



# American Recycler

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## Glass recycling on a global scale

by MAURA KELLER

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The glass recycling market in the U.S. shows a mixed performance compared to global efforts. The national glass recycling rate is about 30 percent (this rate varies significantly across states, with some achieving higher rates due to effective deposit return systems and robust recycling programs). U.S. rates are lower than most European countries, where recycling rates can exceed 85 percent. This disparity is largely due to differences in infrastructure, regulatory frameworks, and public participation.

According to Scott DeFife, president of Glass Packaging Institute, in Europe, high recycling rates are driven by comprehensive deposit return schemes, extended producer responsibility (EPR) programs that emphasize quality and more robust public collection systems. Many countries have set exemplary standards in glass recycling through efficient policies and active public engagement. The European Union's ambitious recycling targets and mandates for member states further drive these efforts.

"By contrast, the U.S. faces challenges such as contamination in a single-stream recycling systems and inconsistent access to recycling facilities across states," DeFife said. "While there is established infrastructure for glass recycling in areas of high production, improvements are possible with technology adoption and contamination reduction that would increase processing efficiency." Additionally, as DeFife explained, the focus on quality is less stringent, leading to a substantial amount of collected glass ending up in landfills after being delivered to a single-stream material recovery facility (MRF). The U.S. has the potential to double the glass recycling rate if the needed infrastructure and policies were adopted more broadly.

Mark Whitley, founder and chief executive officer of Whits Services Corporation, a waste and recycling company, said that in the U.S., glass recycling rates have traditionally been lower than in some other countries.

"As of my last update, the recycling rate of glass in the U.S. was around 31.3 percent in 2018 according to the EPA. In contrast, several European countries have much higher rates," Whitley said. "Countries like Belgium, Sweden, and Switzerland have reported glass container recycling rates of over 90 percent, due largely to extended producer responsibility programs and comprehensive deposit-return systems."

When looking at how glass recycling works in different countries, there is much knowledge to gain. For example, as Whitley explained, Germany and the Netherlands are very good at it, with more than 70 percent of their glass getting recycled



Glass has the ability to be recycled many times without losing its quality. Thirty-three percent of glass containers are being recycled in the U.S.

successfully.

"Their success comes from having effective deposit return plans, which encourage people to bring back their glass bottles. I believe we can gain much knowledge from their methods to improve our own recycling efforts," Whitley said.

On the other side, countries like India and China are progressing but still face problems. They invest money in new recycling systems, yet they struggle with issues such as efficient waste collection and raising people's awareness about it.

"Observing how these countries manage their recycling issues provides both inspiration and lessons," Whitley said.

Recycling glass can seem simple, but it is really quite complex. As Whitley explained, glass has the ability to be recycled many times without losing its quality. However, the industry still faces some issues. "In the United States, about 33 percent of glass containers are being recycled. It's a start, but there's definitely room for improvement," Whitley said. "From my experience, just having the latest technology is not sufficient, even if it is important. We need a setup where technology, public involvement and good policies all cooperate together. It's like putting together a giant puzzle where each piece has to fit perfectly."

Joy Rifkin, sustainability manager at LRS, said that glass recycling in the U.S. involves breaking bottles and jars in recycling trucks, or promptly at the MRF using a glass breaker. The broken glass is then sent for secondary processing and cleaning at a separate facility, before being heated and formed into new bottles and jars.

"This process is laborious, involves numerous steps, and isn't economically viable," Rifkin said. "In other countries, there are still strong bottle return programs. In those programs, the glass is unbroken, which allows for much easier

cleaning, sanitation, and re-use. You may remember this existing in the U.S. in the mid-1900s. Families returned their milk bottles so they could be cleaned and refilled. These systems exist at a much smaller scale than they did in the past. Although glass recycling is happening in the U.S., there are numerous barriers preventing it from being more sustainable and profitable."

#### Issues to Address

Contamination is a key issue affecting the glass recyclability rate within the U.S. As Whitley explained, glass collected for recycling can be contaminated with other materials, which makes it difficult to recycle.

Additionally, proximity to facilities is another key factor. The distance between recycling centers and glass processing plants can be great, further increasing transportation costs and carbon footprint.

"Demand for cullet also fluctuates, and when demand is low, it can diminish the economic incentive to recycle," Whitley said. "And there are technology limitations. The technology available for sorting and processing recycled glass may not always be advanced enough to deal with different colors of glass or to remove all impurities."

Rifkin added that the recycling industry needs people to put the right items into their recycling bins. At LRS, we recycle glass using a cyclone separator, which uses circular air to pull heavy glass pieces down and suck lightweight pieces of paper and plastic upwards.

The sorting of glass also involves money, equipment and carbon emissions. And glass, a heavy material, requires additional fuel for transport, making it less economically viable to move.

"That increased weight also results in increased particulate emissions. Glass processing and recycling involves many steps, and this process needs to

See GLASS RECYCLING, Page A2

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# Glass recycling

■Continued from Page A1

be simplified to be environmentally and economically sound,” Rifkin said. “Although glass is an incredibly sustainable material made from sand and limestone, it is not necessarily an economically beneficial recycling commodity. LRS recycles glass because it’s the right thing to do, not because we make a large profit from marketing this commodity. If glass was considered a more valuable resource, or the recycling process was easier and cheaper, this would greatly impact the glass recycling ecosystem.”

## Opportunities for Education

Many city and county governments conduct local campaigns to educate their residents about recycling programs available in their area. As Whitley pointed out, these can include community workshops, informational mailings, and school programs. States like California and Massachusetts, which have robust recycling programs, often have state-funded educational initiatives focused on recycling.

“Companies that handle waste and recycling services also educate through direct communication with their customers, providing proper sorting guides and other informational materials,” Whitley said.

LRS works with schools, community groups, universities, businesses, cultural institutions, municipalities and non-profit organizations to educate on the importance and challenges of glass recycling. The company also released a virtual MRF tour, a City of Chicago interactive blue cart recycling map, a coloring book for kids, and other resources to educate the communities they serve.

