

## **E Case study: Mexico/ Lead Battery Recycling**

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#### **E.1 Background and Objectives**

Lead batteries are widely used in vehicles, energy storage for solar systems, wind power, telecommunications, and data centers. Due to the current expansion of these market segments, the industry is growing rapidly around the world. For example China experienced a 133% increase in production of lead batteries between 2004 and 2010, making it the world's largest producer.<sup>i, ii</sup> Approximately 80% of lead produced worldwide goes into batteries.<sup>iii</sup> Unlike most hazardous waste, used lead batteries are almost always recycled as this is a profitable enterprise throughout the world. Unfortunately, much of this is done in a primitive fashion by individuals melting batteries on an open fire. Even in formal recycling plants the efficiency and pollution controls vary greatly and there are thousands of very small processors that are extremely polluting.

The lead battery recycling industry is a significant source of lead exposure throughout the developing world. A review article summarizing published studies from 37 countries found elevated lead exposures inside these plants as well as in surrounding communities. The average blood lead level for workers in battery recycling plants in developing countries is 64 micrograms per deciliter ( $\mu\text{g}/\text{dL}$ ) and air concentrations that exceed the US occupational Safety and Health Administration's permissible exposure limit have been reported. The average blood lead level in children residing near these facilities is 19  $\mu\text{g}/\text{dL}$ , or approximately 13 times higher than background levels in children in the US.<sup>iv</sup>

The Basel Convention restricts the transboundary shipment of used lead batteries, but there is considerable legal and illegal trade of used lead batteries around the world. Used lead acid batteries (ULABs) exports from the U.S. to Mexico have increased dramatically since 2008 following regulatory changes further restricting airborne lead emissions in the U.S. The transboundary shipment of used lead batteries between these countries is governed by the Organization for Economic Cooperation and Development (OECD), the Basel Convention and the [La Paz Agreement](#).

Under all of these agreements, ULABs are considered to be hazardous waste and the receiving country must provide consent before they can be imported. The Basel Convention prohibits countries from exporting hazardous waste with few exceptions. Similarly, a 1986 OECD Decision on Exports of Hazardous Wastes restricts exports of hazardous waste to non-OECD

countries unless specific provisions are in place including a requirement that the exporter demonstrate the adequacy of the disposal facility.

Although the U.S. has not ratified the Basel Convention, most of its trading partners are not allowed to import hazardous waste from the U.S. in the absence of an appropriate Article 11 Agreement under the Convention<sup>1</sup>. Since the 2001 Amended OECD Decision<sup>2</sup> qualifies as an Article 11 Agreement under the Basel Convention, it guides the U.S. actions in regards to exporting hazardous waste. The La Paz Agreement also qualifies as a direct Article 11 Agreement between the U.S. and Mexico.

In 2010, the U.S. EPA revised their hazardous waste regulations to incorporate the requirements of the 2001 OECD Decision. However, since ULABs are destined for recovery, they are not handled as strictly under the EPA regulations as other hazardous wastes destined for disposal with respect to manifesting, packaging and transport. Under this regulation, U.S. companies exporting used lead batteries for reclamation are exempt from waste manifest requirements that would normally track hazardous waste to its ultimate destination. The OECD Decision includes requirements for notification and consent, movement documents (similar to waste manifests), and certificates of recovery from the recycling facility. However, under the U.S. EPA's 2010 regulations, there are five OECD countries, including Mexico, to which U.S. exporters can send shipments of batteries for reclamation without providing any movement documents or tracking information.

Due to flaws in the notification system and lax enforcement, many unauthorized shipments of ULABs are making their way into Mexico to both authorized and unauthorized recycling facilities. For example, in 2011, Mexican authorities stopped a U.S. truck in Chihuahua that was carrying 1,800 loose lead batteries that were leaking sulfuric acid in the inside of the trailer. The truck driver had a copy of a manifest that said the batteries were going to an authorized battery recycler in Puebla, but stated that he was delivering them to an industrial facility in Guanajuato.<sup>v</sup>

As of 2011, there were twenty-one authorized battery recyclers in Mexico ([http://tramites.semarnat.gob.mx/index.php?option=com\\_wrapper&view=wrapper&layout=edit&id=443](http://tramites.semarnat.gob.mx/index.php?option=com_wrapper&view=wrapper&layout=edit&id=443)) with a capacity of over 800,000 metric tons. The battery recycling industry in Mexico, however, is not well regulated and enforcement is weak. Reported emissions from lead battery recycling plants in Mexico are approximately 20 times higher than from comparable plants in the U.S.

