A CHINA ENVIRONMENTAL HEALTH PROJECT RESEARCH BRIEF

This fact sheet was produced as part of the China Environment Forum's partnership with Western Kentucky University on the USAID-supported China Environmental Health Project

Lead Batteries: Re-Charging China's E-Waste Disposal

By Kimberly Go and Erika Scull

The proper handling and disposal of lead-acid batteries (LABs) in the developed world is often heralded as an environmental success story. More than 97 percent of all battery lead is recycled in the United States—surpassing recycling rates for aluminum beer and soft drink cans (55 percent), newspapers (45 percent), and glass bottles and tiles (respectively 26 percent) to top the list as the most highly recycled consumer product.[1] However, in China lead-acid batteries are 'recycled' in very crude small-scale operations where approximately 50 percent of the lead is being lost into the environment.[2]
Lead battery waste can discharge acid into waterways and soil, posing a threat to human health.[3] Such land and water contamination from batteries is common in China, where lead-based battery use—particularly for electric bicycles—has increased phenomenally over the past 20 years, but the waste disposal infrastructure fails to properly process most batteries.[4] Daniela Salaverry, speaking at a China Environment Forum meeting in October 2007, related how the Chinese nongovernmental organization (NGO) Green Anhui, based in Hefei city Anhui Province, alerted the media to an illegal dump of batteries on the shore of the local river resulting in the local environmental protection bureau removing the batteries and cleaning up the area.

The Lead-based Battery Market in China

China has more than 1,400 battery manufacturers[5] and, according to the China Battery Industry Association, produced 30.5 billion batteries in 2005, with 13.9 billion of which were consumed in China. This translates into every person in China using an average of 10.7 batteries each year.[6] According to statistics from the central government in 2001, the total output of batteries in China accounts for one-third of the world's output.[7] A growing percentage of this battery production in China appears to be lead-based. A 2007 report by Research and Markets states that China's lead-acid storage battery industry grows at a rate of over 30 percent annually, driven by increasing demand in the global market and the utility of lead-acid storage batteries in technologies such as automobiles and electric bicycles (e-bikes).[8] It merits mention that China is the third largest car producer and second largest car market in the world, indicating that car battery disposal is a substantial and increasing concern. In China's urban centers, e-bikes have been gaining popularity at an extraordinary rate. In 2005, over 10 million e-bikes were produced in China, which is more than 3 times the amount of cars produced during that year. This is significant largely because e-bike batteries have a very short lifespan (1 to 2 years) and they emit roughly the same amount of lead as a car battery in the production process and in their end-of-life loss.[9]

The Consequences of Improperly Disposed Lead-based Batteries

As a highly toxic heavy metal, severe lead poisoning can cause comas, convulsions, mental retardation, seizures, and death. Low level exposure can result in fatigue, impaired central nervous system functions and impaired hearing. Children are especially vulnerable to the effects of lead, as even a relatively small amount of exposure can result in reading impairments, psychological disturbances, and mental retardation.[10] (See CEHP Research Brief: Growing up in a Leaded Environment: Lead Pollution and Children in China).

Globally, properly disposed batteries are sent to a licensed recycler where, under strict environmental regulations, the lead and plastic are reclaimed and then sent to a battery manufacturer to be used to produce a new battery.[11] In China, batteries disposed as regular trash pose a danger to refuse collectors, who can come into contact with lead and corrosive sulfuric acid.[12] Improperly disposed lead-acid batteries

can leak and contaminate soil, groundwater and surface water supplies. A single used battery, if disposed of improperly, could lead to the contamination of 12 cubic meters of water or one cubic meter of soil.[13]

Despite the risks associated with lead poisoning, there are families in rural communities whose main source of income is from small-scale recycling plants that process e-waste, some of which inevitably contains lead-based batteries.[14] Moreover, scrap collectors can make a considerable income rummaging through mounds of waste.[15] China's underdeveloped battery recycling infrastructure and weak enforcement of e-waste imports from industrialized countries has resulted in a low-tech, citizen-based recycling network that puts many of its participants at serious risk of ill health, both from lead and a host of other toxic materials.[16,17]

