

INFO SHEET

The Waste Trade of Electric Vehicle Battery Scrap

What is EV battery scrap and the waste trade of it?

With the rise of electric vehicles (EVs), large volumes of battery scrap are expected to enter the waste trade, because the EV battery recycling process typically involves multiple steps in different facilities and countries. In a first pre-treatment step in some recycling pathways, after discharge, EV batteries retired from a vehicle can be shredded and processed by thermal and heat-based treatments into battery scrap often referred to as “**black mass**”.¹

There is no standardized definition of what constitutes black mass, and the exact composition varies depending on the batteries treated and the treatment process employed. It is a [black powder containing a mixture of battery materials](#), including graphite, lithium, nickel, cobalt, inorganic fluorine compounds, and halogenated organic solvents.

Many of the compounds in black mass, including inorganic fluorine compounds and halogenated organic solvents, are listed as [hazardous wastes under international conventions](#) and are harmful to human health. However, black mass may not always be classified as hazardous waste due to economic and political considerations, with an attempt to ease import regulations.²

¹ GAIA. 2025. Electric Vehicle (EV) Battery Recycling: Questions & Answers. <https://www.no-burn.org/resources/ga-electronic-vehicles-battery-recycling/>

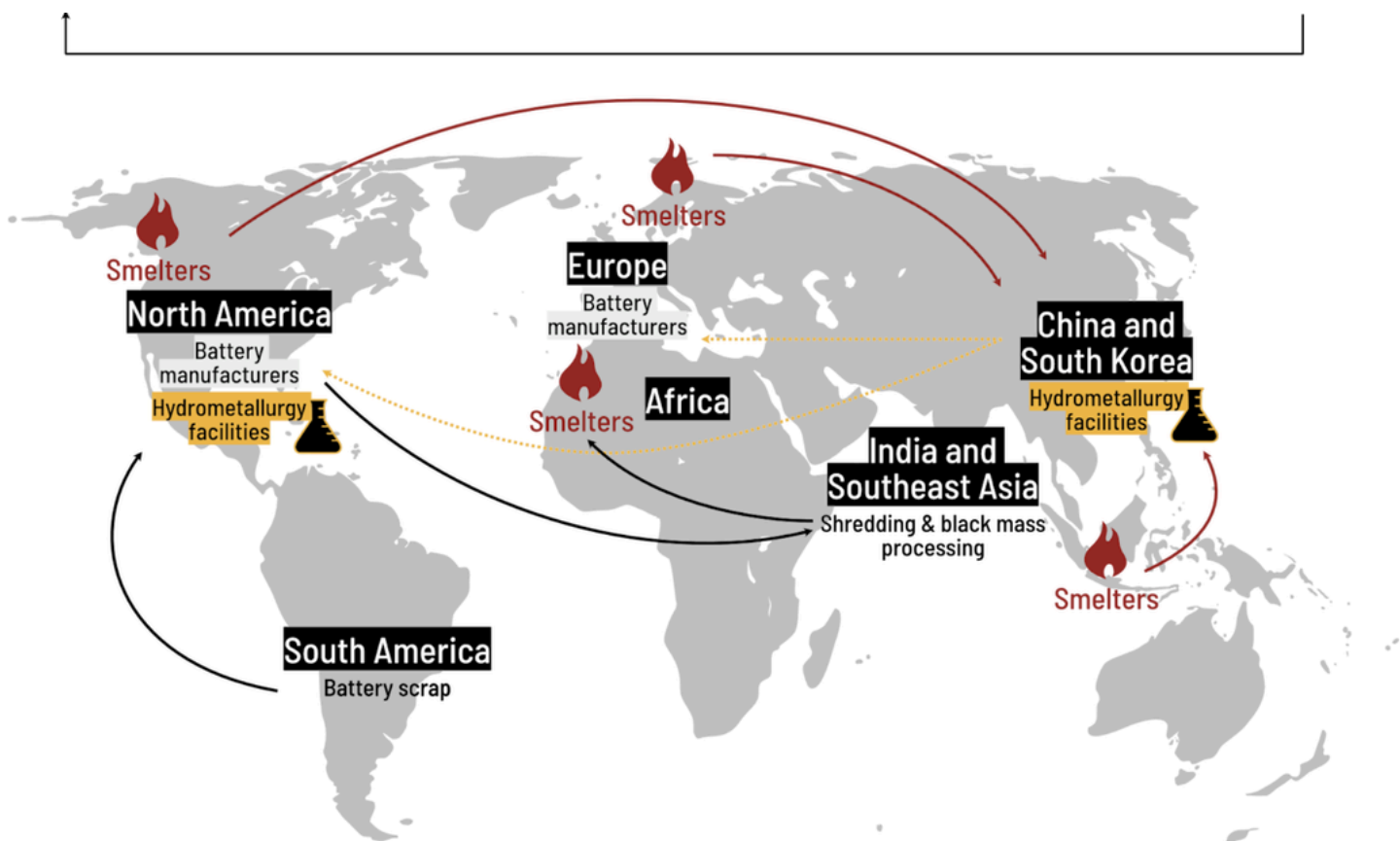
² GAIA. 2025. Electric Vehicle (EV) Battery Recycling: Questions & Answers. <https://www.no-burn.org/resources/ga-electronic-vehicles-battery-recycling/>

