership enrollment of the Accumulator of Battery Manufacturer and Exporters Association (BMB) and also prior taking of the 'No Objection Letter' from the ministry to start the recycling of ULAB.

The MoEFCC has published the National Environment Policy in 2018 which promotes the Polluter's Pay Principle, which holds the polluter liable for any infringement of the rules and

[4] https://doi.org/http://ihmeuw.org/3pgz (Institute for Health Metrics and Evaluation (IHME). (2017).)

imposes fines to the polluter (personnel or the company). It recommends following the 3R Principle, that is 'reduce, reuse and recycle', while using any resource. It also mentions to secure the health and safety of the employees and staff working in an industry, brick kilns, laboratories, educational institutes, the quality of the surrounding air quality must be ensured. The Policy recommends initiating sanitary landfill instead of selecting any site adjacent to water bodies for dumping. It stresses upon doing an Environmental Impact Assessment (EIA) (where applicable) before setting up any industrial operation; promoting research on developing environmentally friendly technologies; promoting zero-emission from industries through reuse and recycle of water and also by offering financial incentives to make available the necessary raw materials for zero-emissions. It also emphasizes on: implementing an internal Clean Development Mechanism; installing waste treatment facilities by every industrial unit by taking necessary measures on health and safety; doing third-party environmental audits and simultaneous online monitoring; promoting green industries; creating mass awareness about the harmful environmental impacts of industrial waste. National Chemical Substance Management Policy mandates the environmentally sound management of chemical substances.

Under Part-II of the **'Fundamental Principles of State policy'** of **'The Constitution of the People's Republic of Bangladesh',** Article 18A states that 'the State shall endeavor to protect, and improve the environment, and to preserve and safeguard the natural resources, biodiversity, wetlands, forests, and wildlife for the present and future citizens.' Thus, the constitutional provision shows the significance of environmental protection in Bangladesh. However, the fundamental principles of state policy (Article 8 to Article 25) are not judicially enforceable but 'shall be applied by the State in the making of laws, shall be a guide to the interpretation of the Constitution, and of the other laws of Bangladesh and shall form the basis of the work of the state and of its citizens' which is mentioned in Article 8(2) of the Constitution. Therefore, all Laws and Rules should be made in consonant with the Constitution.

In 'Dr. Mohiuddin Farooque vs Bangladesh (1996) 48 DLR(HCD) (page 438)[5], the higher judiciary pronounced that the 'Right to life' is not limited to the protection of life and limb but extends to the protection of health maintenance, and improvement of the public health by creating, and sustaining conditions of good health.' In this case it is declared that "right to life" includes right to fresh air and water and a situation beyond animal existence in which one can expect normal longevity of life. The case has referred Article 31[6] and Article 32[7] which are about safeguarding life and those Articles are judicially enforceable as fundamental rights under Part III of the constitution. Therefore, the state has the constitutional mandate to make Regulations regarding ULAB.

Though a directive on ULAB exists but apart from ULAB, there are nickel, cadmium, and other battery chemistries used in domestic and commercial appliances, which should also be strictly managed. Besides, there is a need for a massive comprehensive awareness-raising program with an emphasis on the segregation of wastes at the household level to promote efficient battery management.

[5] https://www.elaw.org/bd.farooque.FAP.1996
[6] http://bdlaws.minlaw.gov.bd/act-367/section-24579.html
[7] http://bdlaws.minlaw.gov.bd/act-367/section-24580.html

The National 3R (Reduce, Reuse, and Recycle) Strategy has been taken by the government, and it intends enacting appropriate rules and guidelines for 3R Separation of waste at source should be made mandatory and the industries need to pay (compensate) more for the generation of waste along with incentives for the generation of less waste as well as recycling should be introduced.[8]

A conducive policy package with strict regulation, together with incentives are required for the proper establishment of Environmental Management System (EMS) in the country. Awareness and capacity building programs along with cleaner technology transfer needs to be promoted.

Table 1: Major policies, Acts, and regulations related to waste lead and LAB management in Bangladesh.

Date	Title
	Policy
2018	National Environment Policy The policy promotes to reduce and ultimately phase-out of heavy metal (Lead, Mercury, and Chromium) uses in the Industrial Sector (Policy 3.15.7).
2011	National Science and Technology Policy This policy promotes national research activities for the development of the country. In this policy, research on "waste management" is emphasized under the area of "environmental science, and technology".
2010	National Industrial Policy This policy recommends the use of ESM and cleaner production practices amongst the industries, including waste lead management also.
2009	National ICT Policy This policy intends to adopt environment-friendly green technologies and to ensure safe disposal of toxic wastes through use of ICTs as environmental pollution is rising due to industrial and consumer wastes in Bangladesh. Its Theme 9.2 requires promoting entire environmental protection including land and water resources through the use of ICT tools.
2008	National Renewable Energy Policy This policy is promoting the production of biogas and other green energy from waste, and it also urges on providing incentives such as CDM to promote green energy projects.
2006	National Urban Policy CDM and recycling have been emphasized in this policy.
1998	Urban Management Policy Statement It recommends the municipalities for the privatization of services as well as giving priority to facilities for slum dwellers including the provision of fresh clean water supply, sanitation, and solid waste disposal.

