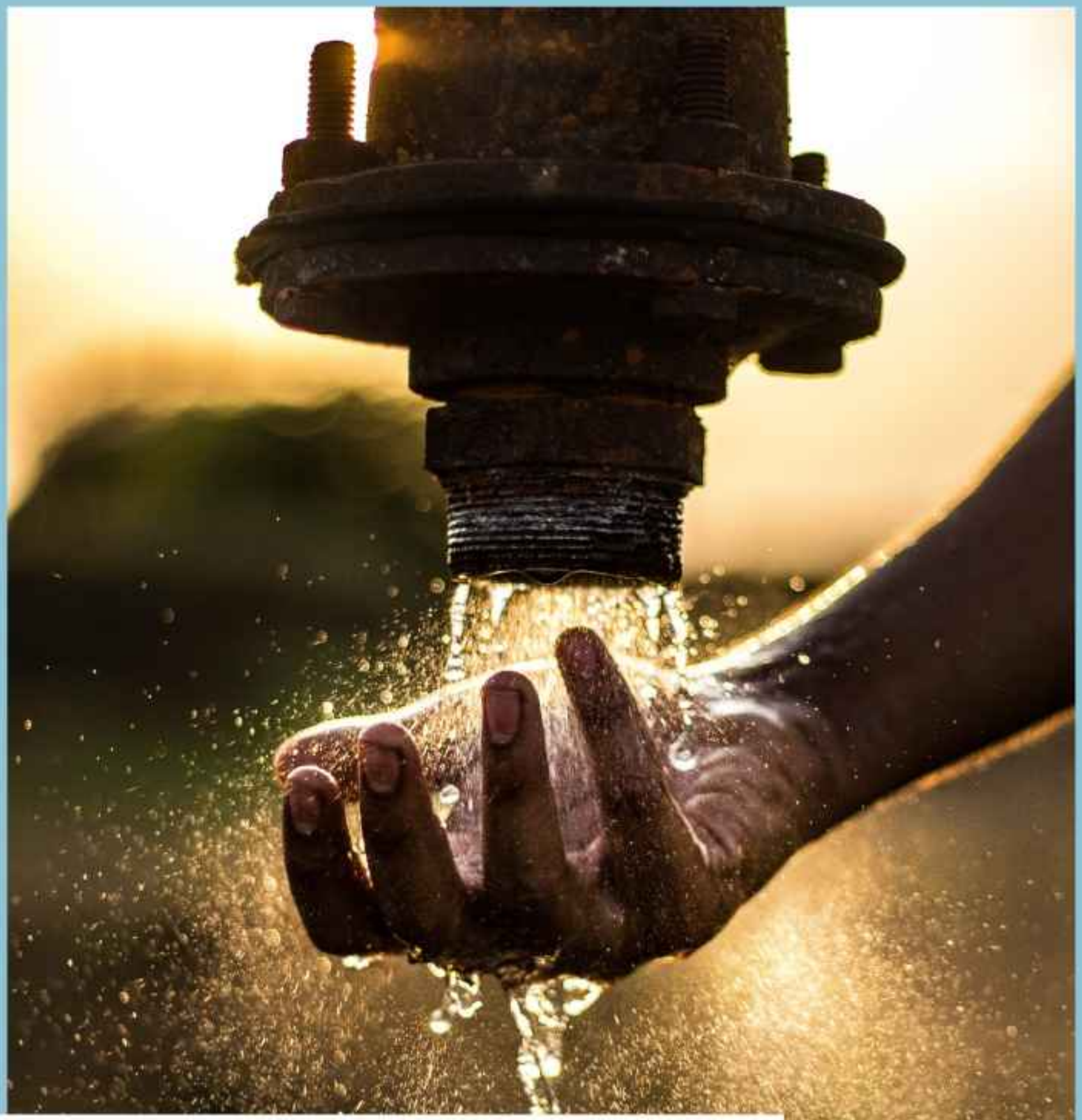

LOCALIZING GLOBAL WATER JUSTICE: DISPOSING LEAD WATER PIPES RESPONSIBLY

An Environmental Justice Report

August 2023

Closing the

CLOSING THE WATER GAP WORKING GROUP

Closing the Water Gap is a cross-discipline student working group that conducts research to inform social action that will expand water access, equity, and affordability. Dr. Marcela González Rivas, an Associate Professor at the University of Pittsburgh's Graduate School of Public and International Affairs and member of the faculty advisory board of the Center for Latin American Studies, formed the working group in 2020 within the Ford Institute for Human Security.

Closing the water gap

University of Pittsburgh

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HISTORY OF LEAD IN DRINKING WATER

Lead is a highly valuable material that has been used in many industries and everyday items for its malleable and durable characteristics, but it also poses devastating health impacts as a result of exposure at every level. The use of lead in drinking water infrastructure was a grave institutional choice made by cities under the influence of the lead industry throughout the 19th and 20th centuries (Rabin, 2008; Troesken, 2006). Despite lead's well-documented costs to human health and government budgets, lead pipes were installed in almost every American city until 1996 (U.S. EPA 2023c). In 1938, the Lead Industries Association (LIA) successfully lobbied for a change in the Pennsylvania plumbing code to require the installation of lead pipes despite nationwide trends to phase them out (Rabin, 2008). Pittsburgh and other Pennsylvania cities hosted LIA lead pipe installation trainings for workers around this same time (Rabin, 2008).

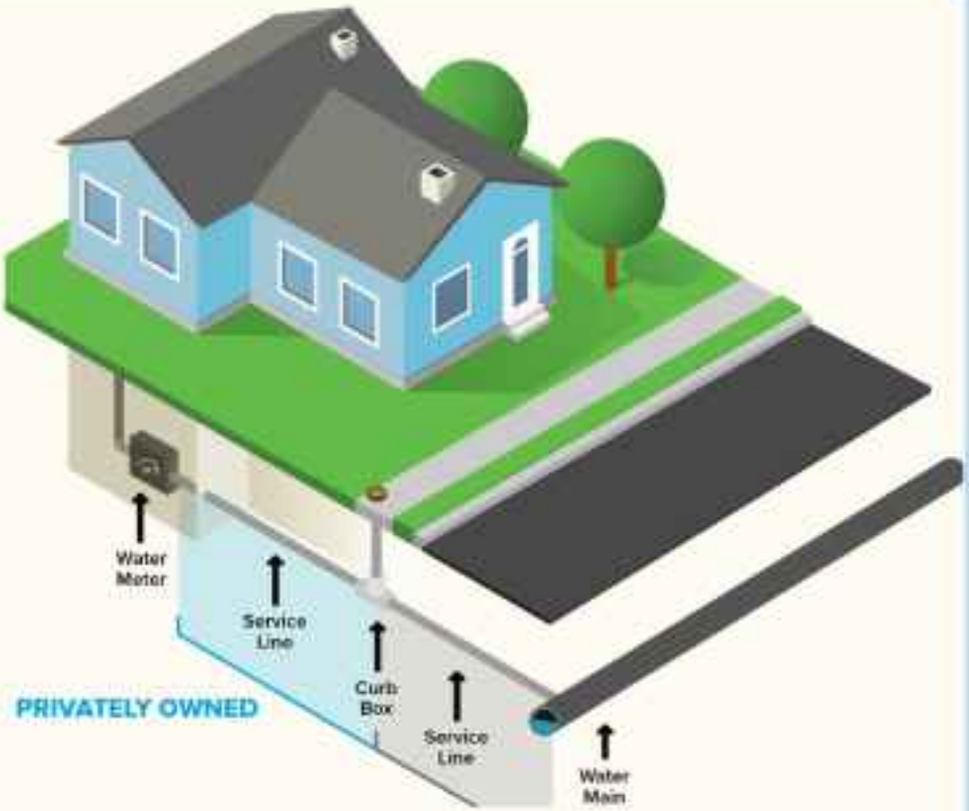
Unfortunately, the industry's influence on the water sector persists today. In June 2023, the American Water Works Association, a non-profit network representing nearly 80 percent of all the U.S. water utilities, submitted a lengthy analysis to the EPA questioning the well-established science that any level of lead poisoning is detrimental (AWWA, 2023). To be clear, there is no safe level of lead in the body. Painstakingly considering how many IQ points is worth losing as a result of exposure or at what blood lead level negative health impacts are considered clinically significant are not worthwhile exercises. These discussions distract from the problem at hand: lead continues to harm communities.

Between 1978-2008, the United States introduced a series of standards that restricted lead's use in products and resources to fund remediation programs. This included a ban on lead service lines with high concentrations of lead in 1996. Childhood lead poisoning dramatically decreased as a result. Yet, as we have seen, lead in water crises are increasingly common in the United States. Nearly 10 million lead services installed before the 1996 ban are aging and leaching into drinking water flowing through them. In cases like Flint, Michigan and Pittsburgh, Pennsylvania, the leaching process was accelerated through careless corrosion control strategies that favored cost-cutting measures over health-protective ones. Celebrating the reduction in lead poisoning over the last 50 years is difficult in the face of these completely preventable tragedies. Another reason to hold our applause is the disproportionate prevalence of lead poisoning among low-income households and communities of color. Predominantly low-income and/or Black and Brown communities–segregated through past and present housing policies–carry the disproportionate burden of exposure to deteriorating infrastructure with lead-based materials. Today, lead poisoning is three times more likely among Black children than White children and children in poverty are 150 times more likely to experience lead poisoning (NASHP, 2020; Yeter 2020; Markowitz and Rosner 2013; Whitehead et al., 2019; Neuwirth, 2018; Baehler, 2021).