“In the last year and a half, we’ve hosted over 800 visitors at The LRS Exchange MRF to lift the veil and showcase the recycling process,” Rifkin said. “Education is paramount to increased recycling success. We highlight the realities of glass recycling and share the successes and struggles with the communities we serve.”

DeFife pointed out that various industry groups and partnerships are actively working to improve glass recycling rates. The broader glass supply chain and a variety of end-market stakeholders came together a decade ago to form the Glass Recycling Coalition (GRC). This group meets regularly for industry wide collaboration and education initiatives.

The work of the GRC eventually led to the creation of a 501c3 charitable foundation, the Glass Recycling Foundation (GRF) that offers grants to local communities that need help with infrastructure and equipment to start or expand glass recycling programs across the country.

“Another step by players in the glass market is to promote and invest in recycling infrastructure. This includes collaborating with municipalities, waste management companies, and recycling facilities to enhance collection, sorting, and processing capabilities for glass materials,” DeFife said. “By investing in state-of-the-art recycling facilities and technology, we aim to make glass recycling more efficient and accessible to consumers and businesses alike.”

DeFife stressed that education and awareness campaigns play a crucial role in encouraging recycling behavior among consumers. Glass packaging manufacturers, along with industry associations like the Glass Packaging Institute, actively engage in educational initiatives to inform consumers about the importance of recycling glass and how to sort and dispose of glass waste properly.

“By raising awareness about the environmental benefits of glass recycling, we aim to instill a sense of responsibility and encourage sustainable practices among consumers,” DeFife

## Steps To Take

So what needs to be done to improve the level of glass recycling in the U.S.? Enhancing public awareness on the importance of recycling glass and providing clear information on how to recycle correctly is paramount.

“Upgrading recycling facilities with the latest technology for sorting and processing glass more efficiently,” Whitley said. “This could include investing in machines that can better sort glass by color or remove contaminants. Enacting EPR laws that make producers responsible for the lifecycle of their products can encourage the design of products with recycling in mind and facilitate better recycling processes.”

DeFife added that prioritizing contamination management is essential, and dedicated glass collection systems can significantly reduce contamination levels. He suggested that a simple change in state waste management policy in a dozen states that have glass manufacturing facilities but no other bottle deposit or EPR for packaging laws to require glass be diverted from landfills to the greatest extent possible, would immediately make it easier to access the glass needed and spur investment in new glass recycling processing facilities that would feed nearby glass manufacturing facilities.

“Keeping glass out of landfills is the number one step any state or local government policy or contract could take that would boost glass recycling rates in the US,” DeFife said.

He also pointed out that policies such as EPR for Packaging and Bottle Deposit Return are more complicated and take time to build out, but are effective at boosting glass recycling rates. GPI has engaged and testified in support of several EPR for Packaging and DRS expansions in a half-dozen states, which we estimate will increase the amount of glass recovered and recycled by over half a million tons.

“As this trend continues, and as more states approach EPR or consider DRS for beverage containers, we believe that the industry could see over one million additional tons of glass recovered, diverted from U.S. landfills, and used domestically for making new bottles by the end of the decade,” DeFife said.

Investments in modernizing and expanding recycling facilities, especially in regions with outdated equipment, will also improve the efficiency of glass recycling.

“Expanding DRS systems across more states will incentivize consumers to return



glass containers for recycling. Research and development of advanced sorting and processing technologies will also enhance the quality and efficiency of glass recycling,” DeFife said. “Collaboration with policymakers to harmonize these regulations will create a more consistent and effective recycling system.”

Whitley further believes that in order to help improve the glass recycling efforts in the U.S., closed-loop recycling systems must be utilized.

“These systems attempt to transform recycled glass back into new containers, which helps in reducing the use of raw materials and minimizing waste,” Whitley said. “Creating a closed loop helps recycling become more efficient and sustainable.”

With new technology and focus on closed-loop systems, the glass recycling

industry is moving toward a more sustainable future.

“It is about observing what functions effectively in different regions and then applying those concepts in our own manner,” Whitley said.

Rifkin added that the recycling industry needs the next generation of scientists, policy makers and engineers to think outside the box. “How can we recycle this material more efficiently? How can we tap into the discussions happening in the packaging world to include glass in the conversation? How can we invent innovative equipment to recover glass more effectively? How can we prevent this durable, sustainable material from ending up in our landfills?” Rifkin said. “We are optimistic and excited to see the future of glass recycling.”

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# NextCycle Michigan awards more than \$100k to advance recycling and reuse projects

The annual NextCycle Michigan Summer Showcase put the spotlight on 17 teams from Michigan and beyond, pitching reuse, recycling, composting, and recycled content projects.

An expert judging panel and an audience of entrepreneurs, small businesses, brands, investors, community representatives, and recycling industry professionals gathered on the Eastern Michigan University campus to hear the teams' innovative and collaborative ideas – part of the state's journey to a stronger circular economy.

NextCycle Michigan, an initiative of the Michigan Department of Environment, Great Lakes, and Energy (EGLE), is designed to advance businesses and projects that build capacity and markets for material recovery, reuse, and recycling in Michigan.

EGLE Director Phil Roos provided the keynote address and highlighted Michigan's efforts to minimize waste and increase innovative and scalable solutions.

Selected teams receive access to research, mentorship and one-on-one coaching, a multiday accelerator camp, business planning, pitch development, and matchmaking with potential partners and funders. The Showcase is the culmination of the six-month program where teams pitch their projects, vie for awards, seek investment, and connect with partners.

The program is strategically designed to meet participants where they are and focus on the success of solutions. With

an emphasis on reducing barriers, the program is free for participants and businesses completing the program do not sacrifice any equity and can focus on reaping the benefits of a technical and collaborative program.