[8] http://old.doe.gov.bd/publication_images/4_national_3r_strategy.pdf

	Acts
2018	Bangladesh Standards, and Testing Institution Act
2010	Environment Court Act
2006	Bangladesh Information and Communication Technology Act
2006	Bangladesh Labour Act
1995	Bangladesh Environment Conservation Act
	Rules
2015	Bangladesh Standards, and Guidelines for Sludge Management It recognizes lead and lead compounds as 'wastes having highly hazardous constituents'; requires initiating sludge treatment processes; and adds Lead batteries as hazardous waste under batteries and accumulators (1606)
2015	Bangladesh Labour Rules It directs to obtain environmental clearance certificate for waste disposal.
2011	Hazardous Waste and Ship Breaking Waste Management Rules The Rules enlisted ULAB and Unsorted used batteries in the hazardous material list, and also mentioned LAB plates and other lead scraps/ashes/residues which are not covered under the Batteries (Management, and Handling) Rules, 2001.
2006	Lead-acid Battery Recycling and Management Rules This Rules provides how to manage LAB and ULAB, especially by the buyer and the seller.
2005	National Solid Waste Management Handling Rules (Draft) It directs applying the 3R principle.
1997	Environment Conservation Rules It provides the standards of environment and sets the emission level of various wastes along with requiring to prepare EMP, doing IEE and EIA for specific activities in order to get environmental clearance certificate.
2019	Draft E-waste Management Rules, It covers various E-waste management issues including all kinds of electronic use components which are hazardous to health, and environment.
	Strategy
2010	National 3R Strategy for Waste Management LAB recycling by the formal and informal sectors and battery buy back for recycling are mentioned in it.
2009	Bangladesh Climate Change Strategy, and Action Plan This strategy emphasizes on taking actions by the government for the priority areas to combat climate change.
2005	National CDM Strategy (Draft)

	This strategy is promoting pro-poor CDM projects in the waste sector by harnessing carbon financing.
2005	Poverty Reduction Strategy Paper (PRSP) It promoes ESM. To improve the solid waste management situation with a special focusing on the segregation of waste at source along with promoting recycling, reduction and reuse of industrial and other solid waste, etc.
	Action Plan
2005	Dhaka Environment Management Plan Waste recycling has been promoted, less landfilling encouraged, ESM promoted among industries.
2005	Solid Waste Management Action Plan for Eight Secondary Towns in Bangladesh Under the Secondary Towns Integrated Flood Protection (Phase-2) Project of Local Government Engineering Department, this action plan was initiated. It emphasizes on the 4 R principle i.e., reduce, reuse, recycle and recovery of the waste.
1995	National Environnemental Management Action Plan (NEMAP) 3R Principle was promoted under the Sustainable Environment Management Programme (SEMP) of NEMAP.
	Other
2004	Dhaka Declaration on Waste Management by SAARC countries SAARC countries agree to encourage NGOs and private companies to establish community-based composting, segregation of waste at source, separate collection, and resource recovery from wastes with a particular focus on composting. These wastes include e-waste also.

1.2.1 Legal Instruments for Managing and Regulating Hazardous Chemicals (including Lead)

Bangladesh Environment Conservation Act (ECA), 1995

This Act is currently the main legislative framework document relating to environmental protection in Bangladesh and empowers the Department of Environment (DoE) to implement it. As per Section 4, the Director-General (DG) may take such measures as he considers necessary and expedient for the conservation of the environment, improvement of environmental standards, and for the control and mitigation of environmental pollution. For that, he may issue any necessary directions in writing to any person to discharge his duties under this Act; can give advice or issue directions regarding the environmentally sound use, storage transportation, export or import of hazardous substances (including lead and lead products). Section 6C directs to control the production, storage, transport, and disposal, etc. of hazardous waste; and the term 'hazardous waste' means, as per section 2(aaa), any kind of waste, due to its physical or chemical properties or contraction with other waste or substances that create toxicity, infection, oxidation, exploration, radioactivity, decay or other harmful effects to the environment.

Section 7 directs on taking the remedial measures and compensation for damaging the eco-system; and section 9 compels the person who is emitting excessive pollutants to mitigate the

same. In the event of accidental pollution, the DG may take control of the operation, and the respective operator is bound to help. The operator is bound to incur any costs for rectification and possible payments for compensation. The DG is in charge of issuing environmental clearance; can fine/penalize a company or person for emissions the exceed the standards or causing harm to the ecosystem, can take steps to identify contaminated sites for the protection of public health, can conduct research, collect, and publish/disseminate information for awareness, and provide education. Section 15 provides various penal provisions for non-compliance of any directions. The penalty for violating section 6C is fine of taka 2 to 10 lacs or imprisonment of 2 to 10 years or both.

Thus, this Act addresses many aspects of the environmental issues through its provisions including:

a) Declaration of ecologically critical areas, and restrictions on the operations and processes which can be carried or cannot be initiated in the ecologically critical areas;
b) Regulation in respect of vehicles emitting smoke harmful to the environment;
c) Environmental Clearance;
d) Power to entry and collect samples to assess standards for the quality of air, water, noise, and soils for different areas and for different purposes; and
e) Formulation of rules and declaration of environmental guidelines.

Environment Conservation Rules (ECR), 1997

The ECR 1997 is adopted under the ECA 1995. It details out the procedure of obtaining and renewal of “Environmental Clearance Certificate" for any industrial or other operations by categorizing activities under different color codes, namely Green, Orange-A, Orange-B and Red. For Orange-B and Red category operations, it is required to prepare and submit the EMP, IEE and EIA for the clearance from DoE. It also sets standards of the quality of air, water and noise and also mentions various waste emission limits, especially of atmospheric emissions of lead for industrial operations. There is plenty of scope to make Rules for the management of ULAB either under this Rules or through a separate rule.

Hazardous Waste and Ship-breaking Waste Management Rules, 2011

It has also been made under the ECA 1995. Lead and lead-based compounds have been recognized as hazardous substances under these Rules. It asserts that hazardous waste generating industries:

a) cannot dispose or sell their waste to anyone who does not have clearance,
b) cannot store waste for more than 90 days, and
c) must provide an annual report to the Director of the Waste Management Cell of DoE.

Rule 2 has defined ‘Hazardous wastes/Material as waste and also directs to follow the definitions of ECA 1995. This rule also conceives the establishment of a national committee on hazardous waste management, which will be responsible for determining the standards for the disposal of hazardous wastes, and for formulating policies on the sound management of hazardous waste.

Bangladesh Labor Act, 2006 and Rules, 2015

The law and its Rules oblige the employer to take measures for waste disposal, provide safety equipment to the workers. The Rules 2015 requires obtaining clearance certificate from

relevant authorities and to follow the ECA 1995 for environmental management. It has hazard exposure mitigation, training sessions and hazard minimization options.