HISTORY OF LEAD IN DRINKING WATER CON'T

This tendency for lead poisoning to occur in marginalized communities makes lead in water poisoning an environmental injustice. "Environmental Justice" in its most technical sense means a geographic area, typically a census tract, with a disproportionate percentage of people of color and/or low-income households (DEP source). On September 16, 2023, a new definition went into effect that considers 32 indicators (including race and income) to define an environmental justice area (PA DEP, 2023). More broadly, environmental justice refers to a global movement to honor and protect the well-being and (in some cases) sacredness of the natural environment. This includes "site fights" to stop the placement of toxic industries such as landfills in communities of color, as well as the persistence of community-controlled water systems. We refer to environmental justice in this report as the guarantee of lead-safe drinking water regardless of race, class, or other identifiers.

SPECIAL SECTION: WHAT IS A LEAD SERVICE LINE REPLACEMENT?



(Your Water Service Line - Community Lead Response, 2021)

This report focuses on water infrastructure and specifically lead service lines that bring water from main water lines to a building. Lead service line replacements (LSLRs) are defined as the "replacement of a lead service line (as well as galvanized service lines requiring replacement) that results in the entire length of the service line, regardless of service line ownership" (40 CFR § 141.2 - Definitions). LSLRs include installing non-lead service lines in a new location and leaving the lead lines in the abandoned location in the ground. Because all replacements do not result in physical removal, the number of replaced lead service lines is greater than the number of removed lead service lines. Water utilities are not required to collect data on the number of removed and abandoned lead services lines, but anecdotal evidence from those in the field report the majority of replacements resulting in removals.

2021 BIDEN-HARRIS LEAD PIPE AND PAINT ACTION PLAN

Graphic designed by Closing the Water Gap

Thanks to the hard work of grassroots organizing efforts to raise awareness of the environmental injustice of lead poisoning and pressure elected officials to act, the Biden-Harris administration launched the Lead Pipe and Paint Action Plan in 2021. This sparked a series of financial and strategic commitments to remove the estimated 10 million lead service lines that are still in use. Below is a summary of this cascade of programs and funding allocations that followed the Action Plan: Many of the funding, policy, and program decisions included language about environmental justice, ending disparities in exposure and access to resources, and investment in marginalized communities. These investments and equity-oriented strategies are historic and unprecedented. Environmental justice advocates from Flint, Michigan to Washington D.C. to Milawaukee, Wisconsin to Chicago, Illinois celebrated these wins after decades of resistance and struggle against government apathy towards drinking water-based lead poisoning.

These investments in prevention answered the resounding calls by leaders such as Dr. Mona Hanna-Attisha, a Flint pediatrician and Flint water crisis whistleblower, for "renew[ed] and refocus[ed] efforts to ensure that the blood of children... are never used as detectors of environmental contamination" (Hanna-Attisha et al., 2018).

Lead poisoning is in large part irreversible and has lifelong developmental, physiological, and neurological impacts (CDC, 2023). Removing sources of exposure is key to protecting the health of our communities. The billions of dollars now being spent on lead service line replacements will no doubt help reduce class-based disparities in lead poisoning as they will ensure replacements occur at no cost to residents, a barrier that has long shut out low-income residents from local replacement programs. Equity strategies such as Justice40 will also require the replacements occur in "underserved communities" first, where lead poisoning is disproportionately high.

Closing the Water Gap joined the celebration of this environmental justice victory for millions of Americans, including our Pittsburgh, Pennsylvania neighbors still recovering from our 2015 lead in water crisis. In fact, the Biden-Harris administration spotlighted the Pittsburgh Water and Sewer Authority's excellent work securing millions of public funds to complete 10,000 lead pipe replacements and prioritizing these initial replacements in neighborhoods with the highest risk of exposure. Yet, in the midst of all this success, we stumbled across a question we never thought to consider: However, in the midst of celebrating this historic victory, one question that few have asked is: where will the replaced lead service lines, "our trash", go?

CEO Will Pickering speaks on the successful 10,000th lead line replacement in the PWSA service area (PWSA, 2023c). Image source: PWSA

EPA Office of Water' Deputy Assistant Administrator Bruno Piggot observes the 10,000th lead pipe replacement in Pittsburgh, Pennsylvania (PWSA, 2023c). Image source: PWSA

SPECIAL SECTION: CLEANING HOUSE, AT WHOSE EXPENSE?

"ESTADOS UNIDOS ESTÁ LIMPIANDO SU CASA, PERO ¿A DÓNDE IRÁ SU BASURA?" "AMERICA IS CLEANING UP ITS HOUSE, BUT WHERE WILL ITS TRASH GO?"

APRIL 29, 2022 EL PAÍS ARTICLE (COTA, 2022)

Family of Dr. Marcela González Rivas, founder of the working group, shared a 2022 article in the Spanish newspaper *El País* that called attention to the potential international dark side of this domestic environmental justice progress. The United States is "cleaning up its house" by removing lead service lines with a sense of unforeseen urgency, but is likely exporting removed lead service lines to be recycled in nations with lower environmental and worker protections. Further, most of the recycled lead is imported by the U.S. for reuse in new lead-based products. In other words, we are exporting environmental injustice abroad in the name of cutting costs.

What really are "waste trade" and "recycling"?

Waste trade and recycling are two terms frequently used to describe what happens to removed lead service lines. Waste trade refers to the selling of waste to another country (1) for permanent disposal (e.g. a landfill or incinerator) or (2) to be repurposed into a new usable good. In the case of lead services lines, they are considered lead scrap waste upon removal. The word trade may imply a balanced relationship, but in reality the United States gains from exporting lead scrap waste (Madapoosi, 2022). The United States takes advantage of countries with low environmental and worker protection standards by allowing international corporations to process lead scrap waste in the cheapest way possible, often to the detriment of community and worker health. It costs less to "trade" lead scrap waste abroad than it does to process the waste within the U.S. Lead emission and occupational regulations in the U.S. are much more health protective and thereby costly. Notably, the United States is the largest importer of raw lead to create new lead-based products. This means that the United States and other Global North countries benefit from the profits made on these new lead-based products created from the lead scrap waste exports.

Recycling is another word surrounded by misconceptions. Recycling is often thought to be an environmentally friendly alternative to burying trash in a landfill by remaking old products into new ones. Recycling lead service lines is far from environmentally friendly or safe. Lead is recycled through a process called smelting, which requires melting down and extracting the lead from the mix of materials. Smelting methods and its many negative health impacts will be discussed later in this report. The economic gains countries make from participating in the smelting market pale in comparison to the financial and social costs of lead poisoning from the "recycling" process. People across the world have been organizing to fight the dumping of hazardous waste in their communities, including where lead service lines are being sent (Madapoosi, 2022).

Smelting: The Lead Pipe Recycling Process

Removed lead services lines are recycled through a dangerous process called smelting. Smelting refers to the use of heat to produce a concentrated metallic item (Britannica??). Primary lead smelting refers to the extraction of lead from lead-containing materials mined from the earth. Secondary lead smelting refers to the extraction of lead from lead-containing scrap metal (USDOL, 2023a). Molten lead is produced from both types of smelting and is then further refined into lead ingots (shown right) that are used to create new lead-based products. This cycle of exporting lead waste and importing concentrated lead ingots is referred to as the international secondary lead waste market.

(Pure Lead / Refined Lead Ingots, n.d.)

(ETool: Lead: Secondary Lead Smelter - Smelting - Blast Furnace | Occupational Safety and Health Administration, n.d.)