The June 12 Summer Showcase featured projects organized into two tracks:

- **Flows Track:** The Food, Liquids & Organic Waste Systems (Flows) Accelerator Track supports projects that transform any aspect of organics recovery in Michigan, from food donation to food scrap recovery to new market development for finished compost.
- **RIT Track:** The Recycling Innovation & Technology (RIT) Accelerator Track supports projects that advance new material recovery technologies, waste minimization techniques, or other advancements in sustainable materials management.

Monetary and in-kind prizes totaling \$26,000 were awarded to teams that presented a five-minute pitch and answered questions from the panel of judges.

In a surprise announcement, Julie Staveland, assistant division director for EGLE's Materials Management Division, announced a total of \$85,000 in Harvest Grant funding would be distributed to the 17 teams (\$5,000 to each team) that presented pitches at the Summer Showcase.

"You have sown the seeds and grown your projects. It is now time to harvest

those endeavors and take it to the next level," Staveland said. "We believe in the work you are doing, and in the mission, and we will continue to invest in you, the change makers."

The NextCycle Michigan Summer Showcase winners are:

- **Hemp for Humanity of Three Rivers, Michigan,** utilizing industrial hemp production waste, agricultural waste, and building deconstruction waste as viable building materials, won the \$10,000 Flows Best Pitch Award, sponsored by RRS. Hemp for Humanity also won the \$500 Flows People's Choice Award, sponsored by the Michigan Organics Council.
- **Design Declassified of Grand Rapids, Michigan,** utilizing plastic waste from residential and commercial sources to manufacture plastic sheets that can be used for building materials or other purposes, won the RIT Make it in Michigan Award of in-kind technical support valued at \$10,000, sponsored by Centropolis Accelerator at Lawrence Technological University.
- **PittMoss of Ambridge, Pennsylvania,** a manufacturer seeking to develop a Michigan facility to use locally sourced recycled paper fibers to manufacture soilless gardening mixes, soil amendments, and animal bedding, won the \$500 RIT People's Choice Award, sponsored by the Michigan Recycling Coalition.

Two tied winners split the \$5,000 Business Growth Award, provided by the Michigan Economic Development Corp.'s Pure Michigan Business Connect:

- **Chippin' In of Detroit** collects foil-lined products like chip bags and candy bar wrappers to upcycle into sleeping bags for people experiencing homelessness.
- **Beaver Island's St. James Township** in northern Lake Michigan is seeking to develop programs to reduce organics and food scraps getting shipped off the island to be landfilled.

Also participating in the Summer Showcase and receiving their share of the Harvest Grant funding were teams representing:

- **Bioworks Energy of Grand Blanc, Michigan**
- **City of Detroit/Wood Work Detroit**
- **Eastside Compost of Lansing, Michigan**
- **Emmet County Department of Public Works/Recycling of Petoskey, Michigan**
- **Fibarcode of Ann Arbor, Michigan**
- **Great Lakes Recycling of Oak Park, Michigan**
- **Liquid Ion Solutions of Pittsburgh, Pennsylvania**
- **New Horizon Property Management of Marshall, Michigan**
- **Nowhere Collective of Chicago**
- **Prairie Robotics of Buffalo, New York**
- **Sanctuary Farms of Detroit**
- **Takeout Takeout of Lansing, Michigan**

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# Rumpke opens North America's largest recycling and resource center

Rumpke Waste & Recycling has opened North America's largest and most technologically advanced recycling technology in Columbus, Ohio.

"The future of recycling is now. Our Rumpke Recycling & Resource Center ensures enough recycling capacity to serve the long-term needs as the region's commercial development continues and the population tops an estimated three million," said Andrew Rumpke, president at Rumpke.

"Rumpke is the market leader, providing an essential component of our region's and country's circular economy. Given our mission to deliver exceptional waste and recycling solutions to our customers and communities through a commitment to safety, service the environment and the growth of our people, we must always strategically plan well into the future to meet our customer's needs by investing, innovating and providing the best options for society's waste," added Rumpke.

The facility, which processes material from 50 Ohio counties, fuels the local circular economy. More than 90 percent of the material processed at the Rumpke Recycling & Resource Center goes to end-users in Ohio.

This new state-of-the-art facility is a \$100 million private investment.

- The new 226,000 sq.ft. facility is the largest, most technologically advanced of its kind in North America.
- It increases processing capability from 160,000 tons of material a year to 250,000 tons.
- It increases material processing speed



Material is dumped from the collection trucks to the tipping floor. The new Rumpke facility processes materials from 50 different Ohio counties and has the capability to process 250,000 tons annually. A separate tipping floor exists for commercial loads.

to a minimum of 60 tons per hour versus 30 tons per hour.

- It increases the material recovery rate to 98 percent.
- The facility is built with evolution in mind. Cranes inside the facility allow for equipment upgrades as future technology comes online and the composition of recycling material changes.

The Rumpke Recycling & Resource Center contains the newest technology making recycling, easier, more accessible and cost effective. "The Rumpke Recycling & Resource Center features the best recycling technology in the world, providing us with the potential to sort more materials, more efficiently," said Rumpke.

This material recovery facility includes 19 optic sorters, artificial intelligence, ballistic separators and trommel equipment. The recycling center has three tipping floors totaling 48,000 square feet.

The main 32,000 square foot tipping area is for residential material, the second 11,000 square foot tipping floor is for commercial material and a third 5,000 square foot tipping floor is for material sampling and auditing, which quickly provides municipal and commercial customers with a thorough evaluation of their recycling efforts, added Rumpke.

Rumpke also created an education center designed in collaboration with COSI (the Center of Science & Industry) to help the public learn about recycling. Groups of people ages 10 and up can visit Rumpke.com to schedule tours starting in October. The hands-on exhibit allows visitors to shop at a sustainable market, scan products to determine recyclability, enjoy interactive video games, play with an interactive model of the recycling facility and see the products that recycling creates.