Bangladesh Import Policy Order, 2015-2018

It has two parts. The Part A (List of controlled goods) states the types of banned and allowable insecticides/pesticides that can be imported. The Part B (List of prohibited goods) provides a list of the chemical insecticides, and industrial chemicals under the Stockholm Convention on Persistent Organic Pollutants (POPs) which are prohibited to import.

Bangladesh Standards, and Testing Institution Act, 2018

The BSTI sets out standards as to whether the product is suitable for local consumption, import and export. Many of Bangladesh's Standards for lead-added products (LAB, paints, etc.) have also set limits on the allowable concentration of mercury to be used.

Right to Information Act, 2009

This law allows a citizen to request and get public information from any government agency. The government agencies are required to appoint a Designated Public Relations Officers (DO or PRO) to fulfill such requests within a required time frame.

1.2.2 Non-regulatory Mechanisms for Managing Chemicals (including Lead)

National Environment Policy, 2018

The Environment Policy, 1992 is replaced by the new one in 2018. The major objectives of the current Environment Policy are to:

i) maintain an ecological balance, and overall development through protection, and improvement of the environment;
ii) protect the country against natural disaster;
iii) identify and regulate activities, which pollute and degrade the environment;
iv) ensure environmentally sound development in all sectors;
v) ensure sustainable, long term environmentally sound base of natural resources; and
vi) actively remain associated with all international environmental initiatives to the maximum possible extent.

The policy highlights public-private partnership for implementing strategies on environmental protection; promotes mass awareness for environmental protection; and identifies the scope for international, and multilateral cooperation in environmental science, research, and clean technology transfer. The policy also promotes to reduce and ultimately phase-out the use of heavy metal (Lead, Mercury and Chromium) in the Industrial Sector (Policy 3.15.7).; emphasizes prohibiting all activities which are harmful to public health and the environment (Policy 3.6.1); directs reflecting the provisions of the "Stockholm Convention, Minamata Convention, Basel Convention, Rotterdam Convention and Montreal Protocol", in the National Regulations (Policy 3.22.5). This Policy has given instructions to reduce other pollutants, such as radiation pollution (Policy 3.23.2) and chemical pollution (Policy 3.23.6); and to use 3R (reduce, reuse, and recycle) strategy for electronic waste management/E-pollution (Policy 3.27.7). It also instructs to make laws and regulations according to the needs of modern times to resolve environmental problems effectively (Policy 4.1). It has instructions to follow

international conventions and make laws accordingly (Policy 4.4). The has been adapted to provide compliance to the provision of 18A of the Constitution of Bangladesh (Policy 6.0). This Policy provides a chart for the "Implementation Plan/Activities" of various sectors to comply with the various policies mentioned in it. Accordingly, importation of chemical substances and manufacturing procedures will be monitored by the Ministry of Food, Ministry of Commerce, Ministry of Industries, BSTI, Food Department, Directorate of National Consumer Rights Protection, DoE and Ministry of Civil Aviation and Tourism. (Chart 3.22.1) The implementation of the Stockholm Convention, Minamata Convention, Basel Convention, Rotterdam Convention, and the Montreal Protocol should be initiated by the Ministry of Foreign Affairs, MoEFCC, Ministry of Industries and DoE (Chart 3.22.4). Furthermore, this Policy has been adopted to give a definite shape to the country's legal framework and this will be observed by the MoEFCC, Ministry of Law, Justice and Parliamentary Affairs, and other relevant ministries (Chart 4.1).

National 3R Strategy for Waste Management, 2010

It has emphasized the responsibility of industries to explore options/opportunities of reusing, recovering, and recycling of hazardous waste in an environmentally sound manner. It states that the DoE will develop an online tracking system for the movement of hazardous waste from generation to disposal/ recovery/ recycle stage. LAB recycling by formal, and informal sectors and battery buy back for recycling are mentioned in this strategic plan.

Bangladesh Standards and Guidelines for Sludge/Slag Management, 2015

It provides guidelines on the limits of use of lead in the sludge/slag as compost/fertilizer (900 mg/kg in sludge and 100 mg/kg in soil), and the testing of lead in all types of sludge before their disposal so that they conform to the disposal limits.

National Health Policy, 2011

This Policy aims to ensure the provision of basic health care services to all levels of the population in Bangladesh as required by the Constitution of Bangladesh. It requires to create awareness on the adverse health effects of lead exposure through conducting educational and prevention programs.

National Industrial Policy, 2010

The Policy directs the government to create awareness among the society on environmental protection, pollution, dumping of hazardous material (including lead) on land and water.

1.3 Institutional Framework for Managing Chemicals (including Lead)

The Ministry of Environment, Forests and Climate Change (MoEFCC)

The MoEFCC is responsible for ensuring environment conservation within the country. It is obligated to implement relevant legal instruments pertinent to environmental management. To achieve this objective, the Ministry's role is to create an enabling environment through policy and regulatory reforms for ensuring sound environmental, and natural resources management.

Department of Environment (DoE)

The DoE under the MoEFCC, according to the ECA1995, is nationally mandated to undertake various measures including giving advice, issuing directions to concerned persons regarding the environmentally sound use, storage, transportation, import, and export of a hazardous substance or its components. The mandate of the Department has expanded over time, evolving from an exclusive focus on pollution control to include natural resources, and environmental management, and now covering:

a) monitoring of the environmental quality,
b) promoting environmental awareness through public information programs,
c) controlling, and monitoring of the industrial pollution,
d) reviewing environmental impact assessments, and managing the environmental clearance process; and,
e) establishing regulations and guidelines for activities affecting the environment.

Bangladesh Standards and Testing Institution (BSTI)

The Government of Bangladesh has established the Bangladesh Standards, and Testing Institution (BSTI) under the Ministry of Industries in 1985. It is statutorily entrusted to test and assess the standard of various products under the BSTI Act of 2018, specifically with the responsibility to formulate national Standards for industrial, food and chemical products whilst keeping in view the regional and international standards. In 2018, the BSTI finalized a standard for the paint manufacturing industry setting the limit for harmful lead content of household paint at a maximum of 90 ppm (parts per million) which makes Bangladesh the only country with a mandatory standard for Lead Paint in South – East Asia.