Blast Furnace Smelting

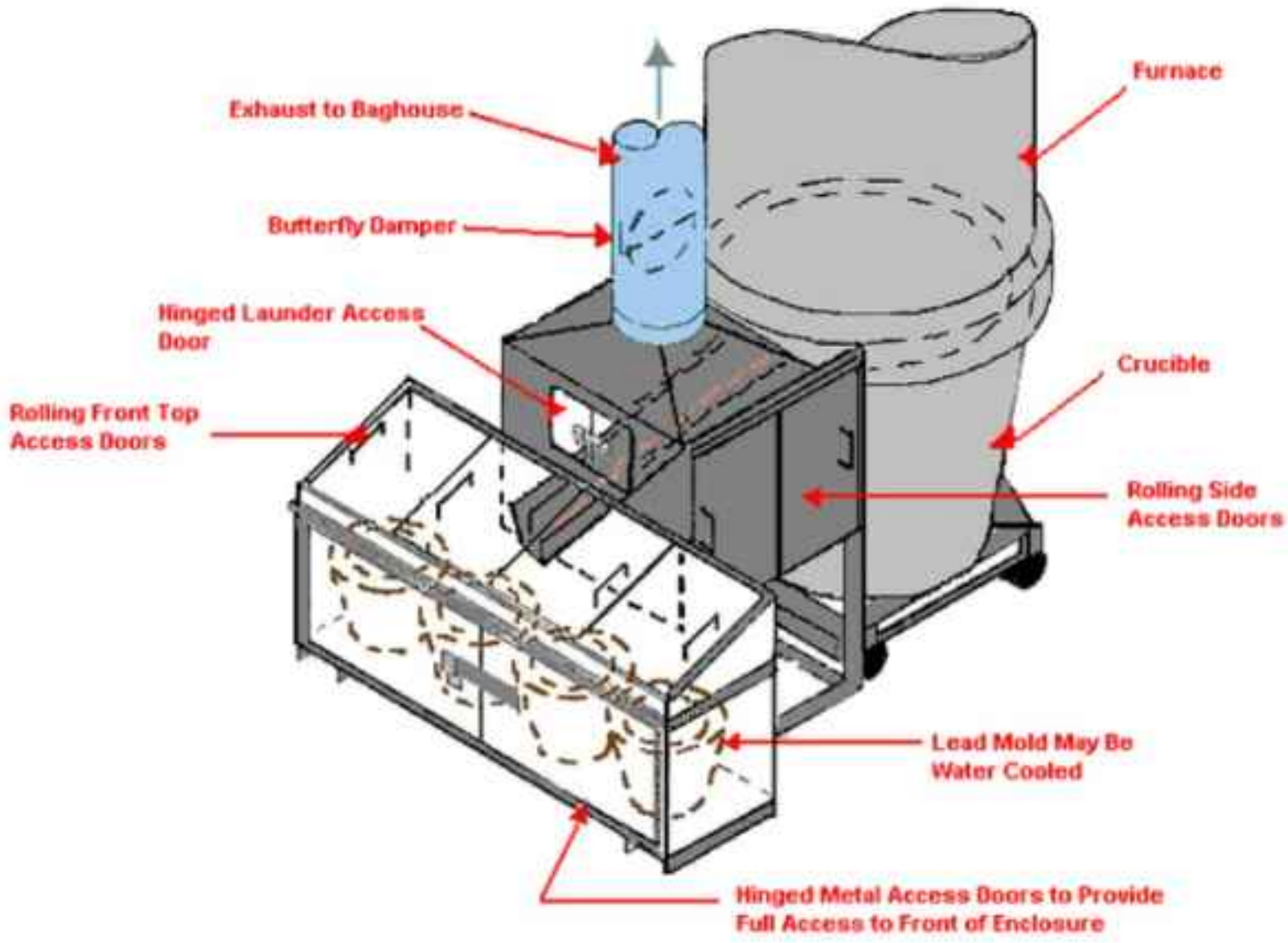
The first type of secondary lead smelting is done in a blast furnace. Lead scrap, including removed lead service lines, are put into the furnace. Heat is produced when the scrap reacts with air blown into the furnace. The heat then melts the material to raw "elemental" lead that is poured into cooling molds. Slag, a byproduct material produced in the process, is also dispensed from the furnace (USDOL, 2023a). Blast furnaces can process 20-80 imperial tons of materials per day (USEPA, 1995).

Reverberatory Furnace Smelting

The second type of secondary lead smelting uses a reverberatory furnace. Similar to the blast furnace, scrap metal is put into the furnace. Heat is produced directly from a burner that shoots a flame inside the furnace. This separates raw, molten lead from other metals with higher melting points (USDOL, 2023a). This may be referred to as "sweating" the lead out of scrap metal. Raw lead exits the furnace through the "lead well and tap" and cools in molds. Slag, a byproduct of this process, is also produced by this furnace. Reverberatory furnaces can process about 50 imperial tons of material a day (USEPA, 1995).

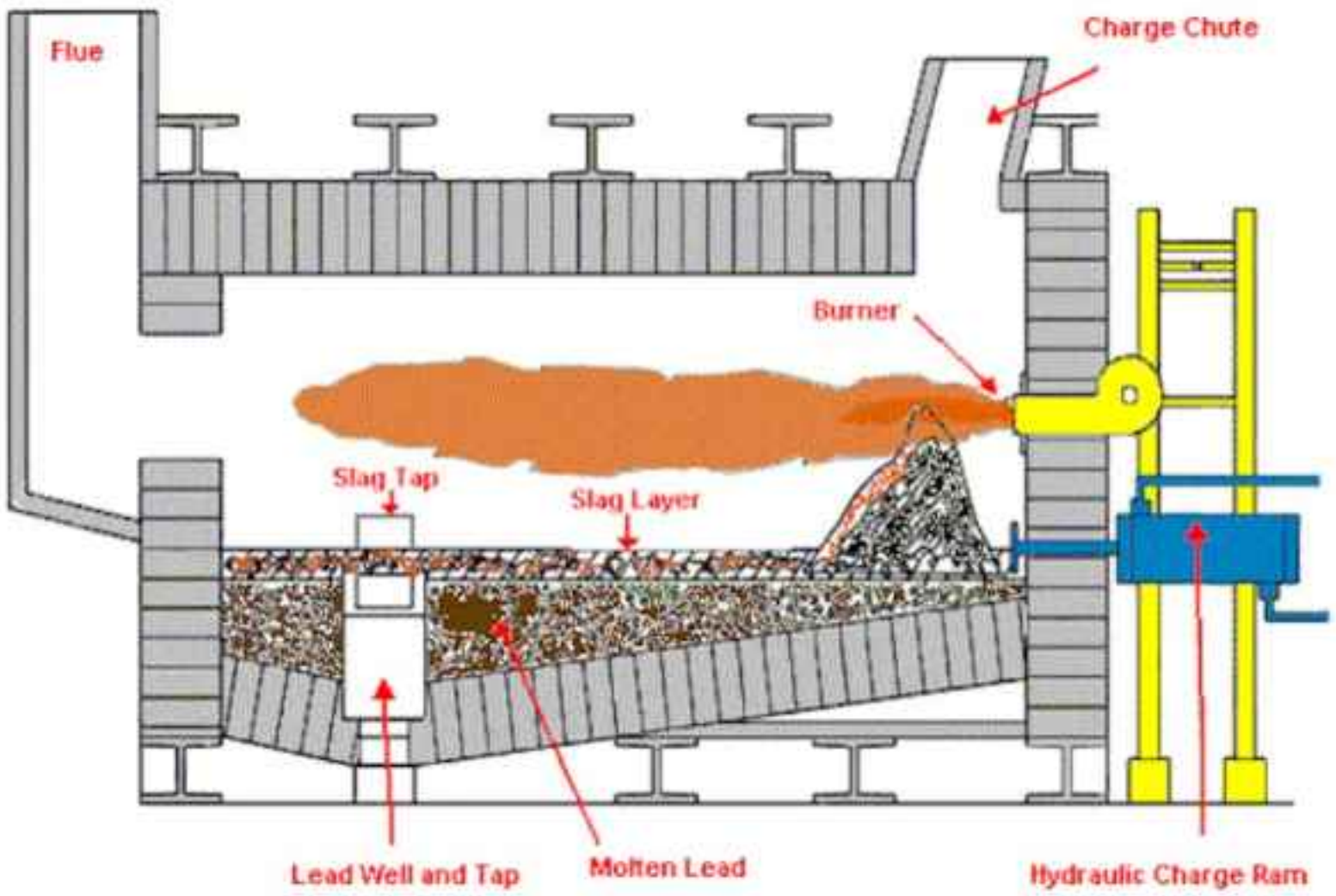
(eTool: Lead: Secondary Lead Smelter - Smelting - Blast Furnace | Occupational Safety and Health Administration, n.d.)

BLAST FURNACE LEAD TAP CONTROLS



(ETool: Lead: Secondary Lead Smelter - Smelting - Blast Furnace | Occupational Safety and Health Administration, n.d.)

REVERBERATORY FURNACE



(ETooL: Lead: Secondary Lead Smelter - Engineering Controls - Local Exhaust Ventilation Diagrams - Reverberatory Furnace | Occupational Safety and Health Administration, n.d.)

In both types of smelting, about 7% of the materials that are put into the furnaces escape as dust or fumes (USEPA, 1995). This poses dangerous health concerns for workers and fenceline communities. While the furnace type used to process removed lead service lines is unknown, the diagram here may indicate that both furnace types are used if removed lead service lines are considered "rare scrap" that enter reverberatory furnaces or "pure scrap" that enter blast furnaces (USEPA, 1995).

CALL OUT BOX: Informal Smelting

While formal industrial smelting is the focus of this report, we want to acknowledge that many informal recycling operations also exist around the world and in the countries that receive U.S. lead scrap waste. For example, tens of thousands of "backyard smelters" are estimated in India (Clark et al., 2005). Because of the informal nature of these operations, information about their safety protocols and share of the secondary lead smelting market is unknown. Further research, beyond the scope of this report, is required.

What are the dangers of Secondary Lead Smelting?

Secondary lead smelters are a significant source of pollution. Lead fumes and dust escape from the furnace and expose workers who are doing tasks like filling the chamber with scrap metal and monitoring the cooling molds. Without proper ventilation, designated lead-free air areas, automated air blasting machines, frequently changed air filters, and proper vacuuming equipment for spills, workers are at high risk of lead exposure (USDOL, 2023b).

An informal smelting furnace in India (Taylor, 2022)

(Lead Smelting, n.d.)