## Comstock Metals secures facility for expansion

Comstock Inc. announced that its subsidiary, Comstock Metals, has secured a long-term lease on a 100,000 sq.ft., facility located at 600 Lake Avenue, Silver Springs, Nevada. The facility will deploy the capacity for processing up to 100,000 tons per year of end-of-life solar panels, and is located on the same campus as the currently operating demonstration facility. Comstock Metals recently received unanimous approval for a conditional use permit from the Lyon County, Nevada, board of county commissioners, for the operations and material storage of solar panels at this facility. This permit accelerated activities deploying the first-of-its-kind, regional solar panel recycling operation.

Comstock Metals is advancing leading technologies and sustainable practices in the solar recycling industry. The new storage capacity enables the company to efficiently manage and process large quantities of end-of-life solar panels and delivers a 100 percent closed-loop, zero-landfill solution that sets a new standard for solar panel recycling.

The Silver Springs facility is strategically located to serve the rapidly expanding solar industry in the Western U.S.

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# Republic Services and City of Louisville utilize fully electric collection fleet



Republic Services' McNeilus Volterra EV will replace the residential recycling and waste collection fleet in Louisville, Colorado, by the end of 2024.

Republic Services of Denver, a subsidiary of Republic Services, Inc. and the City of Louisville, Colorado, have partnered to replace the city's residential recycling and waste collection fleet with electric trucks by the end of 2024. This announcement marks the first time in the U.S. that a municipality has adopted a fully electric residential collection fleet.

"We are so proud that Louisville will be the first city in the nation with a fully electric collection fleet," said Mayor Chris Leh. "These innovative EV collection trucks will fulfill our trash, compost and recycling needs, reduce noise pollution, and include larger windshields to increase each driver's field of vision and lower greenhouse gas emissions, making our neighborhoods quieter, safer and healthier."

"The technology already has been proven in other cities with more challenging climates than ours. What's more, it is cost-competitive for our taxpayers."

Republic Services and the City of Louisville share a strong commitment to sustainability. Adopting an electric fleet will help the city meet the objectives of its Sustainability Action Plan. Republic Services has its own climate goal to reduce greenhouse gas emissions 35 percent by 2030, and partnering with municipalities

on fleet electrification will help the company achieve it.

"The City of Louisville's commitment to sustainability is something we truly applaud," said Richard Coupland, Republic Services vice president of municipal services. "To be the first municipality in the country to adopt an electrified fleet showcases their desire to find tangible solutions to reduce greenhouse gas emissions and combat climate change. Our partnership exemplifies how we can contribute to a more sustainable world."

The fleet serving Louisville will include four McNeilus Volterra EVs, the industry's first fully integrated electric recycling and waste trucks. Developed with insights from Republic Services, these trucks prioritize safety in addition to producing zero tailpipe emissions. Key safety features include 360 degree cameras, an enlarged windshield for improved visibility, lane-departure sensors, automated braking and audible devices that alert nearby drivers and pedestrians to compensate for their quieter operations.

By the end of 2024, Republic Services expects to be operating more than 50 EVs, as research vehicles or in partnership with other forward-thinking municipalities, across the country.

## TDEC grants to boost recycling education

The Tennessee Department of Environment and Conservation announced \$332,953 in grants for Education and Outreach and Organics Management for projects to help reduce landfill waste and increase recycling education in Tennessee.

The grant program encourages and supports local communities to meet solid waste and recycling goals. Local governments can divert more waste from landfills through infrastructure upgrades and provide convenient opportunities for residents to get engaged in the process.

The grants are administered by TDEC's Division of Solid Waste Management.

The Education and Outreach grant will

help local governments produce material needed to consistently promote waste reduction and recycling best practices for established solid waste programs. The primary purpose is to inform residents what they can recycle, where they can recycle, and when they can recycle.

Organics Management grants are for counties, cities, solid waste authorities, and other tax-exempt nonprofit recycling entities designated as 501c(3) organizations. The grants prioritize public/private partnerships, new or expanded organics management services, and reductions in food waste.

# Fort Collins, Colorado begins trash and recycling program

City-branded trash, recycling and yard trimmings carts will be delivered around Fort Collins at addresses included in the city's new program.

The Fort Collins' new contracted trash and recycling program begins collection September 30. The city's contractor – Republic Services – will distribute the new carts for the program through September 27th.

Seven to 10 days ahead of their expected cart delivery date, residents will receive a postcard in the mail with detailed cart delivery information:

The new recycling carts are funded in part by a \$664,000 grant from The Recycling Partnership, a purpose-driven organization committed to building a better

recycling system, with support from the American Beverage Association's "Every Bottle Back" initiative and the Colorado Beverage Association.

The Recycling Partnership selected Fort Collins to receive grant support because of the city's longstanding dedication to advancing recycling. They will partner with the city on recycling education and technical assistance to help ensure that everyone can and does recycle.

"The Recycling Partnership is honored to partner with yet another Colorado community to deploy our best practices in recycling access and engagement to the city of Fort Collins," said Rob Taylor, vice president of grants & community development at the Recycling Partnership.

## Call2Recycle launches provincial battery recycling program in Nova Scotia

Call2Recycle, Canada's leading battery collection and recycling organization, officially launched its battery recycling program, "Recycle Your Batteries, Canada!", in Nova Scotia. As the government-approved program, Call2Recycle will operate the province's household battery recycling initiative under Nova Scotia's new Solid Waste Resource Management Regulations, playing a pivotal role in supporting Nova Scotia's efforts in fighting climate change and reducing waste.

The program's launch follows the Government of Nova Scotia's implementation in August 2023 of new Extended Producer Responsibility (EPR)

regulations, which require obligated producers to manage the end-of-life of batteries sold in the province. This makes Nova Scotia the second Atlantic province to implement comprehensive battery recycling regulations.