Battery scrap (black mass) is often produced in one country and exported to another for further processing. Export and import conditions and restrictions depend on a range of factors, including economic factors such as the grade of the black mass, as well as political factors such as energy security and geopolitics.

Based on research and limited data available, much of the world's EV battery scrap trade originates in EV battery manufacturing plants primarily in China and South Korea, leads through shredding and black mass processing operations in India and Southeast Asia and is further processed in smelters worldwide, all of which feed some material back to EV battery manufacturers, via cathode active materials factories mainly in China and South Korea.

FIGURE 1: EV BATTERIES MATERIALS FLOW

Battery manufacturers → **shredding and black mass processing** → **smelters** → **hydrometallurgy factories**



How is EV battery scrap processed?

Sometimes, fluorinated plastics and electrolytes are removed for waste disposal, while copper, aluminum, and steel components are separated and sent to smelters.³ The remaining materials are cathode active materials and the anode, which are loaded with metals, some of high market value. Most black mass is heated by pyrolysis (in an airless chamber) or by burning in open-air furnaces called smelters. Some processes also use hydrometallurgy, in which solvents extract metals.⁴ Refining occurs at various scales, ranging from a few hundred to more than 100,000 metric tons of processing capacity per year.



³ Gonzales-Calienes, Giovanna, Ben Yu, and Farid Bensebaa. 2022. "Development of a Reverse Logistics Modeling for End-of-Life Lithium-Ion Batteries and Its Impact on Recycling Viability—A Case Study to Support End-of-Life Electric Vehicle Battery Strategy in Canada." *Sustainability* 14 (22): 15321. <https://doi.org/10.3390/su142215321>.