Under the strictest standards, these facilities can annually emit dozens of tons of airborne lead that can travel far from the facility (Schmidt, 2010). These particles blanket nearby communities, contaminating soil, ambient air, and surfaces that people frequently touch. This may lead to hand-to-mouth ingestion after casual contact with outdoor contaminated surfaces, gardening or playing in contaminated soil, and/or tracking contaminated soil into the home on shoes. Inhalation is also possible while lead emissions are still airborne or if lead is resuspended when lead contaminated soil is disturbed (Zachran et al., 2013). Efforts to monitor lead in soil levels too often falls on the shoulders of concerned residents and community organizations without adequate resources to perform comprehensive, systematic testing (Walls et al., 2022). These Barriers to wide scale soil testing efforts nearby smelters make understanding the geographic reach and severity of lead levels in soil difficult. Despite these data gaps, studies on individual smelters across the world indicate there is reason for concern. A 2023 report on Mexican smelters recycling lead-acid batteries found an average lead in soil of 4,897 ppm immediately around the facilities (OK International, 2023). Soils near Indian secondary smelters had levels above 100,000 ppm in a 2005 study (Clark et al., 2005). For reference, under 300 ppm is considered non hazardous and permissible for a play area in the United States. As noted before, there is no safe level of lead, so some groups recommend soil action levels of 100 ppm (OSWER, 2014).

Smelter emissions and material waste (e.g. "slag") produced in the smelting process can also contaminate local waterways and groundwater. If drinking water is not properly treated before entering service lines or drinking water is not sourced through a formal treatment plant, then nearby communities may be at risk of consuming lead in their water. [sources??]

Regardless of the route of exposure, lead impacts almost every system in the body. It can lead to serious health issues with the renal, nervous, immune, cardiovascular, and reproductive and developmental systems (USEPA, July 2023). For example, low birth weights increased in Mexico after smelting was incentivized to move operations from the United States to Mexico after the introduction of more health protective smelting policies (Tanaka, 2022).

Does secondary lead smelting take place in the United States?

Smelting on the whole has increased as the value of lead has been rising (source?). "Lead waste and scrap" is the second fastest growing lead commodity export (in 2020). Still, secondary lead smelting largely takes place outside the U.S. As shown in the graphic here, the US has a lot of industrial facilities, it's just that lead regulations are especially protective, forcing this industry abroad for the greatest profits (CEC, 2013).

After the 2008 improvements to U.S. smelting standards, Johnson Controls Inc. (JCI) shifted most of its smelting capacity to Mexico and in 2011 accounted for 43% of all lead-acid battery exports to Mexico (CEC, 2013).

While a complete list of the current and historical of U.S. smelters is difficult to find, recent (publicly posted) communication between national environmental organizations and the EPA helped illuminate the current list of U.S. smelters (Health Impact Project, 2017). According to these communications and online EPA data, there are 10 active secondary lead smelters in the U.S. owned by 6 companies. The Clairos/Johnson plant in South Carolina closed in 2021, which was the 11th smelter. As is the case for most corporate research, it is challenging to identify the parent and subsidiary relationships among the companies that own and operate smelters across the globe. So far, I have not found evidence of any Mexican smelters that are owned by a company that also operates in the U.S. This does not mean this is accurate, but rather more research must be done on all the Mexican smelters to identify if the parent companies or subsidiaries are from the U.S.

	Facility	Number of U.S. Locations	Notes
U.S. Only	DOE RUN	1	Potentially a second facility in AZ to help process lead pipes? This facility is not on the EPA secondary smelter list
	ELEMENT RESOURCES	2	Mentions "North America" in company description, so confirmation needed that smelters are U.S. only
	GOPHER RESOURCE	2	Mentions "North America" in company description, so confirmation needed that smelters are U.S. only
International	REVERE SMELTING & REFINING (RSR)	3	Horrible conditions in Quemetco plant in CA; pushes for stronger Mexican regs because they don't have facilities there
	EAST PENN Manf. Co.	1	International locations, including one in Mexico, but unsure if the facility is a smelter
	SANDERS LEAD	1	International company, but international smelter locations are unknown; Wiley Sanders is big investor in this company and other subsidiaries

What does this issue have to do with Pittsburgh?

Pittsburgh Water and Sewer Authority (PWSA) is the largest water provider for the City of Pittsburgh. PWSA is rightfully celebrated for their lead line replacement program. In 2016, just two years after the Flint water crisis, Pittsburgh residents learned their water was poisoned by similar corporate corner-cutting; since then, activists have pushed for the cleanup of the city's water supply, fighting for safe, affordable and public water (Demos, 2022). Local organizing efforts transformed PWSA as we know it. Most importantly, PWSA resisted privatization and improved their transparency with the public. They improved their technical expertise in lead service line replacement and corrosion control programs through learning exchanges with public water systems across the nation. This was all beyond regulatory obligation, which only required pipes to be removed and public notification of ongoing lead testing results.

Since their exceedance of the federal action level, PWSA raised over $300 million dollars in public funds and loans for lead service line replacement, replaced over 10,000 lead pipes (PWSA, 2023c), provided real-time data on their progress on a user-friendly online map (PWSA, 2023b), convened a Community Lead Response Advisory Committee that meets on a quarterly basis (PWSA, 2023c), and offered free water testing for any household in their service area. And, thanks in large part to organizing efforts (Rivas & Schroering, 2021), PWSA prioritized neighborhoods with the highest rates of childhood lead poisoning in their lead service line replacement program.

A sign found in yards and windows across the city in the Our Water Campaign's push for PWSA to stay public in 2019. (Krauss, 2019)

What do we know about the fate of removed lead pipes?

After reading about the global environmental injustice to which removed lead lines contribute in the EL PAÍS article, the University of Pittsburgh Closing the Water Gap Working Group spent a year exploring the steps and actors involved in the process of recycling Pittsburgh lead pipes abroad. Our research included interviews with NGOs focused on environmental and occupational health, such as Casa Cem in Mexico as well as Occupational Knowledge International (OK International), the Basel Action Network (BAN), and the Environmental Protection Network (EPN) in the U.S. We also engaged with the Pittsburgh Water and Sewer Authority through their Community Lead Response Advisory Committee and local scrapyards through phone outreach. Finally, we utilized the United Nations' Comtrade database and third-party visualizations of Comtrade data to identify lead scrap trade flows. Quickly, we discovered many information gaps. Below is the information we have compiled thus far. In time, we hope to uncover more details and develop a more complete understanding of where and how removed lead pipes travel from a Pittsburgher's home to secondary lead smelters in other countries.

PWSA hires third-party entities to complete lead service line replacement projects. These companies are required by contract to report where and much (in weight) lead scrap is sold for recycling. Technically, the contractors have two disposal options: pay to have the pipes processed at a hazardous waste facility (e.g. landfill) or sell the pipes to metal scrapyards for recycling. All contractors sell them to local scrapyards because hazardous waste landfills require the contractors to pay for disposal.

A pile of lead lines removed in Gary, Indiana. Photo: Monica Eng/Axios

SPECIAL SECTION: TRANSPARENCY

PWSA was very forthcoming throughout our research, but they unfortunately are an outlier in transparency compared to other water systems. There are several dozen water systems in Allegheny County alone, none of which are required to publicly share the contractors they utilize nor the records documenting the fate of removed lead lines. Right to Know requests are a time-consuming but a fruitful method of acquiring this information, but only if the system is publicly owned. Overall, water utility waste management practices are not easily accessible to the public and documentation is likely to vary between utilities. The process of collecting data to estimate the volume of lead pipes exiting one's local community can quickly become overwhelming. Attempting to assess the waste stream footprint of a larger geographic area, or the entire U.S., would require resources and capacity that environmental justice advocates may not have to spare.

Several trends emerged in our outreach to the 10 scrap metal companies in the Pittsburgh area. First, seven of the vendors (70%) declined to answer at least one of our research inquiries, possibly indicating a hesitancy to disclose information. Second, all vendors sort lead pipes from other metals and sell them to an intermediate company that will sell the pipes again to smelters. Third, seller and customer profiles varied among the vendors who provided a response in these categories. Individuals, company contractors, and municipal contractors all sell lead pipes to Allegheny County scrapyards. Large waste distributors, other scrapyards, and lead smelters all purchase lead pipes from Allegheny County scrapyards. Lastly, PWSA utilizes three scrapyards for their removed lead pipes. One of whom did not share any information, another who accepts scrap exclusively from contractors and sells to one large distributor, and a third who accepts scrap from a diversity of sellers and did not disclose their customer profile. In all, this data was able to confirm our suspicions that local scrapyards are one stop on a removed lead pipe's journey to a lead smelter.

LOCAL SCRAP YARDS SELL LEAD PIPE SCRAP TO WASTE DISTRIBUTORS OR SMELTERS.

Very little information exists about what happens to lead pipes between local scrapyards and arriving at a lead smelter. It is likely that pipes travel from local scrapyards to other, larger scrapyards or scrap metal distributors. Eventually, most pipes are exported to other countries and recycled in smelters. Pipes may be exchanged multiple times before and after being exported. The details are unknown.