The new program offers Nova Scotians greater access to recycling options for a wide range of used batteries, including single-use and rechargeable batteries weighing less than five kilograms each, as well as e-mobility batteries used in devices such as e-bikes and e-scooters. By responsibly recycling their batteries, Nova Scotians can play a vital role in preventing batteries from ending up in landfills.



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## AUTOMOTIVE

# Hypercharge delivers 200 charging stations



Hypercharge Networks Corp. has delivered from its sales backlog and recognized as revenue 200 of 778 charging stations for PCI Developments' King George Hub development in Surrey, BC. The company began phased delivery in Spring 2024, with completion estimated by November 2024.

King George Hub is a landmark mixed-use development that will provide over 760,000 square feet of office and retail space in multiple phases, as well as approximately 1.2 million square feet of residential space situated at the junction of up to three rapid transit lines.

Hypercharge was selected in March 2023 by PCI Developments to provide 748 Level 2 charging stations, one for every residential parking space at King George Hub. In July 2023, the company was selected to provide an additional 29 Level 2 charging

stations and 1 dual-port DC Fast charger for use by visitors to commercial tenants.

"King George Hub's integrated, transit-oriented development is at the heart of the newly developed area in Surrey, and Hypercharge is executing the delivery progress for this substantial order on schedule," said Chris Koch, Head of Growth & Partnerships at Hypercharge. "This development truly supports the future of real estate by adding EV charging stations to every residential parking stall in the project. We continue to move forward on our delivery timeline for the project, adding to our growth and revenue momentum for the second half of 2024."

Hypercharge is completing the project in collaboration with Mott Electric, which is managing installation of all chargers and infrastructure requirements.

## Federal funding awarded for investments in vehicle charging infrastructure

The federal government announced recipients of over \$4.3 billion in Climate Pollution Reduction Grants to implement community-driven solutions that tackle the climate crisis, reduce air pollution, advance environmental justice, and accelerate America's clean energy transition. New Jersey, Connecticut, Delaware, and Maryland were announced as recipients for \$249 million in federal funding for the Clean Corridor Coalition, a project to deploy electric vehicle charging infrastructure for commercial zero-emission medium- and heavy-duty vehicles on the Interstate 95 freight corridor and adjacent roadways.

"The steps we take today to lower emissions from heavy duty vehicles along New Jersey's transportation corridors will improve air quality in our communities, while mitigating climate impacts well into the future," said Governor Phil Murphy. "Building out charging infrastructure along the I-95 corridor is key to advancing those goals."

The New Jersey-led proposal is expected to install over 24 charging

locations with approximately 450 public charging ports, resulting in an estimated cumulative greenhouse gas (GHG) emission reduction of 19 million tons CO<sub>2</sub>e through 2050.

The joint venture amongst the New Jersey Department of Environmental Protection, Connecticut Department of Energy and Environmental Protection, Delaware Department of Transportation, and Maryland Departments of the Environment and Transportation will also provide technical assistance for workforce development and corridor planning across the northeast and Mid-Atlantic region. Technical assistance will be provided to host sites seeking to install charging infrastructure to support cost-effective and successful development. Additionally, the Coalition will deliver on substantial community benefits to directly mitigate diesel emissions in 456 low-income and disadvantages communities, 259 of which are classified by EPA as being at or above the 90th percentile of Traffic Proximity.

## METALS

# Steel imports down 24.5 percent in June vs. May

Based on preliminary Census Bureau data, the American Iron and Steel Institute (AISI) reported that the U.S. imported a total of 2,152,000 net tons (NT) of steel in June 2024, including 1,717,000 net tons (NT) of finished steel (down 24.5 percent and 23.0 percent, respectively, vs. May 2024). Total and finished steel imports are both up 2.2 percent year-to-date vs. 2023. Over the 12 month period July 2023 to June 2024, total and finished steel imports are down 1.9 percent and 5.7 percent, respectively, vs. the prior 12 month period. Finished steel import market share was an estimated 21 percent in June and is estimated at 23 percent over the first six months of 2024.

Products with a significant increase in imports over the 12 month period July 2023 to June 2024 compared to the previous 12 month period, include sheets and strip all other metallic coated (up

35 percent), sheets and strip hot dipped galvanized (up 17 percent), ingots, billets and slabs (up 13 percent), and cut lengths plates (up 11 percent).

In June, the largest suppliers were Canada (559,000 NT, down 3 percent vs. May), Brazil (310,000 NT, down 32 percent), Mexico (210,000 NT, down 32 percent), South Korea (210,000 NT, down 43 percent) and Vietnam (128,000 NT, down 14 percent). Over the 12-month period July 2023 to June 2024, the largest suppliers were Canada (6,726,000 NT, down 3 percent compared to the previous twelve months), Brazil (4,379,000 NT, up 42 percent), Mexico (3,811,000 NT, down 18 percent), South Korea (2,838,000 NT, up 7 percent) and Japan (1,170,000 NT, down 9 percent). Below are charts on steel imports by country and estimated finished steel import market share in recent months.