Import and Export Control Department

This Department is under the Ministry of Commerce to regulate matters concerning exports and imports. It issues export and import certifications, advises the government on trade and tariffs. Besides, the Ministry of Commerce is accountable for the regulation and implementation of policies applicable to domestic and foreign trade.

National Board of Revenue (NBR)

The main accountability of the NBR is to collect tax revenues (primarily, Value Added Tax, Customs Duty, Excise Duty and Income Tax). It is responsible for the inspection of all chemical imports, record keeping of volumes and quantities of imported products into Bangladesh. It keeps a database of all legally imported products including lead, lead compounds (Comtrade). Its database can be shared with relevant agencies to keep track of all the lead/lead compounds uses within the country.

Directorate General of Health Services (DGHS)

Under the Ministry of Health and Family Welfare, the main duties of this Directorate are the implementation of different health programs, health management, planning and the execution of different policies through administration. It encourages the development and implementation of strategies to identify and protect populations at risk, such as developing guidelines for occupational health hazards in battery recycling facilities.

1.4 International Treaties

Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, commonly known as Basel Convention, is an international treaty that is designed to control and minimize any unnecessary movements of hazardous waste between nations and specifically, the Ban Amendment prevents the transfer of hazardous waste from the developed to the least developed countries (LDCs).

There is a scope to revise and update the Basel Technical Guidelines to improve the recycling of ULAB containing procedures for protecting human health and the environment and through 'which its member countries can be obliged to ensure that such wastes are managed and disposed of in an environmentally sound manner. As Bangladesh is a signatory to Basel Convention[9], the government can adopt its relevant provisions into national legislations from the Basel Annex-VIII of hazardous waste lists, the following applicable entries are pertinent to LAB:

- A1020 Waste having as constituents or contaminants of, excluding metal waste in massive form, any of the following: antimony compounds, beryllium, beryllium compounds, cadmium, cadmium compound, lead, lead compounds, selenium, selenium compounds, tellurium, tellurium compound.
- A1160 Waste LAB, whole or crushed.
- A1170 Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous. [Note: List B batteries include waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury].
- A1180 Waste electrical and electronic assemblies or scraps containing components such as accumulators and other batteries included in list A, mercury- switches, glass from cathode ray tubes and other activated glass, PCB- capacitors or contaminated with PCB.
- Annex 1 Constituents (e.g., cadmium, mercury, lead, PCB) to an extent that they exhibit hazard characteristics contained in Annex III.
- B1020 Clean, uncontaminated metal scrap, including alloys, in bulk finished form (sheet, plate, beams, rods, etc.) of Antimony scrap, Beryllium scrap, Cadmium scrap, Lead scrap (but excluding LAB), Selenium scrap, Tellurium scrap.
- B1090 Waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury.[10]

According to Brian Wilson, the Consultant of International Lead Association (ILA) – "The Basel Convention was never intended to reduce the import and export of hazardous waste, its initial intention was to control the movement so that it was environmentally sound. Not every country has the facilities to dispose of or recycle hazardous waste and so regional solutions are required and contained as part of the Basel Convention. What is clear under Article 4 is that if

[9] http://www.basel.int/?tabid=4499
[10] http://archive.basel.int/press/archive/recycling%20of%20old%20batteries%20english.pdf

a country has the necessary environmentally sound facilities to treat a hazardous waste – then that waste should not be exported. It is also illegal to send a hazardous waste to a country without the required treatment plants. This is now even stricter since the adoption of the Ban Amendment. Unfortunately, as years have passed some governments have misinterpreted the terms of the Convention and restricted movements that are necessary leading to a domestic informal sector operation."

1.5 Existing Legislations in International Context

In many countries, there are specific laws and regulations relating to lead and ULAB. 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' is the most appropriate guiding document and is followed by many countries. Depending on the situation, different countries have different legislations for ULAB management. A few of the major ULAB recycling countries have been mentioned below, and the links of these regulations are added in ANNEX-A:

1.5.1 India

The Ministry of Environment, Forests and Climate Change of India has adopted the Batteries (Management and Handling) Rules in 2001 and later amended in 2010. It is applied to every manufacturer, importer, reconditioners, assembler, dealer, recycler, auctioneer, consumer, and bulk consumer involved in the manufacture, processing, sale, purchase, and use of batteries or components thereof. In 2020, the Indian Central Government has drafted another proposed set of Rules for battery management, in exercising the powers conferred by sections 6, 8, and 25 of the Environment (Protection) Act, 1986 (29 of 1986), titled as "Battery Waste Management Rules, 2020".

This draft Rules have comprehensively determined the waste management and handling procedures of battery and also about the sectors involved in the process as well as responsible agencies, EPR authorization and responsibilities of various actors. The draft also suggests import, export, collection, customer clearance, registration and certification procedures. However, the current Rules and the proposed 2020 do not include a monitoring regime that provides for regular onsite inspections and environmental, health and safety audits.

1.5.2 Sri Lanka

The Minister of Environment and Natural Resources, Sri Lanka has framed regulations on batteries containing lead, mercury, nickel, cadmium, lithium, and electrolyte from batteries and accumulators, titled the 'National Environmental (Protection, and Quality) Regulations, No. 1 of 2008. In addition, Sri Lanka has a set of 'Technical Guidelines on the Management of Used Lead-acid Batteries' authorized by Central Environmental Authority in August 2005 under the Ministry of Environment and Natural Resources. Under the same regulation, the government has another safe management guideline on 'Guidelines for the Management of Scheduled Waste in Sri Lanka', which also mentions battery management protocols.

1.5.3 Indonesia

The Government Regulation of the Republic of Indonesia no.18/1999 on the Management of the Waste of Hazardous and Toxic Materials includes wet cell batteries as specific sources of hazardous waste. In non-specific sources of wastes, 'Lead Scrap' is also included under the Regulation.