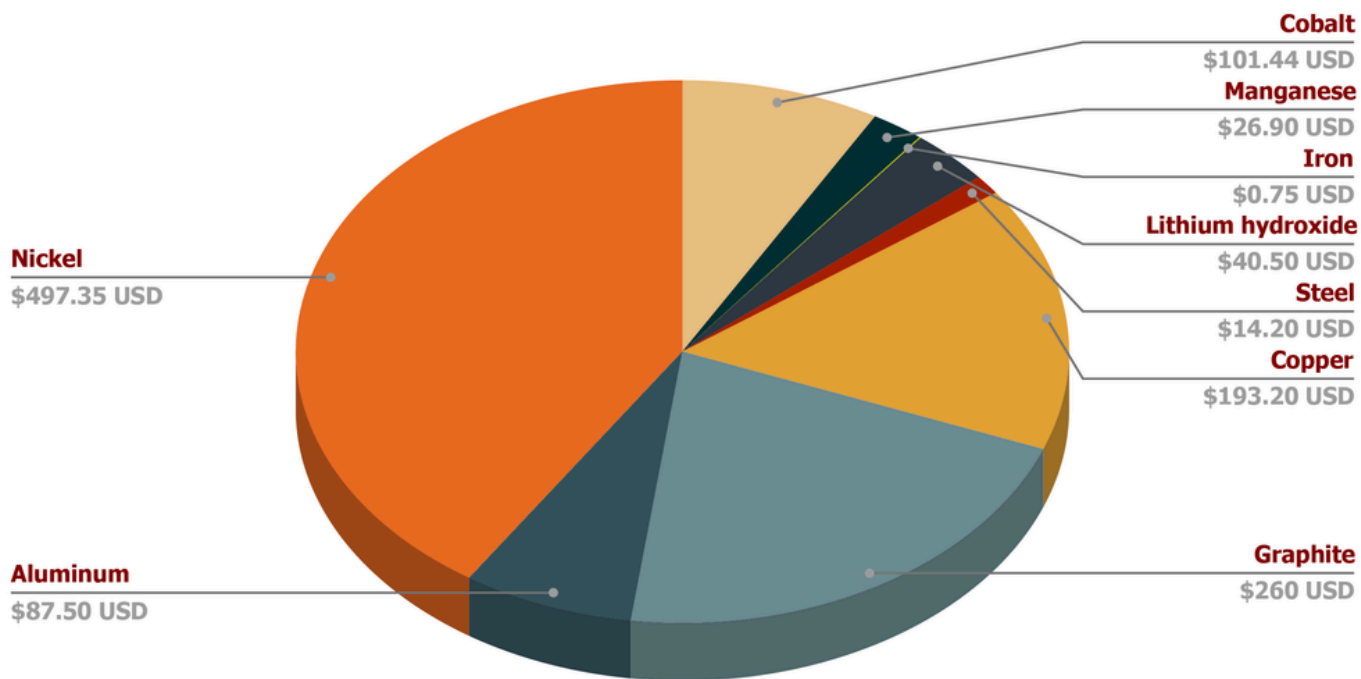
⁴ "The shredded battery material is reduced in size with the formation of a mixed powder residue, known as 'black mass'. Prior to mechanical reprocessing, cell deactivation or treatment of the black mass can be carried out by pyrolysis. Black mass can be pyrolyzed at up to 700°C after separation from the shredded material to remove the electrolyte components. This stage removes the fluorine-containing components. The resultant black mass is then commonly treated in a way analogous to a mined ore concentrate, with the elements of interest recovered through either a pyrometallurgical or hydrometallurgical processing route." L. Donnelly et al., *Proceedings of WCSB10: TOS Forum Issue 11*, 397-409 (2022) https://www.imppopen.com/subs/tosf/v22/S11_0397.pdf

What are the valuable materials in black mass?

Fractions of expensive metals in the battery cells are the most sought-after materials. According to a 2020 estimate, nickel accounts for roughly 16% of an average battery's mass,⁵ but holds about 40% of the value. Cobalt is roughly 4% of a typical EV battery, and 8% of its value. The waste trade in scrap is designed to capitalize on the most profitable metals. The other materials' fates are poorly documented and lightly regulated.

⁵ Transport & Environment, 2021. From dirty oil to clean batteries. See also Bhutada, Govind. 2022. "The Key Minerals in an EV Battery." Elements, May 2, 2022. <https://elements.visualcapitalist.com/the-key-minerals-in-an-ev-battery>.

FIGURE 2: POTENTIAL VALUE OF BLACK MASS COMPONENTS (IN USD)



The above chart is based on 2020 aggregated data from a mix of chemistries ([source](#)). Today, as the EV battery industry evolves, the relative percentage of cobalt and nickel is even lower than is shown here.

What are the emerging trends in global waste flows of black mass?

While battery waste recycling infrastructure continues to develop, some trends are apparent. A globalized network has emerged. It begins with EV battery manufacturers, which are the main source of batteries in today's scrap trade. It leads through facilities that dismantle, shred, and pre-treat retired or spent batteries; and onward, for pyrolysis, hydrometallurgy, or burning in a smelter. From here, a fraction of valuable materials emerges into the metals market. Some cobalt, nickel, and other metals are used as precursor cathode active materials by EV battery manufacturers.

The actual percentage of EV battery scrap material that is reused in new EV batteries is not yet documented. The loss and fate of mass along the way, and the resulting pollution, remain poorly understood.

The flow of battery waste is influenced by the availability of profits from its components and geopolitical factors. When mineral prices are low, it is less expensive to mine than to recover metals from EV battery scrap, resulting in an overcapacity of recycling infrastructure. Investments in new mines are also releasing new volumes of nickel into global markets, leading to downward pricing.