### U.S. Imports of Steel Mill Products by Country of Origin (thousands of net tons)

COUNTRY	JUN. 2023 PRELIM	MAY 2023 FINAL	% VAR. JUN. VS. MAY	YTD 2024 (6 MON.)	YTD 2023 (6 MON.)	% VAR. 2024 VS. 2023	JUL. 2023 TO JUN. 2024	JUL. 2022 TO JUN. 2023	% VAR.
Canada	559	574	-2.6%	3,482	3,641	-4.4%	6,726	6,923	-2.8%
Brazil	310	453	-31.5%	2,515	2,078	21.1%	4,379	3,090	41.7%
Mexico	210	310	32.1%	1,953	2,325	-16.0%	3,811	4,673	-18.4%
South Korea	210	369	-43.2%	1,517	1,316	15.3%	2,838	2,652	7.0%
Japan	84	108	-22.3%	588	607	-3.1%	1,170	1,278	-8.5%
Germany	128	148	-13.7%	673	254	165.0%	979	581	68.4%
Vietnam	65	88	-26.3%	448	530	-15.6%	959	1,115	-14.0%
Taiwan	84	117	-28.3%	519	357	45.3%	741	812	-8.7%
Netherlands	39	73	-45.8%	277	229	21.1%	556	553	0.5%
China	51	43	17.3%	230	387	-40.5%	440	705	-37.6%
Egypt	3	49	-94.4%	213	118	80.1%	429	139	208.8%
Romania	39	45	-12.7%	258	224	15.4%	410	449	-8.6%
Turkey	41	31	33.5%	206	260	-20.8%	386	515	-25.1%
Italy	27	39	-30.0%	266	203	31.2%	375	662	-43.3%
Algeria	51	22	131.9%	191	128	48.9%	365	275	32.8%
All Other	250	382	-34.5%	2,005	2,352	-14.7%	3,934	4,642	-15.2%
Total	2,152	2,851	-24.5%	15,340	15,007	2.2%	28,499	29,064	-1.9%
memo EU-27	292	411	-28.8%	2,061	2,085	-511%	3,979	4,381	-9.2%



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# METALS

## Scrap Metals MarketWatch



Commodity		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
<b>FERROUS</b>						
#1 Bushelings	per gross ton	\$385.00	\$385.00	\$385.00	\$383.00	\$384.00
#1 Bundles	per gross ton	371.00	374.00	379.00	371.00	379.00
Structural	per gross ton	357.00	357.00	339.00	337.00	339.00
#1 & #2 Mixed Steel	per gross ton	321.00	321.00	325.00	323.00	325.00
Crushed Auto Bodies	per gross ton	219.00	220.00	224.00	229.00	228.00
Shredded Auto Scrap	per gross ton	371.00	364.00	367.00	372.00	371.00
<b>NON FERROUS</b>						
#1 Copper Bare Bright	per pound	3.93	3.97	4.21	4.26	4.22
#2 Copper Wire & Tubing	per pound	3.98	4.00	4.05	4.01	4.05
Aluminum Cans	per pound	.78	.76	.75	.79	.82
Al/Cu Radiators	per pound	2.00	2.00	2.06	2.07	2.15
Aluminum Radiators	per pound	.68	.69	.70	.72	.74
Heater Cores	per pound	1.39	1.38	1.39	1.40	1.42
Stainless Steel	per pound	.69	.69	.65	.64	.65

All prices are expressed in USD. Printed as a reader service only.

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## Novelis reports first quarter results

Novelis Inc. reported results for the first quarter of fiscal year 2025.

“Novelis delivered meaningful year-over-year improvement across a number of financial metrics in the quarter, led by a double-digit increase in beverage packaging shipments benefiting from normalized demand, our broad global presence and solid customer relationships,” said Steve Fisher, president and chief executive officer, Novelis Inc.

### First Quarter Fiscal Year 2025 Financial Highlights

Net sales for the first quarter of fiscal year 2025 increased two percent versus the prior year period to \$4.2 billion, mainly driven by higher average aluminum prices and higher total shipments. Total flat rolled product shipments increased eight percent to 951 kilotonnes in the first quarter of fiscal year 2025 versus the prior year period, due primarily to normalized demand for beverage packaging sheet compared to the prior year, which had been impacted by customer inventory reduction activity.

Net income attributable to the firm’s common shareholder decreased three percent versus the prior year to \$151 million in the first quarter of fiscal year 2025, due to initial charges associated with flooding at the Sierre, Switzerland, plant at the end of June, as well as higher restructuring and unfavorable metal price lag, largely offset by higher Adjusted EBITDA. Net income attributable to

Novelis common shareholder, excluding special items, was up 32 percent year-over-year to \$204 million. Adjusted EBITDA increased 19 percent versus the prior year to \$500 million in the first quarter of fiscal year 2025, primarily driven by higher volume and favorable product pricing, partially offset by less favorable product mix and higher cost. Adjusted EBITDA per tonne increased 10 percent year-over-year to \$525.

Net cash flow provided by operating activities was \$74 million in the first three months of fiscal year 2025, compared to an outflow of \$32 million in the prior fiscal year period, primarily due to higher adjusted EBITDA and favorable changes in working capital. Adjusted free cash flow was an outflow of \$280 million in the first three months of fiscal year 2025, an improvement compared to the prior year period outflow of \$349 million due to higher cash flow from operating activities. Total capital expenditures were \$348 million for the first three months of fiscal year 2025, primarily attributed to strategic investments in new rolling and recycling capacity under construction. The company had a net leverage ratio (Net Debt / trailing twelve months (TTM) Adjusted EBITDA) of 2.4x at June 30, 2024.

The company had a total liquidity position of \$2.2 billion, consisting of \$886 million in cash and cash equivalents and \$1.3 billion in availability under committed credit facilities, as of June 30, 2024.

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## METALS

### Finished import market share estimated at 22 percent in July

Based on the Commerce Department's most recent Steel Import Monitoring and Analysis (SIMA) data, the American Iron and Steel Institute (AISI) reported that steel import permit applications for the month of July totaled 2,289,000 net tons (NT). This was a 5.7 percent decrease from the 2,428,000 permit tons recorded in June and a 6.3 percent increase from the June final imports total of 2,152,000. Import permit tonnage for finished steel in July was 1,936,000, up 12.9 percent from the final imports total of 1,715,000 in June. For the first seven months of 2024 (including July SIMA permits and June final imports), total and finished steel imports were 17,629,000 NT and 13,636,000 NT, up 1.4 percent and 2.6 percent, respectively, from the same period in 2023. The estimated finished steel import market share in July was 22 percent and is 23 percent year-to-date (YTD).