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<sup>1</sup> **Basel Convention ARTICLE 11 BILATERAL, MULTILATERAL AND REGIONAL AGREEMENTS:**

1. Notwithstanding the provisions of Article 4 paragraph 5, Parties may enter into bilateral, multilateral, or regional agreements or arrangements regarding transboundary movement of hazardous wastes or other wastes with Parties or non-Parties provided that such agreements or arrangements do not derogate from the environmentally sound management of hazardous wastes and other wastes as required by this Convention. These agreements or arrangements shall stipulate provisions which are not less environmentally sound than those provided for by this Convention in particular taking into account the interests of developing countries.

2. Parties shall notify the Secretariat of any bilateral, multilateral or regional agreements or arrangements referred to in paragraph 1 and those which they have entered into prior to the entry into force of this Convention for them, for the purpose of controlling transboundary movements of hazardous wastes and other wastes which take place entirely among the Parties to such agreements. The provisions of this Convention shall not affect transboundary movements which take place pursuant to such agreements provided that such agreements are compatible with the environmentally sound management of hazardous wastes and other wastes as required by this Convention.

<sup>2</sup> **Guidance manual for the control of the transboundary movements of recoverable wastes at:**

<http://www.google.de/url?q=http://www.oecd.org/dataoecd/57/1/42262259.pdf&sa=U&ei=J1DYT56bBaX64QSC0jTAw&ved=0CBMOFjAA&usq=AFOjCNGA9-tE3MA5-cTHvc6a-F0Xc-3NQ>

Occupational exposures in these plants are three times higher than those in the U.S.<sup>vi</sup> In addition, smaller, unauthorized plants rely on manual labor to dismantle batteries and have even less pollution control technology in place.

## E.2 Recommended Approach

Hazardous waste regulations and agreements governing international trade for wastes destined for recycling are failing to account for the disparities in environmental and occupational regulations governing the recycling processes and emissions. Hazardous waste laws and informed consent provisions are insufficient to track shipments to authorized recycling facilities.

The most important action that is needed to address the problems identified is to improve Mexican environmental regulations pertaining to the battery recycling industry in order to put them on par with U.S. regulatory requirements. Promulgating such standards in Mexico would be a first step in reversing the current incentives to export ULABs to take advantage of their weaker laws. In many cases there are legal requirements to promulgate regulations that cover aspects of lead battery recycling, but these efforts have stalled in the Mexican bureaucracy. Table 1 details the discrepancies between some of the key standards in the U.S. and Mexico.

Table 1. Summary of Mexico and U.S. Lead Standards			
Standard	MEXICO		UNITED STATES
	Limits		Limits
Occupational Airborne Lead Exposure Limits	150 µg/m <sup>3</sup> (8 hrs per day/40hrs weekly) <sup>vii</sup>		50 µg/m <sup>3</sup> (averaged over an 8-hour period) <sup>viii</sup>
Occupational Blood Lead Level (employee removed from exposure)	N/A		50 µg/dL <sup>ix</sup>
Ambient Lead Air Quality Standard	1.5 µg/m <sup>3</sup> (three month arithmetic average) <sup>x</sup>		0.15 µg/m <sup>3</sup> (rolling 3-month average) 1.5 µg/m <sup>3</sup> (quarterly average) <sup>xi</sup>
Drinking Water Standard	50 µg/l <sup>xii</sup>		15 ppb <sup>xiii</sup>

The current gaps in governing regulations for this industry appear to be growing wider as more restrictive requirements in the U.S. come into force. For example, the U.S. EPA finalized regulations for lead emissions from secondary lead smelters in January 2012. The new emissions standard of 0.2 milligrams per dry standard cubic meter (mg/dscm) per stack at new facilities and an average of 0.2 mg/dscm (with a maximum of 1 mg/dscm) at each stack for existing facilities is ten times lower than the previous standard from 1997. There are no similar restrictions on emissions in Mexico. Similarly the ambient air standard for lead in the U.S. was recently lowered by 90%. In sum, these requirements are forcing lead battery recycling facilities in the U.S. to invest significant funds in improving pollution controls.