1.5.4 EU

The European Commission, having regard to the Treaty on the Functioning of the European Union (EU), having regard to the Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators, and waste batteries and accumulators, and repealing the Directive 91/157/EEC (1), and in particular Article 12(6)(a) thereof, whereas "Recycling processes, as part of a sequence or as standalone processes, of waste lead-acid, nickel-cadmium, and other batteries and accumulators, should achieve the minimum recycling efficiencies as set out in Annex III, Part B to the Directive 2006/66/EC". The Commission Regulation (EU) No 493/2012 of 11 June 2012, under the Directive 2006/66/EC of the European Parliament and the Council, provides a detailed rule regarding the calculation of recycling efficiencies of the recycling processes of waste batteries, and accumulators.

1.5.5 USA

The U.S. federal law requires, with certain exceptions, used nickel-cadmium (Ni-Cd), and lead (Pb) batteries to be managed as Universal Waste (40 CFR Part 273). The Universal Waste Rule prohibits the handlers (e.g., contractors) from disposing of waste Ni-Cd and Pb batteries, and further indicates that these batteries must be sent for recycling.

1.5.6 Vietnam

The Law on Environmental Protection (LEP), 2019 of Vietnam, which has revised, and replaced the LEP 2005, has provisions regarding implementation of Basel Convention. This law has improvised provisions on importing of waste, and scrap, and Circular No. 34/2017/TT-BTNMT requires to take back, and to undertake the treatment of discarded products including accumulators and batteries.

1.5.7 Ghana

In Ghana ULAB and its recycling activities are classified as hazardous. Prior to 2016, the Environmental Protection Agency Act, 1994 (Act 490), the Environmental Assessment Regulations 1999, (LI 1652), Basel Convention and Bamako Convention used to regulate these recycling activities. In 2016, the Hazardous and E-Waste Management and Control Act, 2016 (Act 917) was passed as a domesticated version of the Basel Convention. The Act has covered two types of wastes in two parts, "Hazardous and other wastes (including biomedical wastes)" and "Electrical and Electronic Waste". In this Act, section 9 describes take-back schemes; section 11 is specifically about battery management; section 10 discusses on financing of waste management activities; sections 13-19 on requirements, application and permitting recycling facilities; section 21-22 regarding import-export controls and section 23 on consent for transit.

Ghana has the "Environmental Protection Agency" to combat the environmental issues of Ghana.[11]

1.5.8 Brazil

Brazil's National Environment Council (CONAMA) replaced the country's groundbreaking 1999 Resolution on the environmental management of batteries in 2008. The 1999 Resolution was a binding one and also referenced directly by several states and municipal laws in Brazil. The current Resolution requires registration, testing of batteries, making management plan, take-back plan and setting limits of compounds in LAB. It prescribes in Articles 7, and 8 to make the "environmentally adequate destination" of zinc-manganese, alkaline, LAB and small portable batteries; the responsibility of the respective manufacturer or importer and this responsibility extends to manufacturers and importers of products that contain such batteries in a non-removable fashion.

The term "environmentally adequate destination" is defined in Article 2 as "one that minimizes risks to the environment, and adopts technical procedures for the collection, receipt, reuse, recycling, treatment or final disposal in accordance with existing environmental law." The present Resolution replaces the limits of 1999 Resolution No. 257 for Lead-0.1% by weight (earlier 0.2%) for all batteries and accumulators with such chemistries; and for the LAB-mercury with 0.005% by weight and cadmium with 0.01% by weight.[12]

1.6 Comparison of Laws and Regulations with Relevant Countries

The SRO No. 175-Act/2006 (dated August 29, 2006) of Bangladesh has laid out instructions for the collection and recycling of used/non-functional batteries to control and prevent environmental pollution. This SRO has been adopted under section 6A of ECA 1995 and deals with manufacturing and processing of hazardous substances.[13] According to this SRO, no recycling of batteries is permitted without the environmental clearance from the DoE; and it restricts on improper disposal of used batteries or any parts of used batteries in open space, water bodies, waste bins, or other unlicensed disposal facilities. However, this SRO was amended in 2008 (SRO No. 29-Act/2008 dated February 11, 2008) to allow financial transactions on mutually agreed fixed costs (IDCOL, 2017). In 2018, another regulation was proposed and the DoE and Accumulator Battery Manufacturers & Exporters Association of Bangladesh (ABMEAB) organized a series of joint stakeholder meetings. Although a new proposed drafted copy of used lead battery management from DoE is in process, it is yet to establish a proper regulation and national guidelines for the ESM of ULAB. Therefore, referring and comparing to other countries' standards, there are no specific appropriate regulations in Bangladesh, to ensure ESM of ULAB, should adopt relevant legislation and management rules where necessary to end the gap. The best possible provisions of other countries could be taken into consideration while adopting the new regulation.

[11] http://www.epa.gov.gh/epa/
[12] http://www.temasactuales.com/temasblog/environmental-protection/brazil-adopts-new-battery-rules/
[13] Lead-acid Battery Recycling and Management Rules 2006

CHAPTER 2: ULAB GENERATION & MANAGEMENT: GLOBAL & NATIONAL

2.1 The ULAB Scenario

2.1.1 The Global Situation of LAB

Currently, more than 86% of the global demand and consumption for lead is for batteries and they are mainly used in motorized vehicles, for the storage of energy generated by photovoltaic cells, wind turbines and for back-up power supplies. The increasing demand for motor vehicles as countries undergo economic development and the growth in the use of renewable energy sources with the need for storage batteries is directly proportional to the increasing demand for LAB (WHO report)[14]. The global LAB market size is expected to reach USD 93.04 billion by 2027, registering a CAGR of 5.9% over the forecast period, according to a new report[15]. LAB is expected to witness a significant rise in demand due to their increasing use in various industries including oil and gas, nuclear power, electricity generation, gas turbine, hospitality, transport infrastructure, manufacturing, construction, mining, and off-grid renewable. Moreover, advantages associated with these batteries, such as durability, high voltage capability, low-cost, and simple manufacturing process are expected to increase the demand.