Given that nickel and cobalt represent about half of the value within black mass, nickel and cobalt smelters are frequent destinations for the EV battery waste trade. Before black mass reaches a smelter, however, it may undergo multiple steps to enhance concentrations of its most valuable elements. Different processes have different impacts on workers, communities, and the environment, each of which can become exposed to toxic chemicals.

Lower-value black mass shipments

In between the EV battery makers and metals traders lie overlapping networks of smaller processing service companies. The final destinations depend upon buyer specifications and the price of the black mass. Destinations with fewer environmental regulations and lower labor costs are more likely to receive less valuable black mass. Lower-value shipments indicate higher levels of contamination with less valuable materials, including Per- and Polyfluoroalkyl Substances (PFAS).⁶

For example, official customs records in India for black mass shipments support the idea that lower-quality black mass is shipped to lower-income countries.⁷ From January 2023 to April 2024, companies in India made at least 28 shipments of black mass to the Philippines. The average value of these shipments was just \$288 USD per metric ton, with some shipments valued as low as \$62 USD per metric ton. The average value of black mass shipments to Hong Kong was \$1,137 USD per metric ton, and to the United States: \$1,220 USD.⁸ These values are comparable to the total value of metals as seen in the above pie chart.

⁶ For more information, please see: Jung, Erica. 2025. Info Sheet: PFAS in Electric Vehicle Batteries. Global Alliance for Incinerator Alternatives. April 15. <https://www.no-burn.org/resources/info-sheet-pfas-in-electric-vehicle-batteries/>

⁷ Fastmarkets. 2024. "India's EV Battery Gigafactory Plans Could Spur Black Mass Imports and Cut Exports." Fastmarkets. <https://www.fastmarkets.com/insights/indias-ev-battery-gigafactory-plans-could-spur-black-mass-imports-and-cut-exports/>

⁸ Indian Customs Export Declarations



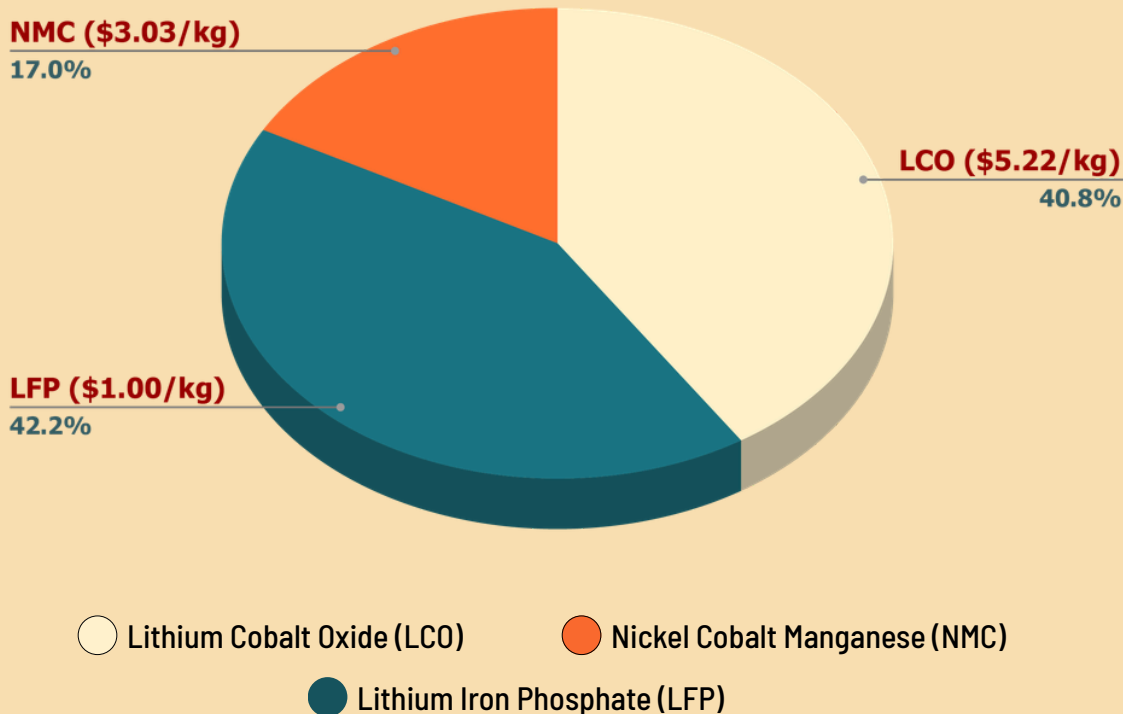
CASE STUDY

BATX Energies (India) → Petromine (Philippines)