Recycled lead is also thought to be a source material for some of the highly leaded children's toys and jewelry made in China. Following some of the 2006 Chinese-made toy recalls in the U.S., a research team at Ashland University in Ohio analyzed the levels of antimony – a chemical element used as a hardener in lead batteries - in a sample set of highly leaded children's jewelry. The researchers found compelling similarities between the antimony levels of leaded batteries and the children's jewelry. Because of the relative cheapness of this jewelry, their levels of antimony, and the wide range of lead levels found in the same type of toy - which indicates an opportunistic use of scrap metal – the researchers believe that some of the children's jewelry made in China contains lead recycled from car batteries and other electronic waste.[18]

Addressing the Problem

In recent years, China has introduced several regulatory measures related to lead. The Occupational Diseases Prevention and Control Act of 2002 reaffirmed the authority of the Ministry of Health to revise and develop new Occupational Exposure Limits (OELs) and subjected violators to fines, revocation of business licenses, and criminal prosecution.[19] However, medical statistics compiled in a 2006 report show that it has been ineffective in reducing lead exposure levels from battery factories and smelters. The average exposure levels for both lead fumes and lead dust remains substantially higher than the OELs from 2003 to 2005, with some samples reporting even higher levels than before the 2002 Act.[20] As for occupational lead poisoning, the 2002 Act appears to have had a minimal impact. The lead poisoning rate among lead battery workers dropped from 45.0 percent in 1990-2002 to 36.8 percent between 2003 and 2005.[21] The report asserts that a lead poisoning rate of more than 30 percent is hardly acceptable.[22]

Since 1998, urban centers like Beijing and Shanghai started their battery recycling initiatives, installing recycling boxes in public places such as shopping centers.[23] It was reported that as of 2001, Beijing had over 4,000 battery recycling spots, which was the most high-profile symbol of environmentalism at that time.[24] However, these efforts still left a large number of used batteries dumped in landfills, as most of the recycling spots were still quite far away from where people lived. Battery recycling rates in Beijing have been generally below 5 percent, but even lower in Shanghai and Guangzhou (2 to 3 percent).[25] One significant problem facing China is the lack of sufficient plants with the proper technology to deal with the used batteries. In most cases the recycled batteries are simply dumped in landfills or piled in warehouses without being properly disposed of.[26]

There are efforts being made to develop proper disposal technologies to address the battery crisis. In 2001, Shandong Association of Battery Pollution Prevention and Treatment said they will set up a network for the collection and maintenance of waste batteries for recycling purposes. The association will also sponsor research and application of technologies and materials for the production of environment-friendly batteries.[27] The same year, experts at Beijing's University of Science and Technology developed the "chemical disposal" technique in which heavy metal ions such as lead are purified before being discharged, and this technology was implemented in a new battery recycling plant in Hebei Province.[28] At the fourth Sino-U.S. Strategic Economic Dialogue in June 2008, China promised to cooperate with the United States to work out a treatment and disposal plan for lead-acid batteries, medical waste, and other hazardous

materials.[29] In 2008, Beijing built the world's largest plastics recycling plant and continued to install recycling bins around the city in an effort to improve its recycling infrastructure and modernize waste treatment.[30]

This brief was completed with research assistance from CEF intern Ma Tianjie. Kimberly Go is a rising senior at Barnard College, where she studies Asian cultures, sociology, and environmental science. She is preparing to write her thesis on public participation in Chinese environmentalism and is a summer 2008 research intern with the China Environment Forum. She can be reached at: kg2175@barnard.edu. Erika Scull is a Global Environmental Politics graduate student at American University and she can be reached at: es4978a@student.american.edu.