Because U.S. exporters of ULABs to Mexico are exempt from manifest requirements, there is no effective means of tracking shipments of ULABs from US exporters to Mexican recycling plants. Therefore, the system does not account for used lead batteries going to unauthorized or inadequate facilities. The notification procedures that are in place provide information on anticipated quantities of exports and their destination. In addition, annual reports must provide data on actual exports that have occurred, but since the reporting periods do not have to match, the resulting data is not very useful for tracking purposes. In fact some companies that provided notices of intent to export never provided reports of actual exports leaving regulators to wonder if these shipments were never made or just never reported.

U.S. businesses are exporting smaller quantities of ULABs to at least 30 other developing countries, but information that was obtained from U.S. EPA indicates that they are not receiving reports for most of these shipments. U.S. customs data provides information about total quantities of exports to individual countries, but not about the ultimate destinations of these exports. The Mexican regulations do not provide for tracking either since they only require notification of the intent to import, but not actual quantities shipped.

### **E.3 Conclusions and Lessons learned**

The disparity between regulations in Mexico and the U.S., and the even larger differences in actual performance in key environmental measures, are resulting in unnecessary lead contamination and exposures in Mexico. In addition, the current system for tracking the export of used lead batteries to Mexico is insufficient to ensure that these batteries are actually received at licensed recycling facilities. The current notification system also fails to even capture all of the trade between these two countries.

[The Commission for Environmental Cooperation \(CEC\)](#) was established under a side accord to NAFTA to specifically address environmental issues of mutual concern. In February 2012, the CEC Secretariat announced that it would begin an independent investigation into the environmental hazards and public health issues associated with the transboundary movement and recycling of ULABs in North America. This effort grew out of concerns raised with the dramatic increase in exports of used lead batteries from the U.S. to Mexico since 2008. The CEC's purpose in generating this report is to address the management of spent lead-acid batteries in order to protect human health and the environment in the U.S., Mexico and Canada.

The CEC's final report will also include information on:

- the transboundary shipments of ULABs;
- the current status of relevant environmental and health regulations, implementation and enforcement; and
- opportunities for improving the environmentally sound management of ULABs.

This effort by the CEC is a first step toward better defining the issues and to help frame recommendations to improve the management of used lead batteries. However bridging the gap in environmental regulations, and the actual performance of lead battery recycling plants in the U.S. and Mexico, is likely to take a considerable amount of time. In the interim, it will be necessary to control ULAB recycling by strengthening enforcement of existing regulations and making improvements to the mechanisms for tracking transboundary shipments.

Another way to reduce the hazards posed by transboundary movements of ULABs is to encourage companies that generate used lead batteries to voluntarily stop exporting lead batteries to Mexico and other developing countries until environmental regulations and performance of the battery recycling industry in Mexico improve. These types of voluntary restrictions on transboundary shipments can help pressure companies involved in recycling lead batteries in Mexico to improve their environmental performance. It may also help encourage policy makers to close the gaps in both regulations and enforcement capacity.

## **E.4 Links and materials available**

### **Occupational Knowledge International**

[www.okinternational.org](http://www.okinternational.org)

### **Fronteras Comunes**

[www.fronterascomunes.org.mx](http://www.fronterascomunes.org.mx)

Exporting Hazards: U.S. shipments of used lead batteries to Mexico take advantage of lax environmental and worker health regulations – English version:

[http://www.okinternational.org/docs/Exporting%20Hazards\\_Study\\_100611v5.pdf](http://www.okinternational.org/docs/Exporting%20Hazards_Study_100611v5.pdf)

Exporting Hazards: U.S. shipments of used lead batteries to Mexico take advantage of lax environmental and worker health regulations – Spanish version:

[http://www.okinternational.org/docs/ExportingHazards\\_Spanish.pdf](http://www.okinternational.org/docs/ExportingHazards_Spanish.pdf)

Commission for Environmental Cooperation (CEC) information about Environmental Hazards of the Transboundary Movement and Recycling of Spent Lead-Acid Batteries