Recent research segmented the global LAB market based on the product, application, construction method and region:

Segments (Revenue, USD Million, 2016 - 2027)	**Product, Application, Construction method and Region**
LAB Product Outlook	➢ SLI ➢ Stationary ➢ Motive
LAB Construction Method Outlook	➢ Flooded ➢ VRLA
LAB Application Outlook	➢ Automotive ➢ UPS ➢ Telecom ➢ Electric Bikes ➢ Transport Vehicles ➢ Others
LAB Regional Outlook	• North America - U.S.A • Europe- Germany, U.K. Italy and Russia • Asia Pacific- China and India • Central & South America- Brazil • MEA- South Africa

[14] https://apps.who.int/iris/bitstream/handle/10665/259447/9789241512855-eng.pdf;jsessionid=DE707557C9481D70B0254A6C19800F1A?sequence=1

[15] https://www.grandviewresearch.com/press-release/global-lead-acid-battery-market#:~:text=The%20global%20lead%20acid%20battery,by%20Grand%20View%20Research%2C%20Inc.&text=Lead%20acid%20battery%20is%20widely,power%20to%20start%20the%20engine.

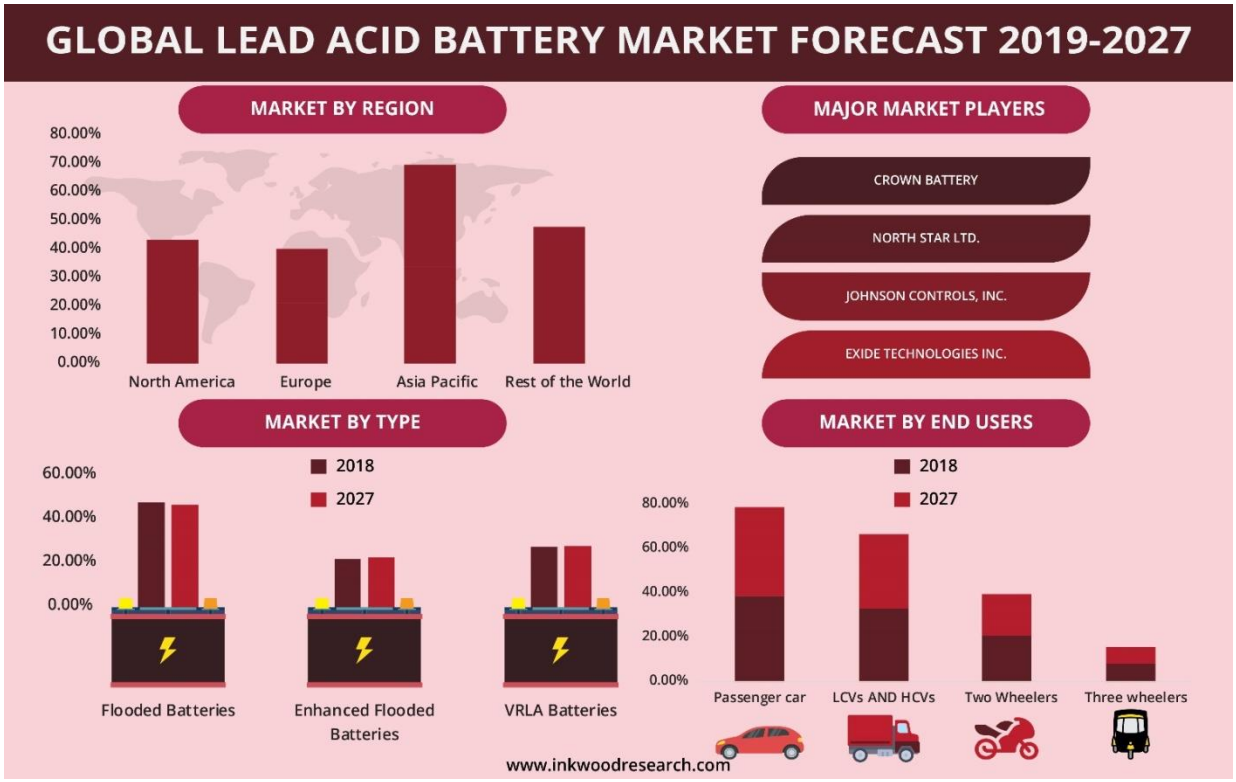

Figure 1: Global LAB market forecast 2019-2027[16].

The Asia Pacific region is the largest market, as well as the fastest growing region for the LAB market. According to the statistics of the Bureau of Transportation for China, which is the largest automobile producing country across the globe, the automobile sector has been on an upsurge in India because the country is leading in terms of sales of two-wheeled vehicles that surpassed that of China by 2015. The presence of many multinational organizations such as Honda and Toyota in Japan has also fueled the demand for LAB, as they are used in both the traditional multi-systems cars and micro-hybrid cars.

2.1.2 Recycling and Reusing Practice of LAB

In Dhaka City, the most prominent battery recycling and reusing areas include Dholaikhal, Doyagonj, Sadarghat, Kakrail and Mirpur. These areas were selected for a study;[17] and a survey was done, involving and identifying approximately 106 battery recycling shops and of them 55 shops were surveyed in the five specified locations of Dhaka city. The outcome of this study shows:

i. From this study, two recycling process were found- Direct and Indirect recycling process;
ii. batteries used in ships, vehicles, generators, IPS, UPS, the solar panel are recycled;
iii. recycled batteries cost 30-35% of new battery;
iv. direct recycling process is not performed in a sustainable way;
v. both shopkeepers and customers are mostly unaware of their contribution to environmental deterioration through this process; and

[16] https://www.inkwoodresearch.com/reports/lead-acid-battery-market/
[17] https://www.researchgate.net/publication/314872550_Recycling_and_Reusing_Practice_of_Lead_Acid_Battery_in_Dhaka_City

vi. the monthly collection and selling amount of LAB in each shop was determined from the survey.