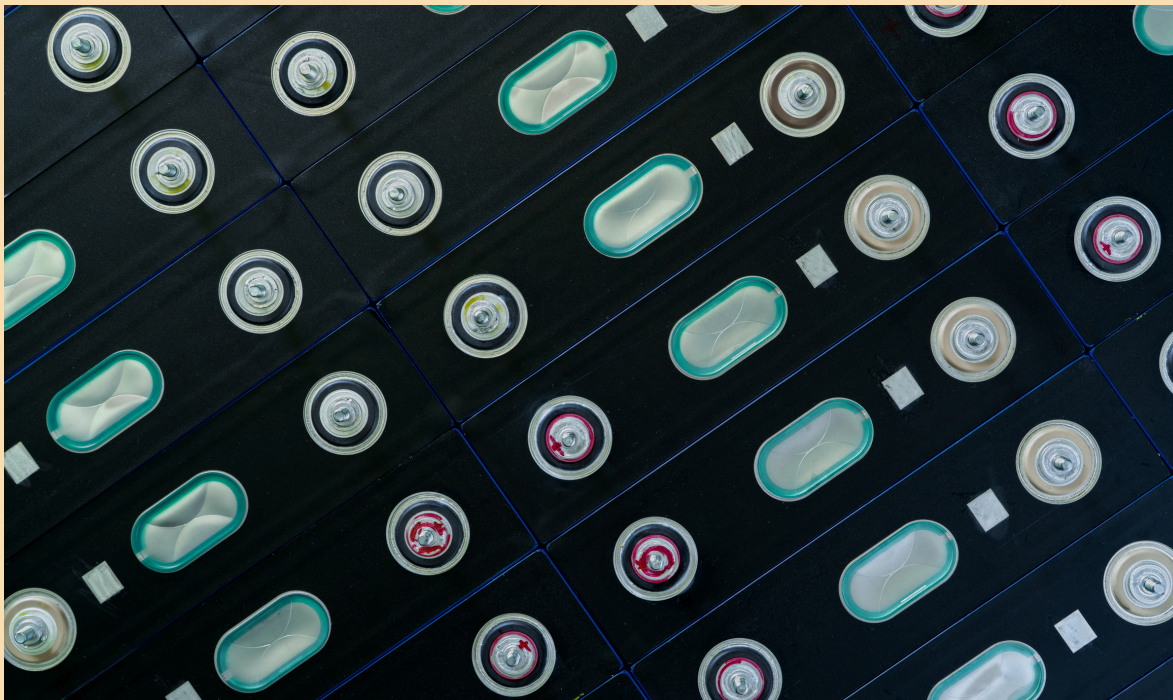
The lowest value EV battery black mass shipments found in shipping records were from BATX Energies (India) to the Petromine metals recovery operation in the Philippines.

In 2023, BATX began making black mass in Secunderabad, Uttar Pradesh, from batteries imported from around the world. BATX has shipped more than 300 metric tons of “metal concentrate (black mass)” to Petromine. Cargoes were distinguished by type: Lithium Cobalt Oxide (LCO), Nickel Cobalt Manganese (NMC), and Lithium Iron Phosphate (LFP). The LCO black mass was valued relatively high (\$5.22 USD per kilogram, on average). NMC black mass averaged \$3.03 USD per kilogram. The LFP mass was worth much less: \$1.00 USD per kilogram.

FIGURE 3: BLACK MASS SHIPEMENT, BY TYPE



Unfortunately for the valuation of recycling, LCO is the least common of these EV battery chemistries. NMC has been the most common type, but globally, LFP is becoming dominant, especially in China.⁹ The world's biggest automakers, including Tesla and Ford, are installing them. LCO's share of the market will decrease from 11% in 2023 to 4% in 2033, and over that same period, NMC will decline from 50% to 43% while LFP rises from 29% to 48%.¹⁰ LFP cathodes have similar amounts of lithium as NMC batteries, but no cobalt or nickel.¹¹



The lowest value type, LFP, had the largest share of black mass shipped to the Philippines. Petromine runs a metal-bearing waste treatment in Caloocan City, where the waterways are highly polluted.¹² Formal and informal e-waste recycling is a major part of the economy.¹³

Petromine recovers cobalt, nickel, and lithium from phones and used batteries using a combination of hydro- and pyrometallurgy.¹⁴ Petromine's clients include the smelter company, Umicore, and the EV battery manufacturer, Samsung.¹⁵ Hundreds of companies like Petromine move and process EV battery waste. But their financial backing comes from a few of the world's largest corporations (see the following chapter).