Steel imports with large increases in July permits vs. June final imports

include tin plate (up 124 percent), cut length plates (up 103 percent), wire rods (up 87 percent), heavy structural shapes (up 59 percent) and cold rolled sheets (up 39 percent). Products with significant year-to-date (YTD) increases vs. the same period in 2023 include sheets and strip all other metallic coated (up 71 percent), sheets and strip hot dipped galvanized (up 41 percent), wire rods (36 percent), cold rolled sheets (up 28 percent) and structural pipe and tubing (up 18 percent).

In July, the largest steel import permit applications were for Canada (497,000 NT, down 11 percent from June final), Brazil (339,000 NT, up 9 percent), South Korea (199,000 NT, down 5 percent), Mexico (151,000 NT, down 28 percent) and Japan (139,000 NT, up 65 percent). Through the first seven months of 2024, the largest suppliers were Canada (3,930,000 NT, down 6 percent), Brazil (2,823,000 NT, up 15 percent) and Mexico (2,089,000 NT, down 20 percent).

### World crude steel production increases

World crude steel production for the 71 countries reporting to the World Steel Association (worldsteel) was 161.4 million tonnes (Mt) in June 2024, a 0.5 percent increase compared to June 2023.

#### Crude steel production by region

Africa produced 1.6 Mt in June 2024, down 9.6 percent on June 2023. Asia and Oceania produced 120.6 Mt, up 0.3 percent. The EU (27) produced 11.1 Mt, up 5.1 percent. Europe, Other produced 3.8 Mt, up 2.1 percent. The Middle East produced 4.6 Mt, down 2.7 percent. North America produced 8.9 Mt, down 1.9 percent. Russia & other CIS + Ukraine produced 7.4 Mt, up 1.4

percent. South America produced 3.5 Mt, up 4.1 percent.

#### Top 10 steel-producing countries

China produced 91.6 Mt in June 2024, up 0.2 percent on June 2023. India produced 12.3 Mt, up 6.0 percent. Japan produced 7.0 Mt, down 4.2 percent. The United States produced 6.7 Mt, down 1.5 percent. Russia is estimated to have produced 6.0 Mt, down 4.1 percent. South Korea produced 5.1 Mt, down 7.2 percent. Germany produced 3.2 Mt, down 8.9 percent. Turkey produced 3.1 Mt, up 4.3 percent. Iran produced 2.6 Mt, down 8.5 percent. Brazil produced 2.9 Mt, up 11.8 percent.

#### Top steel-producing countries

	Jun 2024 (Mt)	percent change Jun 24/23	Jan-Jun 2024 (Mt)	percent change Jan-Jun 24/23
China	91.6	0.2	530.6	-1.1
India	12.3	6.0	74.2	7.4
Japan	7.0	-4.2	42.7	-2.6
United States	6.7	-1.5	40.0	-2.4
Russia	6.0 e	-4.1	36.8	-3.0
South Korea	5.1	-7.2	31.5	-6.4
Germany	3.2	8.9	19.4	4.5
Turkey	3.1	4.3	18.6	16.9
Iran	2.6	-8.5	16.6	5.9
Brazil	2.9	-11.8	16.4	2.4

e-estimated. Ranking of top 10 producing countries based on year-to-date aggregate

## WASTE

# SWANA publishes report on Seattle's Zero Waste System

The Solid Waste Association of North America (SWANA) Applied Research Foundation (ARF) has released a data-rich report, Zero Waste Programs: An Analysis of Seattle's Performance Data. The report provides an in-depth analysis of the impacts of Seattle's zero waste program initiatives on the total and per-capita recycling and disposal rates for the city's four primary waste generation groups: single-family households, multi-family households, businesses, and waste self-haulers.

In FY2021, Seattle diverted 53 percent of its municipal solid waste (MSW) from disposal through recycling initiatives, with single-family residents and commercial establishments recycling over 60 percent of their waste. Multi-family residents and self-haul customers had lower

rates, at 35 percent and 10 percent.

By 2040, the city aims to increase its overall recycling rate to 69 percent, with single-family and commercial recycling rates projected to rise by 14-15 percentage points. This would mean single-family residents diverting 83 percent of their waste and commercial establishments diverting 78 percent. These rates would mark significant progress and set unprecedented benchmarks for waste management.

SWANA noted that the data and analyses presented in this report will serve as invaluable resources for zero waste planners in developing highly effective zero waste systems. Drawing inspiration from the models established in cities such as Seattle, San Francisco, and San Jose, we hope the report will inform and empower other communities.

# Casella Waste Systems reports second quarter 2024 results

Casella Waste Systems, Inc., a regional solid waste, recycling and resource management services company, reported its financial results for the three and six-month periods ended June 30, 2024.

Key highlights:

- Revenues were \$377.2 million for the quarter, up \$87.5 million, or up 30.2 percent, from the same period in 2023.
- Solid waste pricing for the quarter was up 5.7 percent from the same period in 2023, driven by 6.2 percent collection price growth and 4.8 percent disposal price growth.
- Net income was \$7.0 million for the quarter, up \$1.5 million, or up 27.6 percent, from the same period in 2023.
- Adjusted EBITDA, a non-GAAP measure, was \$91.6 million for the quarter, up \$19.4 million, or up 26.9 percent, from the same period in 2023.
- Acquired five businesses through August 1, 2024 with over \$100 million in aggregate annualized revenues, including LMR Disposal, Inc. and Whitetail Disposal, Inc. in the Mid-Atlantic region.

"We continued to execute on our core operating strategies in the second quarter and have driven solid year-to-date performance," said John W. Casella, chairman and chief executive officer of Casella Waste Systems, Inc. "The growth in our business, both organically and through acquisitions, positions us well for the second half of the year."

"Since the end of the second quarter, we acquired two high quality companies in the Mid-Atlantic region that expand and densify our operations in this market and offer exciting growth opportunities," Casella said. "We would like to welcome our new team members and customers, and we look forward to continuing to deliver a high level of service. As we build scale in this market, we see further

value creation opportunity through cost efficiencies and our differentiated service offerings. Our M&A pipeline remains robust across our entire footprint with potential to close on more acquisitions this year."