LEAD PIPE SCRAP IS EXPORTED FROM THE UNITED STATES

All U.S. exports must be labeled and trade data is voluntarily reported to the United Nations' Comtrade database. This database contains information from 200 countries and nearly every reported global merchandise transaction (UNDEC, 2022). Goods are assigned a code in the Harmonized System (HS) that indicates the category of material. Because these codes represent a category of goods and not individual goods such as removed lead pipes, it is difficult to determine the exact amount of service lines exported. Still, one of the following three HS codes are likely assigned to removed lead pipes being exported for recycling:

- 7802: Lead waste and scrap
- 7805: Lead tubes, pipes and tube or pipe fittings
- 7806: Other lead articles

Comtrade data includes the final destination of goods assigned a certain HS code. Yet, because it is unclear which of these three codes is assigned to removed lead pipes, it is difficult to determine exactly which countries are recycling these pipes. In other words, removed lead pipes might be classified under 7802, 7805, or 7806 depending on the entity through which it is exported and the HS guidance at any given time. A 2013 data analysis on lead-acid battery exports found similarly challenging results based on inconsistent trade code labeling (CEC, 2013). When we searched for Comtrade data associated with each code, 7805 did not report any information. This means that, for reasons we do not know, 7805 seems to not have been utilized for any goods exported from the United States so far, including removed lead pipes. The results for our Comtrade inquires for HS codes 7802 and 7806 are summarized below:
Between 2018-2022, the U.S. exported Lead Scrap and Waste (7802) to 44 countries and Other Lead Articles (7806) to 126 countries. In 2022, approximately 21,000 metric tons of Lead Scrap and Waste (7806) and 220,000 metric tons of Other Lead Articles (7806) were exported. India appears to be the predominant recipient of 7802 exports, with few changes in these trade dynamics in the last five years. For 7806 exports, the recent trends are shifting. Kuwait was the primary recipient of 2021's historic year during which lead scrap and waste exports nearly quadrupled, but in 2022 exports were back at pre-2021 levels and being sent primarily to Mexico, Jordan, and Canada. Because the HS code assigned to removed lead pipes is unknown, it is unclear whether one code or both should be utilized to trace where removed lead services lines are sent to be recycled.

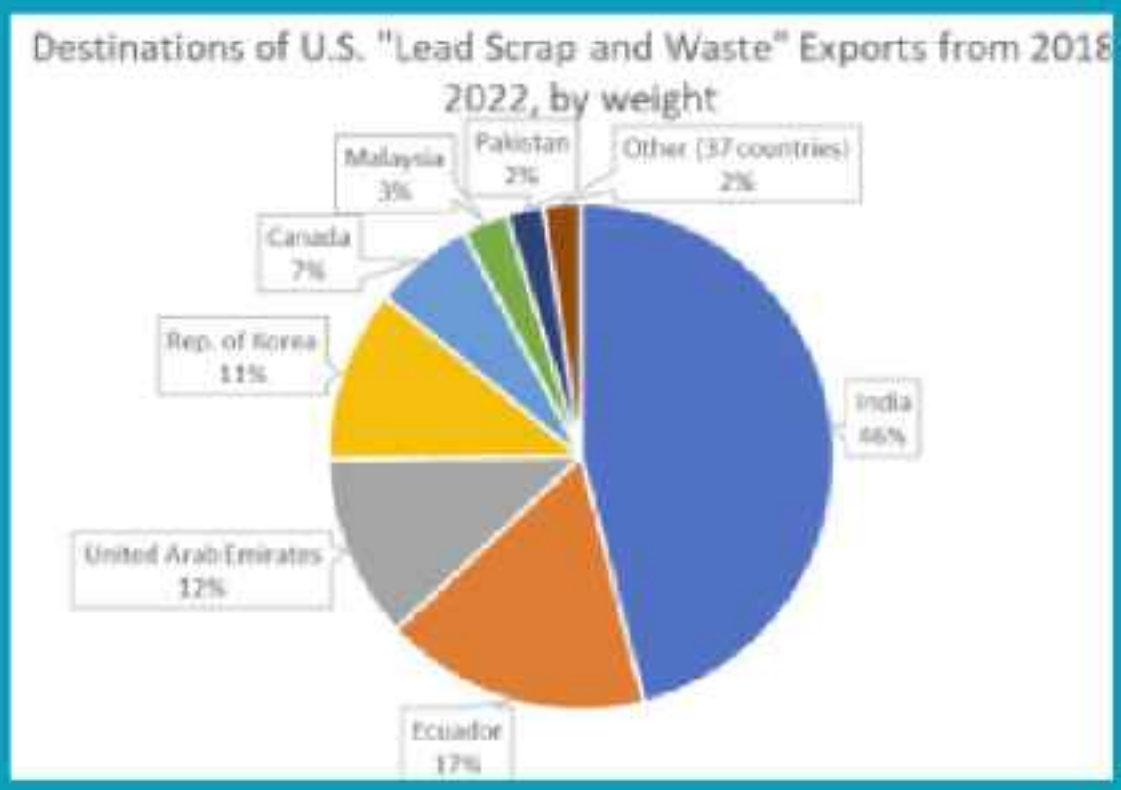
Importers of U.S. Lead Waste from 2018-2022, by weight (kg)

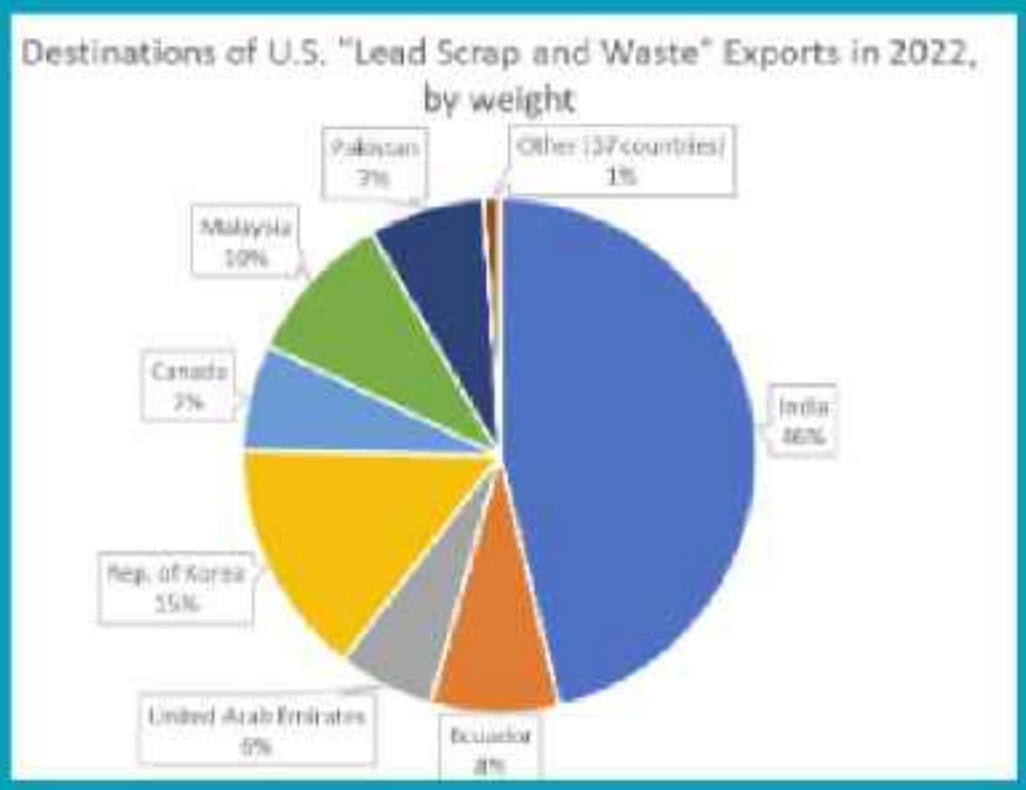
Top Importer (n=44)	Lead Scrap and Waste (7802)	Top Importer (n=126)	Other Lead Articles (7806)
India	46%	Canada	19%
Ecuador	17%	Ecuador	18%
United Arab Emirates	12%	Kuwait	12%
Republic of Korea	11%	Mexico	10%
Canada	7%	Jordan	8%
Other Countries (39)	7%	Other Countries (121)	33%

Lead Scrap and Waste (7802) by weight:

- *In the last five years (2018-2022),* ***India*** *has been the top recipient of lead scrap and waste exports. Ecuador, United Arab Emirates, Republic of Korea, Canada, Malaysia, and Pakistan also received notable amounts of lead scrap and waste exports.*
- *In 2022, the majority (61 percent) of USA lead scrap and waste exports were sent to* ***India*** *(46 percent) and* ***Republic of Korea*** *(15 percent).*

	India	Ecuador	United Arab Emirates	Rep. of Korea	Canada	Malaysia	Pakistan
2018	26.79%	22.09%	11.54%	21.56%	10.28%	0.12%	3.13%
2019	44.70%	23.11%	17.40%	2.97%	8.55%	0.75%	0.19%
2020	56.77%	16.40%	13.00%	7.76%	2.37%	2.05%	0.14%
2021	59.59%	14.39%	10.63%	7.19%	3.63%	2.67%	0.80%
2022	45.58%	8.03%	6.06%	14.78%	6.65%	9.61%	7.27%
5-year Total	**45.79%**	**16.99%**	**11.69%**	**11.44%**	**6.40%**	**2.93%**	**2.35%**