In Dhaka city, battery waste reusing and recycling is mostly dealt with by the informal sector with suboptimal procedures resulting in lower recovery rates and dangerous exposure to the environmental and health risks. In this paper, a sustainable recycling model is proposed for recycling and reusing of the LAB. With adequate technology, training and with support of regulatory frameworks battery recycling activities can positively contribute to the conservation of natural resources, energy savings, in reducing toxic gases and in the development of green technologies.

2.1.3 Registration of dealers of LAB

All dealers of LAB, in India are required to register with the Board of Waste Management Cell. Applications are to be made online and a copy of the online application and a copy showing the payment of application fees are to be submitted to the Waste Management Cell of the Board at Paribesh Bhawan, Saltlake, Kolkata; and the application fees payable are Rs 7150/- for five years.[18] However, the Bangladesh government has provided certain forms for registration which is prerequisite for LAB and ULAB. These forms impose obligations onto the concerned party before dealing with LAB and ULAB.[19]

2.2 Consequences of Poor Management of ULAB and Its Waste

In many lower-income countries, ULAB recycling and smelting operations are conducted in the open air, sometimes in densely populated urban areas and often with few (if any) pollutions control mechanisms. Inappropriate recycling operations release considerable amounts of lead particulates and fume into the atmosphere. The dust eventually deposits onto the soil, into water bodies, and other surfaces, which cause negative impact on environment and human health. According to the Centers for Disease Control and Prevention (CDC), an elevated blood lead level (BLL) is defined as ≥ 10 μg/dL[20]. In children, BLLs as low as 5 μg/dL or even lower, have been associated with developmental growth delays, deficits in behavioral functioning, decreased stature, diminished hearing acuity, and difficulty in learning [1]. A 1 μg/dL increase in BLLs is associated with a 3.32-point decline in cognitive functioning in children ages six months to three years and a 2.47-point decline in children ages three to five-years-old. BLLs ≥ 70 μg/dL in children should be considered a medical emergency [2]. This level of lead can cause serious health issues, such as seizures, coma, and death. A high, toxic dose of lead poisoning may result in emergency type symptoms. These include severe abdominal pain, cramping, vomiting, muscle weakness, stumbling when walking, seizures, coma, and encephalopathy. In Bangladesh, an estimated 6.9 million children from 5–14 years old (12.9% of the total labor force) are engaged in physical labour [3]. They are exposed to more than 200 hazardous, and risky conditions, including welding, car repairs, lead melting, ship breaking, and pottery glazing, all of which are likely sources of lead poisoning. Common sources of lead

[18] http://www.wbpcb.gov.in/pages/display/127-registration-of-dealers-of-lead-acid-batterries
[19] https://dpccocmms.nic.in/SPCB_DOCUMENTS/battery_updated.pdf
[20] https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6247a6.htm#:~:text=CDC%20has%20designated%2010%20%C2%B5g,the%20United%20States%20(2).

are house paint, toys, household items, jewelry, pottery, certain contaminated spices and some traditional ethnic medicines.[21]

Air lead levels were recorded as being very high in Dhaka, Bangladesh between 1997–2000. In a cross-sectional study of 49 children from three areas in Dhaka, the mean ± SD of blood lead levels was 17.6 ± 4.9 μg/dL[22]. A study conducted on 408 pregnant women, and 331 children in the rural Chandpur district and it concluded that rice might be an important source of lead due to contamination from agrochemicals [4]. The median rice lead concentration from 63 households was 0.013 μg/g; based on an estimated consumption of 0.5 kg rice per day, the median intake of lead from rice alone would be 6.5 μg/day, exceeding the established maximum daily intake limit set by the US Food and Drug Administration in 1993. The 2013 Munshiganj study identified the spice turmeric as a potential exposure route since 8 of 18 samples contained more than 100 μg/g Pb [6].

People in Bangladesh can become exposed to lead through occupation and environmental sources. This mainly results from:

1. Inhalation of lead particulates generated by burning materials containing lead, for example, during smelting, recycling, stripping leaded paint and using illegal leaded gasoline or leaded aviation fuel;
2. Ingestion of lead-contaminated dust, water (from old leaded pipelines) and food (from lead-glazed or lead-soldered containers).

Young children are particularly vulnerable to lead poisoning because they absorb 4–5 times more ingested lead than adults from a given source. Hand and-to-mouth behavior result in their mouthing and swallowing lead-containing or lead-coated objects, such as lead in metal, and plastic toys, especially imported toys, antique toys, toy jewelry, contaminated soil or dust, and flakes from decaying lead-containing paint. This route of exposure is magnified in children with a psychological disorder called ‘pica’ (persistent, and compulsive cravings to eat non-food items), who may, for example, pick up and eat, leaded paint from walls, doorframes, and furniture. The problem of lead poisoning in Bangladeshi children was high, with 39% of the study children having elevated BLLs [2].

CHAPTER 3: CONCLUSIONS

LAB is widely used, dependable and inexpensive. Lead from these batteries can contaminate the surrounding ecosystem due to improper recycling or disposal and contribute to lead poisoning. Lead poisoning is an important public health issue that can cause adverse human health impacts. Today, most of the leaded products involved in global commerce are obtained from recycled ULAB. Currently, there are thousands of small to medium-sized workshops that service vehicles in Bangladesh. As a result, the use of highly toxic and hazardous materials, such as paint, and solvents, has been gradually increasing. Due to the small size and limited

[21] https://www.newagebd.net/article/93740/hidden-impact-of-lead-poisoning

[22] Woo MK, Young ES, Mostofa MG, Afroz S, Sharif Ibne Hasan MO, Quamruzzaman Q, Bellinger DC, Christiani DC, Mazumdar M. Lead in Air in Bangladesh: Exposure in a Rural Community with Elevated Blood Lead Concentrations among Young Children. Int J Environ Res Public Health. 2018 Sep 6;15(9):1947. doi: 10.3390/ijerph15091947.

resources of these auto bodies and auto repair shops, the hazardous substances are often mishandled and improperly disposed of into the environment. Therefore, Bangladesh needs proper guidelines to combat these issues. Though Bangladesh has ECA 1995 which has authority and responsibility to conserve environment, it does not provide any distinct regulations related to LAB or ULAB; which means that there are prevalent health and environmental risks that are not necessarily or adequately covered by the legislation. Moreover, the 2006 SRO does not properly mention any specific prosecution provisions for non-compliance with ESM of ULAB processes and it also does not mention the procedure to deal with ULAB.