<http://www.cec.org/Page.asp?PageID=751&SiteNodeID=1075>

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<sup>i</sup> Occupational Knowledge International, Global Village of Beijing, Institute of Public and Environmental Affairs. Health and Environmental Impacts from Lead Battery Manufacturing & Recycling in China. [http://www.okinternational.org/docs/China\\_Lead\\_Battery\\_Report\\_IPE\\_English.pdf](http://www.okinternational.org/docs/China_Lead_Battery_Report_IPE_English.pdf)

<sup>ii</sup> Qi Wang, Re-production of Lead-acid Battery and Pollution Control, Chinese Research Academy of Environmental Sciences, 2010

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- <sup>iii</sup>International Lead and Zinc Study Group (ILZSG) <http://www.ilzsg.org/static/enduses.aspx?from=1>
- <sup>iv</sup> Gottesfeld, Perry, Pokhrel, Amod K. Review: Lead exposure in battery manufacturing and recycling in developing countries and among children in nearby communities. *Journal of Occupational and Environmental Hygiene*, 8:520-532, 2011.
- <sup>v</sup> [http://www.profepa.gob.mx/innovaportal/v/4196/1/mx/asegura\\_la\\_profepa\\_en\\_chihuahua\\_un\\_trailer\\_que\\_transportaba\\_inadecuadamente\\_1800\\_acumuladores\\_de\\_autos.html](http://www.profepa.gob.mx/innovaportal/v/4196/1/mx/asegura_la_profepa_en_chihuahua_un_trailer_que_transportaba_inadecuadamente_1800_acumuladores_de_autos.html) - [Tp9QyC4wJ4g.email](mailto:Tp9QyC4wJ4g.email)
- <sup>vi</sup> Occupational Knowledge International and Fronteras Comunes. Exporting Hazards: U.S. shipments of used lead batteries to Mexico take advantage of lax environmental and worker health regulations. [http://www.okinternational.org/docs/Exporting\\_Hazards\\_Study\\_100611v5.pdf](http://www.okinternational.org/docs/Exporting_Hazards_Study_100611v5.pdf)
- <sup>vii</sup> Ministry of Labor, NOM-010-STPS-1999, "Occupational Health in Areas where Chemicals are Handled, Transported, Processed or Stored" (Condiciones de seguridad e higiene en los centros de trabajo donde se manejen, transporten, procesen o almacenen sustancias químicas capaces de generar contaminación en el medio ambiente laboral) Available at: <http://asinom.stps.gob.mx:8145/upload/nom/10.pdf>. Accessed: November 2010.
- <sup>viii</sup> Occupational Health and Safety Administration, 1910.1025, "Lead Standard" Available at: [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=standards&p\\_id=10030](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10030). Accessed: December 2010.
- <sup>ix</sup>Ibid.
- <sup>x</sup> Mexican Official Standard, NOM-026-SSA1-1993, "Environmental Health Criteria for Evaluating Lead in Ambient Air" (Salud Ambiental. Criterio para Evaluar la Calidad del Aire Ambiente, con Respecto al Plomo) Available at: [http://bibliotecas.salud.gob.mx/gsdl/collect/nomssa/index/assoc/HASH01af.dir/doc.pdf#search=%22\[plomo\]:DC%20%22](http://bibliotecas.salud.gob.mx/gsdl/collect/nomssa/index/assoc/HASH01af.dir/doc.pdf#search=%22[plomo]:DC%20%22), Accessed: November 2010.
- <sup>xi</sup> Environmental Protection Agency, 40 CFR part 50, National Ambient Air Quality Standards. Available at: [http://www.access.gpo.gov/nara/cfr/waisidx\\_08/40cfr50\\_08.html](http://www.access.gpo.gov/nara/cfr/waisidx_08/40cfr50_08.html) Accessed: December 2010.
- <sup>xii</sup> Ministry of Health, "General Health Regulation Law in the Field of Sanitary Control of Activities, Establishments, Products and Services"(Reglamento de la Ley General de Salud en Materia de Control Sanitario de Actividades, Establecimientos, Productos y Servicios) Article 213. Available at: <http://www.salud.gob.mx/unidades/cdi/nom/compi/rlgsmcsaeps.html>
- <sup>xiii</sup> U.S. Environmental Protection Agency, Maximum Contaminant Level (MCL).