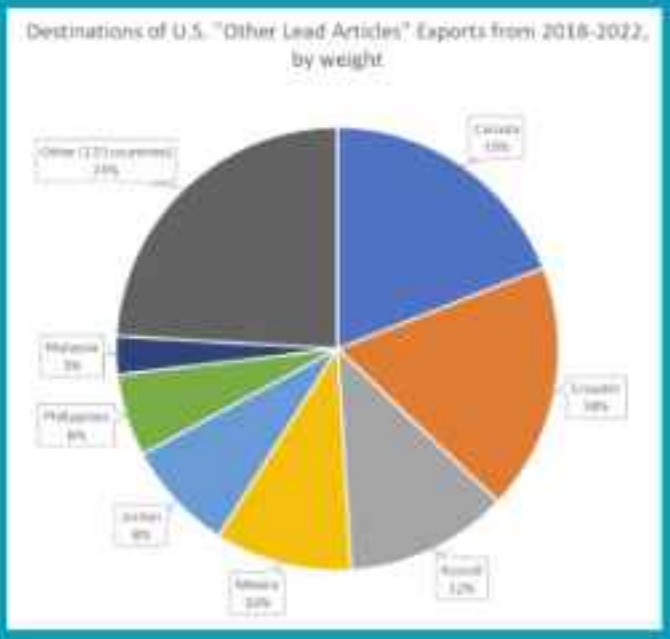


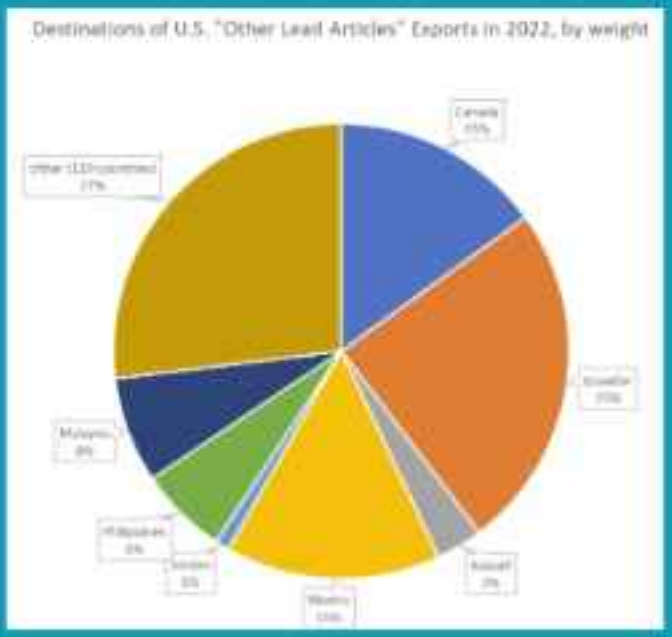


Other Lead Articles (7806) by weight:

- *In the last five years (2018-2022), the top recipients of other lead articles were **Canada** (19 percent), **Ecuador** (18 percent), and **Kuwait** (12 percent). Mexico, Jordan, Philippines, Malaysia, France, Netherlands, China, Costa Rica, India, Dominican Republic, and Australia also received notable amounts of other lead articles.*
- *In 2022, the majority (55 percent) of other lead articles were sent to **Ecuador** (25 percent), **Mexico** (15 percent), and **Canada** (15 percent). For Mexico and Ecuador, this was a significant increase from 2021. There were also notable declines in exports to Kuwait, from 25 percent to 3 percent, as well as Jordan, from 20 percent to 2 percent.*

	Canada	Ecuador	Kuwait	Mexico	Jordan	Philippines	Malaysia
2018	24.43%	0.32%	11.46%	12.30%	0.20%	9.27%	0.20%
2019	20.27%	30.89%	3.05%	8.15%	0.47%	7.67%	0.01%
2020	23.34%	24.95%	1.82%	8.51%	3.95%	4.42%	2.13%
2021	16.14%	11.17%	25.53%	6.13%	20.27%	3.18%	2.35%
2022	15.04%	24.73%	3.32%	15.34%	1.66%	6.32%	7.54%
5-year Total	**18.72%**	**17.66%**	**11.88%**	**9.63%**	**8.07%**	**5.57%**	**2.79%**





NOTE: Possibly due to unclear reporting and HS codes, third party sources that visualize Comtrade data show slightly different results. The International Trade Administration (ITA) lists India, Ecuador, and South Korea as the top importers of 7802 (ITA, 2023). For 7806, ITA lists Jordan, Mexico, and Canada as the top recipients (ITA, 2023). Resource Trade visualizes does not visualize 7806, but does have data for 7802 showing India, Ecuador, and United Arab Emirates as the top recipients (RTA, 2020).

Why is it important to identify where in the world U.S. pipes are smelted?

Identifying where U.S. companies send removed lead pipes to be smelted and recycled helps us understand who is carrying the burden of our toxic waste as well as the political strategy behind global waste colonialism. Waste colonialism, or "toxic colonialism" is when countries with more political power dispose or recycle their waste in countries with less political power (Pratt, 2011). Exporting removed lead pipes – a toxic material – to countries without adequate protections from the dangerous emissions from the recycling process for community members or workers is a toxic waste colonialism by the United States. Countries accept these exports and participate in the lead smelting industry under the guise of economic growth (despite the serious and costly health impacts) and often without the capacity to build enough social movement power to stop these predatory practices. Toxic colonialism is a longtime issue. The United Nations took action in 1989 by creating the first and only international treaty that regulates hazardous waste exports between politically powerful and politically vulnerable countries called the Basel Convention. The convention is not international law, but rather an agreement that countries can voluntarily sign. The Basel Convention prohibits exporting hazardous waste to countries that did not ratify the convention, countries that ban hazardous waste imports, and to Antarctica. A significant loophole exists in this agreement, though. These requirements do not apply if countries have multilateral or bilateral agreements that are no less "environmentally sound" than the Basel Convention's requirements. It has been updated several times since its creation, including an addition in 2021 to ban plastic waste trade between countries who did not sign the convention (Madapoosi, 2022). Notably, the United States has to date refused to sign onto, or ratify, the agreement.

SPECIAL SECTION:
GLOBAL CALLS FOR AN END TO TOXIC WASTE COLONIALISM

"Toxic Colonialism" was coined in the early 1990s by Jim Puckett, who is now the Executive Director of the Basel Action Network (BAN) (Pratt, 2010). At the time, Puckett defined this term as "dumping of the industrial wastes of the West on territories of the Third World" (Dalyell, 1992). Countries across the world have called for the end of this exploitative practice. The United Nations' Special Rapporteur on Toxics and Human Rights brings attention to human right violations related to toxic environmental exposures and recommends global strategies to rectify these violations and prevent more violations. He has emphasized repeatedly that "The prevention from toxic exposure through the sound management of hazardous substances has direct consequences on the enjoyment of human rights, impacting people's life, health and livelihood" (UN Human Rights, 2022).

Exporting toxic waste for recycling is unfortunately not the only form of toxic waste colonialism. Another egregious practice is wealthy countries exporting toxic products that are banned in their nation for consumption in countries with weaker chemical regulations. In his 25 year progress report on UN toxic mandates, Orellana wrote that "High-income States continue to export highly hazardous pesticides and toxic industrial chemicals, resulting in widespread infringements in low and middle-income countries of the human rights to life, dignity and freedom from cruel, inhuman and degrading treatment. Last year [2019], at least 30 States exported hazardous substances that had been banned locally for health and environmental reasons to Latin America, Africa and Asia" (Orellana, 2020). Even though removed lead pipes are (wrongfully) exempt from hazardous waste definitions, their production is banned out of recognition of their toxicity. Exporting these materials to other countries with lower environmental and worker protections colonial behavior and violates the human rights of people living near recycling facilities.

The U.S. Department of State (n.d.) says they do not have adequate authority to implement all the Convention's requirements. They are among five countries (East Timor, Fiji, Haiti and South Sudan) in the U.N. who did not ratify this treaty (UNEP, 2011a). This means they are not directly subject to its requirements (Archibald & Puckett, 2005). Instead, the U.S. is subject to hazardous waste guidance from other international groups of which they are a member (called multilateral agreements) and any specifications in agreements they make with individual countries (called bilateral agreements). The United States is regulated by a multilateral agreement called the OECD Council Decision on the Control of Transboundary Movements of Waste Destined for Recovery Operations and bilateral agreements with Canada, Mexico, Costa Rica, Malaysia, and The Philippines (USEPA, 2023 September). The OECD agreement regulates trade between OECD nations and each bilateral agreement regulates trade between the United States and one of the five listed countries.

India, the largest importer of U.S. lead scrap, is in a unique position. India ratified the Basel Convention, but is not a member OECD. This seemingly means that India must enter into a bilateral agreement with the U.S. to satisfy its Basel Convention obligations. For example, the U.S. signed a bilateral agreement with India to trade glass cullet with Mercury in 2002 (USDOS, 2017). But when ratifying the Basel Convention, India only included a partial restriction on wastes imported for "recovery". Their definition of hazardous waste is not the same as the Basel Convention's. Instead, India's policies defer to the hazardous waste definitions held by the country of import or export. Because the United States does not recognize exports destined for recycling as hazardous waste, hazardous waste trade can occur unregulated between India and the United States (UNEP, 2011b).