9 BloombergNEF. 2024. "Electric Vehicle Sales Headed for Record Year, but Growth Slowdown Puts Climate Targets at Risk, According to BloombergNEF Report." BloombergNEF. <https://about.bnef.com/blog/electric-vehicle-sales-headed-for-record-year-but-growth-slowdown-puts-climate-targets-at-risk-according-to-bloombergnef-report/>

10 Fastmarkets. 2023. "Growing LFP Adoption Drives Need for More Transparency across Chemistry's Supply Chain." Fastmarkets, December 18, 2023. <https://www.fastmarkets.com/insights/growing-lfp-adoption-drives-need-for-more-transparency-across-chemistrys-supply-chain/>

11 Visual Capitalist. 2021. "The Key Minerals in an EV Battery." Elements by Visual Capitalist. <https://elements.visualcapitalist.com/the-key-minerals-in-an-ev-battery/>

12 Resilience and Innovation Learning Hub (RILHUB). 2020. Fact Sheet: Caloocan City. RILHUB. https://rilhub.org/wp-content/uploads/2020/07/Factsheet_CaloocanCity_ECHOvisit-v1638_20190124.pdf

13 EcoWaste Coalition. 2022. "The Woes of Informal Waste Workers: How Are They Coping With the Pandemic?" EcoWaste Coalition, February 14, 2022.

14 Petromine Group. About Us. Petromine Group. <https://petromine.ph/aboutus/>

15 Petromine Group. About Us. Petromine Group. <https://petromine.ph/aboutus/>

Key Players

Glencore

Glencore is the world's biggest mining and mineral trading company. It purchases and trades in much of the black mass that enters the global market, and it burns a lot of it in its own smelters. Glencore's customers include the electric carmaker GEM, which in turn partners with the EV battery giants, including the world's largest lithium-ion battery manufacturer, CATL (China).

China & South Korea

China and South Korea are the two dominant sources of cathode active materials, with an increasing share being produced in South Korea. Battery materials manufacturer CNGR and GEM have been shifting production of EV battery materials to partnerships in South Korea, for example, with SK and Posco, due to tariffs and other restrictions against materials made in China.¹⁶

- **China's CNGR** is the world's leading producer of precursor cathode active materials (pCAM), and is the final customer for EV battery scrap supply chains from India to Morocco and Laos.¹⁷
- **The SK chōsun** (family conglomerate) of Korea is involved in all aspects of battery waste, from producing batteries to organizing a global EV battery waste collection and shipping network to producing new cathode active materials. SK is also building EV battery factories around the world and has arrangements with China's GEM and CNGR in Asia and Europe.¹⁸
- **SK's subsidiary TES** collects battery waste worldwide and operates 23 logistics and distribution facilities. TES has also secured about 30 Basel Permits -- an international permit required to legally send discarded batteries to its overseas facility as of October 2023.¹⁹ SK's TES directs a significant portion of this global "closed loop" to Singapore, where it operates a shredder.

The margins of this trade are built in waystations, communities in places like Vientiane and Caloocan City, where black mass is processed to remove contaminants, where relatively cheap labor is abundant, and government protections against injustice are weak. Many black mass processing and refining operations are being established on or near Native lands.

¹⁶ The Korea Herald. 2023. "Korea-China Battery Minerals Tie-Up Mutually Beneficial: CNGR Chief." The Korea Herald, July 3, 2023.

https://www.kedglobal.com/batteries/newsView/ke_d202307030017; CNGR. 2022. "SK ecoplant and CNGR to Make a Joint Foray into European Used Battery Reutilization Market." CNGR News World, October 17, 2022. <https://cngre.eu/news-world/>

¹⁷ Benchmark Mineral Intelligence. 2023. "Morocco Is a Sweet Spot for the Time Being." Benchmark Mineral Intelligence. <https://source.benchmarkminerals.com/article/morocco-is-a-sweet-spot-for-the-time-being-qa-with-cngrs-thorsten-lahrs>