---

[1] Battery Council International. "Battery Recycling." [Online.] Available: http://www.batterycouncil.org/LeadAcidBatteries/BatteryRecycling/tabid/71/Default.aspx
[2] Interview with Perry Gottfried Executive Director Occupational Knowledge International, September 4, 2008.
[3] "National Workshop's Report on the Inventory of Used Lead-Acid Batteries in Cambodia." (2004). [Online.] Available. http://www.basel.int/centers/proj_activ/stp_projects/03-02.pdf.
[4] "State to Prevent Battery Pollution." (2001, June). *China Daily.* [Online.] Available: http://www.china.org.cn/english/2001/Jun/14454.htm.
[5] BNET. (2004, February). "China Should Control Cellphone Battery Pollution." CNET Networks. [Online]. Available: http://findarticles.com/p/articles/mi_qa3864/is_200402/ai_n9402491.
[6] *China Daily.* (2006, October 30). "Green Batteries to Help Cut Pollution." [Online]. Available: http://en.chinagate.com.cn/english/environment/49144.htm.
[7] http://www.china.org.cn/english/2001/Jun/14454.htm
[8] BNET. (2007, April). "Lead acid batteries are a key component in some of China's fastest growing industries." [Online.] Available. http://findarticles.com/p/articles/mi_m0EIN/is_2007_April_12/ai_n27199574.
[9] Cherry, Christopher, Jonathan Weinert & Chaktan Ma. (2007, April). "The Environmental Impacts of E-bikes in Chinese Cities." UC Berkeley Center for Future Urban Transport. Working Paper. http://www.its.berkeley.edu/publications/UCB/2007/VWP/UCB-ITS-VWP-2007-2.pdf
[10] http://www.basel.int/centers/proj_activ/stp_projects/03-02.pdf
[11] http://www.basel.int/centers/proj_activ/stp_projects/03-02.pdf
[12] Ibid.
[13] "China Develops Technology to Dispose of Used Batteries." (2001 July). *People's Daily.* [Online.] Available: http://english.people.com.cn/english/200107/24/eng20010724_75716.html.
[14] Lee, Debbie Yan and Jing Chen. (2008). "Growing Up In A Leaded Environment: Lead Pollution and Children in China." China Environment Forum. [Online.] Available. http://www.wilsoncenter.org/index.cfm?topic_id=1421&fuseaction=topics.item&news_id=444931.
[15] Pasternack, Alex. (2007 December). "In China, Recycling by Tricycle." Treehugger. [Online.] Available: http://www.treehugger.com/files/2007/12/china_urban_recycling.php.
[16] Ibid.
[17] Lee, Debbie Yan and Jing Chen. (2008). "Growing Up In A Leaded Environment: Lead Pollution and Children in China." China Environment Forum. [Online.] Available: http://www.wilsoncenter.org/index.cfm?topic_id=1421&fuseaction=topics.item&news_id=444931.
[18] Weidenhamer, Jeffrey D. and Michael L. Clement. (2007, June). "Evidence of Recycling of Lead Battery Waste into Highly Leaded Jewelry." *ScienceDirect.* [Online]. Available: http://personal.ashland.edu/jweiden/BatteryWaste.WeidenhamerClement.pdf
[19] Ye, Xibao and Otto Wong. (2006 June). "PB exposure, lead poisoning, and lead regulatory standards in China, 1990-2005." *Regulatory Toxicology and Pharmacology.*
[20] Ibid.
[21] Ibid.
[22] Ibid.
[23] Gao, Pei. (2001) "The Current Situation of Battery Recycling and Disposal in Several Cities," *Green Web*, [Online] Available: http://www.green-web.org/infocenter/show.php?id=510
[24] "Numerous Difficulties Haunting Battery Recycling," (2006) *Xinhua.* [Online]. Available: http://news.xinhuanet.com/video/2006-04/07/content_4395886.htm
[25] Ibid.
[26] Ibid.

[27] "Association Established to Combat Battery Pollution." (2001, May). *People's Daily*. [Online.] Available: http://english.peopledaily.com.cn/english/200105/02/eng20010502_69135.html.
[28] "China Develops Technology to Dispose of Used Batteries." (2001 July). *People's Daily*. [Online.] Available: http://english.people.com.cn/english/200107/24/eng20010724_75716.html.
[29] Yu Tianyu and Li Jing. (2008, June). "Common Goals." *China Daily*. [Online.] Available: http://www.chinadaily.com.cn/bw/2008-06/16/content_6761710.htm
[30] Pasternack, Alex. (2007 December). "In China, Recycling by Tricycle." Treehugger. [Online.] Available: http://www.treehugger.com/files/2007/12/china_urban_recycling.php.