CALL OUT BOX: the issue of "consent"

Since 2012, requests and confirmation of consent from the country receiving the waste have been sent electronically between the United States, Mexico, and Canada (CEC, 2013). Still, a 2013 analysis uncovered that U.S. lead-acid battery exporters may be sending waste to places that did not consent to receiving the waste (CEC, 2013). This evidence of consent is called a "manifest". Mexico, unlike the United States, requires that exporting entities obtain a "receipt" proving that the export reached a recycling facility and submit them for recordkeeping (CEC, 2013).

This lack of consent may also be an issue with lead scrap imports. As UN Special Rapporteur Marcos Orellana cites non-consensual hazardous waste trade as a human rights violation: "And while the right to life, health, and a healthy environment are perhaps the prime rights implicated, in exposure to hazardous wastes and hazardous chemicals, there are certainly other rights involved such as the right to food, the right to water, the right to housing, the right to self-determination, the right to personal integrity, the right to information, and the right to science. Many of these chemicals enter our bodies without our consent and that is an affront to personal integrity. The right to be free from toxics in our bodies, and the right to live in a toxic free environment, are guiding forces for the conduct and pursuit of the mandate on toxics and human rights."(Main-Klingst, 2022)

Angelo Merendino / The Washington Post via Getty Images

The following chart indicates which of the recipients of United States' lead scrap have signed the Basel Convention and which are members of the OECD. Countries that are both OECD members and Basel Convention signers are exempt from hazardous waste regulations. Countries that are not OECD members and/or have not ratified the Basel Convention are not to receive hazardous waste from the United States or other OECD members.

Country	OECD Member (OECD, n.d.)	Basel Convention Signee (UNEP, 2011b)
Australia	Yes	Yes
Canada	Yes	Yes
China	No	Yes
Costa Rica	Yes	Yes
Dominican Republic	No	Yes
Ecuador	No	Yes
France	Yes	Yes
India	No	Yes
Jordan	No	Yes
Kuwait	No	Yes
Malaysia	No	Yes
Mexico	Yes	Yes
Netherlands	Yes	Yes
Pakistan	No	Yes
Philippines	No	Yes
Republic of Korea	Yes	Yes
United Arab Emirates	No	Yes
United States	Yes	No

WHAT UNITED STATES POLICIES REGULATE THE TRADE OF REMOVED LEAD PIPES?

FEDERAL (USEPA, 2023 AUGUST)

In 1978, a set of new standards were passed for lead prevention, including the prohibition of lead in residential paint, protections for industrial workers, and the first ambient lead in air standards. Since then, these standards have been updated and built upon.

1.) Resource Conservation and Recovery Act (RCRA) (USEPA, 2023 June)
This EPA regulation exempts lead material sent through the recycling process from being labeled, and therefore regulated, as hazardous waste. This code only regulates lead-containing material as hazardous waste if the material's lead levels are above a specified threshold and are being buried in a landfill. Recycled materials, regardless of the amount of lead they contain, are exempt from any hazardous waste labels.

2.) Safe Drinking Water Act (SDWA)
This EPA regulation includes the Lead and Copper Rule, which requires water utilities to reduce lead exposure through lead service line replacement, corrosion control, and monitoring programs. This Rule has undergone significant changes in the last few years and is still under revision in 2023. While guidance on the disposal of removed lead service lines was mentioned anecdotally in our key informant interviews, no such guidance has been located to date.

3.) Clean Air Act
The Clean Air Act created a number of EPA air quality regulations, including the National Ambient Air Quality Standards (NAAQS) and National Emission Standards for Hazardous Air Pollutants (NESHAPs). In other words, these regulations set maximum levels of contamination for air across a community and air immediately outside an industrial facility, respectively. Lead is one of six pollutants monitored and regulated by the NAAQS (USEPA, 2023 July). These regulations changed dramatically in 2008 from a maximum allowable level of lead in air of 1.5 to .05 ug/m3 (USEPA, 2022 October). This change led to the relocation of U.S. lead smelters to other countries that did not necessitate the same pollution control measures. With the heightened public awareness of lead poisoning after the disaster in Flint, some pushed for even stronger regulations in 2015 when the NAAQS were reopened for updates.

3.) Clean Air Act *Con't*

The EPA-initiated Children's Health Protection Advisory Committee recommended that the NAAQ lead level be reduced to 0.02 µg/m3 and that enforcement take environmental justice into account (Sathyanarayana, 2015). This recommendation cited a 2012 study that found that the 2008 standard would not protect children in poverty from lead's negative impacts (Chari et al., 2012). A letter from EarthJustice stated, "The NAAQS in place now only seeks to avoid an air-related population mean IQ loss in excess of 2 points – recognizing that on average that, or in some communities even higher neurological harm is occurring under the 2008 Lead NAAQS" (Gartner, 2016). Ultimately, the EPA did not adopt this recommendation due to the pressure from the Coalition of Battery Recyclers, who represent the majority of the secondary lead smelting market.

- *Note: Designations of attainment and nonattainment (for example, an assessment in 2011 found 3 places in PA to be nonattaining) (USEPA, 2023 June)*

Within the NESHAPs, the EPA regulates lead emitted at primary and secondary lead smelters, as well as other industrial facilities that may emit lead (USEPA, 2023 February). Both the primary and secondary lead smelter regulations were strengthened in 2011. (USEPA, 2023 March; USEPA, 2023 Marchb). In response to the 2020 EJ plan, a collective of environmental and social justice groups submitted a public comment that included a call for stronger regulations on lead smelting emissions (Cheuse et al., 2016).

The Toxics Release Inventory Program data (UEPA, 2023b) makes lead emissions data available for any facility releasing above the regulated amount of lead and lead compounds. This offers the public some access to this information and ensures a minimum level of transparency.

4.) The Resource Conservation and Recovery Act

The EPA regulates the entire lifecycle of hazardous waste through this law. The handling process and amount of waste are two important factors this policy considers when designating waste as hazardous or not. Removed lead pipes sold for recycling, while made from material that recognized as toxic, is not hazardous waste according to the RCRA (USEPA, July 2023)

5.) Occupational Safety and Health Act

The U.S. Department of Labor contains the Occupational Safety and Health Administration that implements the Occupational Safety and Health Act. OSHA standards ensure that workers in lead smelters and other industrial facilities are protected from exposure and monitored when exposure elimination is not possible. A Permissible Exposure Limit (PEL) and Blood Lead Level for Removal are determined in these standards (USDOL, n.d.).

State

- Pennsylvania hazardous waste regulations reflect federal requirements discussed above. Lead is recognized as hazardous waste by its toxicity characteristic, but removed lead pipes are specifically not hazardous waste when destined for recycling. (PA DEP, 2021)

- Other states have gone beyond federal requirements. For example, Wisconsin requires that lead pipes be recycled and that scrap companies are monitored to ensure they will recycle and not dispose of the lead pipes in landfills. (WDNR, n.d.).

COMPARING SECONDARY LEAD SMELTER STANDARDS: UNITED STATES, MEXICO, AND INDIA

Mexico and India are recipients of the United States' removed lead pipes and have air emission and occupational standards that are significantly lower than U.S. standards. India's standards for end of stack emissions and occupational safety standards were unable to be determined and require further investigation.

Air Emissions	U.S.	Mexico	India
End of stack (facility wide)	.2 mg/dscm each stack at new sources	.2 mg/m3	Unknown
End of stack (each stack)	1.0 mg/dscm Each stack at existing sources	1.0 mg/m3	Unknown
Ambient air	.15 ug/m3 over 3-month rolling average (total suspended particulate matter)	.5 ug/m3 averaged annually (for PM10 only)	Annual: .50 ug/m3 24 hours: 1 ug/m3
Occupational			
Permissible Exposure Limit (PEL)	50 ug/m3 averaged over 8 hours OSHA has set required standards for an action level at 30 µg/m3 averaged over an 8-hour workday (source)	50ug/m3 averaged over 8 hours	Unknown
Blood lead level for medical removal	50 ug/dl	No standard	Unknown

What barriers prevent local water systems from ensuring removed lead lines are recycled in the United States?

The only method of disposing lead pipes as hazardous waste available to water systems is paying for their placement in a hazardous waste landfill. This process is expensive, especially considering that recycling pipes results in recovered costs. Hazardous waste landfills are also notorious for leaking toxic substances into the environment, making them a less viable option from a public health perspective.

The retired lead service lines are sometimes left in the ground. In some cases, new water pipes are installed in a location different from the previous lead pipes. The lead pipes are abandoned in place in these scenarios. This prevents the lead lines from being recycled at all, and raises the risk of environmental contamination.

Water systems do not have access to the chains of command for the removed lead pipes they deliver to local scrapyards, making it difficult to identify which scrap vendors will utilize domestic smelters.

Federal regulators do not provide any formal guidance on the issue of ethical recycling practices for removed lead lines. Because water systems are often restricted by limited capacity, regulatory obligations are prioritized over optional commitments.

How can we develop locally focused, globally minded solutions to this problem?