¹⁸ Rho Motion. 2023. "China's GEM Promotes Recycling Expansion into Europe." Rho Motion, November 6, 2023. <https://rhomotion.com/news/chinas-gem-promotes-recycling-expansion-into-europe/>; Yicai Global. 2022. "China's CNGR Teams Up with South Korea's SK Group on Lithium Materials." Yicai Global, June 2022. <https://www.yicai.com/news/china-cngr-teams-up-with-south-korea-sk-group-on-lithium-materials>

¹⁹ The Korea Herald. 2023. "Korea-China Battery Minerals Tie-Up Mutually Beneficial: CNGR Chief." The Korea Herald, July 3, 2023. https://www.kedglobal.com/batteries/newsView/ke_d202307030017

Lack of transparency as the key challenge

The trend in battery chemistries away from higher-value minerals will likely entrench what we are seeing already: the location of the dirtiest parts of the industry in places with the lowest-cost labor and fewest environmental protections.

In theory, the waste trade in EV battery scrap, especially black mass with toxic contaminants, falls under the prior informed consent (PIC) construct of the Basel Convention. These materials may also be considered hazardous waste, which is outlawed from export to non-OECD countries under the BAN Amendment of 1994. Some countries are pursuing that angle in order to capture these resources regionally.²⁰

Due to loopholes in the Basel Convention, as described in GAIA's [Infosheet on Waste Colonialism](#), much of the trade in black mass is not made public under open-access reporting systems. Harmonized shipping codes are anything but harmonized, and there's a lack of consistent guidance on the rules governing how black mass is classified and transported around the world.²¹ In the meantime, China recently issued a national standard, which is expected to allow legal importation of black mass under certain conditions on quality.²²

This lack of transparency is compounded by shipping regimes. Just as there is no precise industry definition of "black mass," there is no standard terminology under the internationally standardized system of classifying traded products. Black mass is sometimes described as exactly that in shipping manifests, but often it is described as "cobalt mattes," "mixed metal powder," "metal concentrate," or many other imprecise terms. It is shipped under inconsistent Harmonized System Codes.²³

The scrap metal industry recognizes the inconsistencies in reporting and is seeking to harmonize reporting in places like the United States,²⁴ the United Kingdom, and the European Union. There are clear differences in the value of black mass that relate to the desired metal content and unwanted toxic contamination. Standardization of black mass specifications, grades, and harmonized tariff codes will help to identify materials that may be more harmful than beneficial to the importing countries, their workers, and the environment. Standardization of practices, quality control, and restrictions on highly contaminated scrap trade are imperative to ensure that the flood of EV battery scrap does not lead to waste colonialism.

20 Euractiv. "EU Urged to Restrict Export of Black Mass from Used Electric Vehicles." Euractiv. <https://www.euractiv.com/section/circular-materials/news/eu-urged-to-restrict-export-of-black-mass-from-used-electric-vehicles/>

21 MMTA. "The Evolving Black Mass Market." MMTA. <https://mmta.co.uk/the-evolving-black-mass-market/>

22 "GB/T 45203-2024 English Version, GB/T 45203-2024 Recycled Black Mass for Lithium Ion Battery (English Version) - Code of China." <https://www.codeofchina.com/standard/GBT45203-2024.html>.

23 This includes 280519 (Alkali Metals, not otherwise specified), 854912 (Waste and scrap obtaining lead, cadmium or mercury, of primary metals), 81052030 (Cobalt mattes and other intermedia products of cobalt metallurgy), 285300 (inorganic compounds not otherwise specified), 38429999000 (binders made for foundry molds), to name just few.

24 ISRI. "Senate Hearing on Electronics: Identifying Opportunities." ISRI. <https://www.isri.org/scrap-articles/senate-hearing-on-electronics-identifying-opportunities>

Key Recommendations

National governments, with inter-governmental coordination, must:

- Conduct strict inspections of black mass or related battery scrap at both export and import, including the identity of the supplier.
- Adopt standardized definitions, specifications, grades, shipping, and tariff codes for “black mass” with strict labeling requirements.
- Prohibit shipments of highly contaminated scrap.
- Ensure all relevant health and safety data are available to protect workers and frontline community health and safety.

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