CHAPTER 4: RECOMMENDATIONS

As Bangladesh has yet to establish a strong regulatory framework and national guidelines for ULAB management, it has become mandatory to impose proper legislation for handling, transporting and end life management systems of battery. Other countries like India, Sri Lanka have already adopted mandatory regulations and technical guidelines for battery recycling and battery waste management, so Bangladesh should consider taking necessary steps in this regard. There are only a few sectors included in Bangladesh SRO-2006 (Amendment 2008) on LAB which directs the battery manufacturers to abide by DoE guidelines as stipulated through the issuance of an Environmental Clearance Certificate.

Furthermore, the following recommendations are preferred to both regulate and manage ULABs in Bangladesh:

Amendment of legislation:

- Bangladesh is a signatory of both the Basel Convention and the Rotterdam Convention. As a signatory state, it is the prime responsibility of Bangladesh to implement relevant Articles of these two conventions into its national legislations. While framing new Rules in respect of ESM of LAB and ULAB, it should consider to reflect the necessary provisions of these two conventions.
- There are no proper and specific provisions as to prosecution in the existing SRO and that deficiency needs to be addressed accordingly. However, the DoE has committed to follow ESDO's guidelines and recommendations regarding ULAB management. Therefore, necessary change in the SRO is required.
- The SRO should be published in English for the battery importer of foreign countries. There is a good scope for exporting ULAB in the foreign market. For this, Bangladesh needs to upgrade its Nations Regulations with other countries. As English is a widely spoken language, these Regulations need to be published in English also.
- Child involvement in ULAB should be restricted. There needs to be an age limit for working in ULAB processing units. As Bangladesh has age limitations for various working sectors like, the garment sector or other industrial sectors, ULAB processing sectors should be identified like this to put an age bar of the workers.

Awareness raising and educational activities:

- Stakeholders should take steps for a more effective program regarding ULAB management. They can arrange a workshop, seminar, mobile campaigns for mass population to create awareness and educate regarding the health issues of ULAB. Moreover, they can use social media and print media or both for awareness raising.
- Educate people about the ULAB recycling process. This process can be done in various ways like, advertisements in social media, creating infographics, banners, posters etc. Seminars and workshops can also be arranged with local people especially people who have zero knowledge about it. Also, the hazardous effects of ULAB can be mentioned in children's textbooks so that they can learn about ULAB issues from their early ages.

Implementation and monitoring Scope:

- It is absolutely required to promote the ESM of ULAB processes in Bangladesh and for that the situations of other countries should also be taken into consideration. Appropriate environmentally sound technologies and procedures should be implemented where possible. There is a need to focus on an incentive scheme to promote ULAB process. And all of these should be backed by relevant legal instruments which is still lacking.
- Battery collection processes should be based on 'One Stop Service' where these can be stored in a specific area. As ULAB is connected with hazardous components, its processing should be done in a specific area which should be kept free from the local populations. Also, there is a need for limited processing units where batteries will be collected.

Assessment and gap identification:

- It is also required to implement the existing regulations and most importantly to find out the loopholes of the regulations for improvement. Bangladesh has some legislations regarding ULAB management. However, there is a little scope for ESM in ULAB management under the existing legislations. Therefore, those loopholes should be identified and targeted as early as possible for improvement. This can be done with the help of the DoE as it has already taken an initiative to amend the SRO 2006 to make it clearer and more concise.

Bangladesh has Constitutional mandate as well as legal obligation to protect 'right to life' and 'right to the safe environment'. It is impossible to expect a healthy life if lead poisoning from informal ULAB recycling continues the way it is happening currently and it is putting human and animal life in major threat. Therefore, Bangladesh government should include ESM in its national regulations and legislations for regulating unauthorized ULAB recycling. Bangladesh government may have to follow the UNEP Technical Guideline and Basel Convention Regulations during formulating the final draft of the amended version of SRO on ULAB management in Bangladesh.

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National Action Plan and Guidelines

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National 3R Strategy for Waste Management, 2009

National Strategy for Sustainable Brick Production in Bangladesh, 2017

Legislations, Rules, Orders and Policies

Environment Conservation Rules, 1997

Hazardous Waste and Ship-breaking Waste Management Rules, 2011

Biomedical Waste Management Rules, 2008

Bangladesh Labor Act, 2006

Import Policy Order, 2015-2018

National Environment Policy, 2018

National Health Policy, 2011

National Industrial Policy, 2010

ANNEX-A

Links of the rules for LAB Management of different countries:

1. **India:** Battery Waste Management Rules, 2020 - https://www.eqmagpro.com/wp-content/uploads/2020/02/Battery-Waste-Management-Rules-2020-draft.pdf
2. **Sri Lanka-** Technical Guidelines on Management of Used Lead-acid Batteries - http://www.cea.lk/web/images/pdf/Battery_waste_Guidelines.pdf
3. **Indonesia-** Waste & hazardous substances - https://www.ecolex.org/details/legislation/government-regulation-of-the-republic-of-indonesia-no-18-of-1999-on-waste-management-of-hazardous-, and-toxic-materials-lex-faoc036549/
4. **EU-** Recycling processes which, as part of a sequence or as standalone processes, recycle waste lead-acid, nickel-cadmium, and other batteries, and accumulators - https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32012R0493&from=EN
5. **USA-** Universal Waste Rules - https://www.call2recycle.org/recycling-laws-by-state/ & https://www.epa.gov/hw/universal-waste
6. **Vietnam-** Law on Environmental Protection (LEP) - https://www.env.go.jp/en/recycle/asian_net/Annual_Workshops/2017_PDF/Day1_S1/S1_01_Viet_Nam.pdf