Halting removed lead pipe exports is not an easy undertaking, but inaction and silence on this issue will afflict further violence on vulnerable communities across the globe. The United States' recent political action on lead pipe removal could double these exports in the near future. Will we fall in line with the status quo of sending our toxic waste to other countries, or chart a new path for locally focused, globally minded water citizenship? The solution to the U.S lead in water crisis is not exporting this environmental injustice abroad. Agencies charged to protect people and planet, such as the Environmental Protection Agency and public water utilities, must intervene on corporate tendencies to run smelting operations in the least regulated conditions at the expense of worker and community health. For example, since the U.S. strengthened lead emission standards in 2008, smelting market leaders like Johnson Controls Inc. moved most of their operations to Mexico (CEC, 2013). Processing removed lead pipes in their country of origin is only one piece of the solution.

We must move away entirely from a dependence on toxic chemicals

The secondary lead scrap market is one of many examples of waste imperialism practiced by countries like the U.S. As long as the U.S. continues to send its toxic waste to other countries to reduce Americans' exposure, motivation to end the use (and reuse) of hazardous materials will be limited.

Too often, alternatives proposed for materials under public scrutiny are also toxic. Most lead pipes are replaced with plastic (e.g. polyvinyl chloride or "PVC") or copper. Because plastic is less expensive than metal, nearly 80% of U.S. water pipes are predicted to be plastic by 2030 (Lloyd, 2022). This is highly concerning because plastic pipes may leach health threatening chemicals, permeate toxic substances from outside the pipe, and damage easily under extreme weather conditions like wildfires (Lloyd, 2022).

The first step in removing toxic chemicals from our economy is to acknowledge the myth of recycling. We must challenge the positive idea we have of "recycling" and the idea that this process is entirely environmentally friendly (Archibald & Puckett, 2005)

- **Domestic recycling must be done safely.**
  - Every country replacing lead service lines should have health-protective policies to ensure domestic smelting is conducted as safely as possible. We must support the capacity of local organizations working to improve their country's smelting standards.
  - Even with the recent shrink in U.S. smelters, these facilities disproportionately impact people of color (41 percent nonwhite) and more Latino and Hispanic residents (52 percent) than the population as a whole (25 percent and 14 percent, respectively) (EC/R Inc, 2011). These communities must be protected from the dangers of smelting. Remaining secondary lead smelters, such as Tampa's Gopher facility are notoriously in violation of OSHA and EPA standards. Enforcement must be improved if Gopher and the three other U.S.-based companies are to increase operations (Johnson et al, 2021).
  - As emission control and air monitoring technology continues to improve, so must regulations. Because there is no safe level of lead exposure, the lowest technologically possible emissions must be required by emission regulations. The EPA's 2016 decision to reject the Children's Health Protection Advisory Committee recommendation for a lower lead emission action level failed to do so and must be reconsidered.

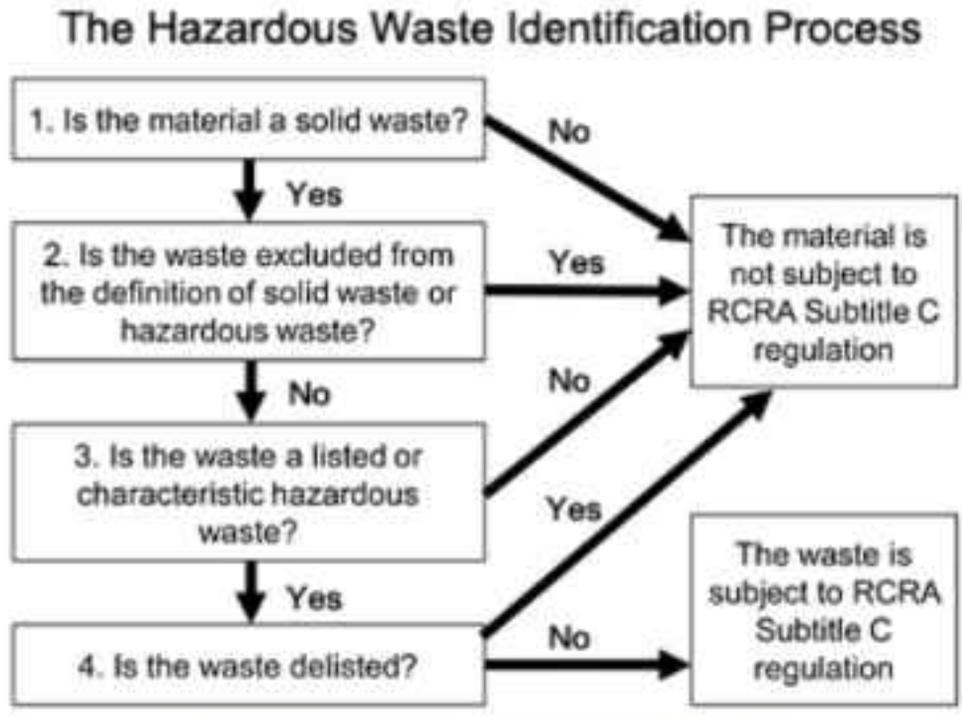
- **Global considerations in EJ initiatives and strategies**
  - Every strategy that addresses lead in water must consider the lifecycle of removed lead service lines. Considering the global implications of recycling these pipes abroad as an afterthought or neglecting to consider them is an environmental injustice. Lead prevention advocates must work to raise awareness of this issue among their peers to ensure future guidance like the NRDC's LSLR principles discusses the importance of safe, domestic recycling (Olson, 2022).
  - This integration, and the transition towards a circular economy that is both chemically and climate-safe, should be guided by human rights principles. Product and technology life cycles should be assessed to ensure actual decarbonization. Capacities for sound, circular management of chemicals and wastes generated by the climate transition should be installed to ensure detoxification. Human rights due diligence standards along the supply chain for climate change mitigation technologies should be mandatory. Environmental and human rights safeguards should be strengthened and enforced, instead of dismantled to purportedly favour the energy transition.
  - Manufacturing of electric batteries for electric vehicles or as storage for solar or wind energy sources requires minerals, metals and rare earth elements. Techniques and substances employed to extract them generate toxic wastes. Scrap produced at the end of their life cycle also contains harmful and toxic elements for human health and the environment.

- **Local utility contract requirements can build momentum for a federal requirement for domestic recycling.**
  - Many water utilities, such as PWSA, choose to complete lead service line replacement projects through contracts with third party companies. Utilities can leverage these contracts to require disposal practices to the extent of the contractors' control. For example, PWSA requires contractors to report the scrap vendors utilized and the weight of lead scrap sold to each vendor. Washington D.C.'s 2018 Water Standards Guide requires the following documentation to be submitted upon the completion of construction projects....

Source: D.C. Water

..."Submit written evidence that the receiving lead waste treatment, storage, or disposal facility is approved to accept lead waste by the federal and district or local regulatory agencies." (Benson, 2018) Documentation confirming the location of recycling could be pursued to collect data on the fate of local lead scrap and eventually to prove domestic recycling took place.

- **Define removed lead pipes as hazardous waste.**
  - The Resource Conservation and Recovery Act (RCRA) definition of hazardous waste is contradictory. Generally, they define hazardous waste as "a waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment". Lead pipes certainly pose a health risk when transporting drinking water, but also to workers handling them and the immediate environment. Removed lead pipes lose their hazardous waste label if sold to a scrapyard for recycling and maintain their hazardous waste label if brought to a landfill for disposal. The Hazardous Waste Identification Process flow chart below shows this loophole.



Source: U.S. Environmental Protection Agency

- Internationally, the Basel Convention defines Lead and Lead Compounds as hazardous waste that is toxic to both human health and the environment. Notably, lead-acid batteries are explicitly listed as hazardous waste. Ensuring that removed lead pipes are listed as hazardous waste, rather than implied through definition, would strengthen the ability of Basel Convention members to reject them. Still, as discussed earlier, the Basel Convention allows for bilateral agreements with non-member countries like the U.S.

REMAINING QUESTIONS

There is much that remains unknown in the story of exporting removed lead pipes from the U.S. As we continue to pursue more information about the life cycle of lead pipes removed from U.S. water systems, the following questions are top of mind:

- How much does the secondary non-ferrous lead scrap metal smelting market mirror the secondary lead-acid battery smelting market?
  - Reports like the CEC's 2013 Hazardous Trade? An Examination of US-generated Spent Lead-acid Battery Exports and Secondary Lead Recycling in Canada, Mexico, and the United States outline the dangerous and exploitative nature of the lead-acid battery market in North America.
- What U.S. actors are ultimately responsible for exporting removed lead service lines?
- Which trade codes are removed lead service lines assigned, if any?
- How can we better engage with environmental justice movement leaders in countries receiving U.S. lead scrap waste to build power to stop these exports?

To help raise awareness of this global injustice, the working group hosted a webinar in July 2023 with a Mexican environmental health NGO (Casa Cem), an occupational health expert (OK International), and labor and environmental organization (BlueGreen Alliance). More than 100 advocates, water utility administrators, public health agencies, non-profit organizations, and academics gathered to learn more about this important issue.

We will explore the above questions and others that arise in our continued research in additional webinars and cross-sector discussions. Without building awareness of this problem, we will not gain enough momentum to build creative solutions and the power to win them at the global scale.

Closing the water gap

University of Pittsburgh