For the quarter, revenues were \$377.2 million, up \$87.5 million, or up 30.2 percent, from the same period in 2023, with revenue growth mainly driven by: the rollover contribution from acquisitions closed in 2023; strong collection and disposal pricing; and higher recycling commodity prices.

Operating income was \$23.0 million for the quarter, up \$0.4 million, or up 1.8 percent, from the same period in 2023.

Net income was \$7.0 million for the quarter, or \$0.12 per diluted common share, as compared to net income of \$5.5 million, or \$0.10 per diluted common share, for the same period in 2023. Adjusted Net Income, a non-GAAP measure, was \$12.5 million for the quarter, or \$0.22 Adjusted Diluted Earnings Per Common Share, a non-GAAP measure, as compared to Adjusted Net Income of \$18.8 million, or \$0.36 Adjusted Diluted Earnings Per Common Share, for the same period in 2023. Adjusted EBITDA was \$91.6 million for the quarter, up \$19.4 million, or up 26.9 percent, from the same period in 2023, driven by acquisition rollover and 6.0 percent organic growth.

Net cash provided by operating activities was \$79.8 million for the year-to-date period, as compared to \$83.2 million for the same period in 2023, with the year-over-year variance mainly attributable to higher cash interest payments and negative changes in working capital. Adjusted Free Cash Flow was \$39.5 million for the year-to-date period, as compared to \$47.9 million for the same period in 2023, with the year-over-year variance further driven by higher capital expenditures.

## BUSINESS BRIEFS

### ARI Phoenix appoints Jones as its president & chief operating officer

ARI Phoenix, Inc. announced that Christopher Jones of Liberty Township, Ohio joined the company as president and chief operating officer.

Jones most recently served as the president of GF Machining Solutions, the U.S. operation of a Swiss leader in machining and automation. His 30 year career has been marked by excellence in sales development and general corporate leadership.

ARI is a leader in shop equipment for the heavy-duty truck maintenance industry across North America.

### Hendrickson acquires Reyco Granning

Hendrickson, a global manufacturer of suspension systems and components for medium and heavy-duty trucks and trailers, has acquired Reyco Granning suspension business, based in Mt. Vernon, Missouri, from Reyco Granning LLC and its parent MAT Capital, LLC. Reyco Granning specializes in manufacturing and marketing suspension solutions for heavy and medium-duty vehicles.

Reyco Granning's primary product lines include suspension solutions for motorhomes, commercial trucks, emergency response vehicles, specialty trailers, buses, and the aftermarket sector. The Reyco Granning brand will continue to operate independently under its existing name for the foreseeable future, maintaining its market identity and ensuring continuity in operations and customer service.

### Revolution appoints Coleman as chief executive officer

Revolution Sustainable Solutions, LLC, an innovator in sustainable materials and recycling solutions and a portfolio company of private equity firm Arsenal Capital Partners, has appointed Scott Coleman as president and chief executive officer.

Coleman joined Revolution in 2013 and has most recently served as the senior vice president of growth and strategy, as well as previously serving as division president and vice president of business development. He succeeds Sean Whiteley, who has served as the chief executive officer of Revolution for the past 12 years. Whiteley is leaving the company to serve his church, leading a three-year mission in Taiwan and will remain active as a member of the board.

In his role as chief executive officer, Coleman will oversee all operations and continue to drive Revolution's growth as a leader in sustainable materials and plastic waste solutions. Since joining Revolution 11 years ago, he has contributed significantly to strategic growth initiatives and has led the identification and completion of eleven highly synergistic acquisitions.

### Lindemann Metal Recycling appoints head of procurement and aftermarket

Lindemann Metal Recycling has appointed Markus Tandel as its new head of procurement and aftermarket.

Tandel brings a wealth of experience to Lindemann. His career began in the heating machinery industry, where he worked in the purchasing team. His international experience includes two years in Slovakia, followed by stints in Germany and the UK, overseeing business development in the UK, France, the Netherlands and Belgium.

Tandel's career continued at French multinational Saint-Gobain, where he specialized in strategic sales projects, customer segmentation, and performance metrics across Germany, Austria, and Switzerland. In 2020 he joined Saurer, textile machinery industry, where he worked in after sales and service, further honing his commercial skills before bringing his expertise to Lindemann.

At Lindemann, he now oversees the procurement and aftermarket functions.

### Wieland names Schmidt to lead global metal management department

Uwe Schmidt, an industry expert in metal sourcing, sustainability and copper recycling, joined the Wieland Group. As senior vice president and Wieland Group executive committee member, he will lead Global Metal Management. This central department is responsible for procuring metals such as scrap, cathodes, and formats for the copper supplier's business units and production sites worldwide. Schmidt and his team will also oversee the sale of recycled metals to third parties.

Schmidt earned his reputation and proficiency over approximately 30 years of professional experience leading metal trading, recycling, and metal processing companies. Among other things, Schmidt was head of metal management at Diehl Metall and managing director of SMH Süddeutsche Metallhandelsgesellschaft for 12 years.

### MASABA expands with new facility

MASABA, Inc., a leading manufacturer of custom designed bulk material handling systems and processing equipment, has broken ground on a new state-of-the-art steel fabrication facility in Vermillion, South Dakota. Located adjacent to its existing 211,000 sq. ft. manufacturing facility, the new building will create an additional 125,000 sq. ft. of fabrication space and over 20,000 sq. ft. of office space. The facility will house more than \$15 million in new steel fabrication equipment and will be fully operational by May 2025.

# BUSINESS BRIEFS

## SWANA names new board members

Tammy Hayes has been appointed as president of the Solid Waste Association of North America (SWANA), joining other industry leaders who have been appointed to the board of directors. Together, the board members will play integral roles in guiding the organization's mission to advance the solid waste and resource management industry.

With a commitment to sustainability, innovation, and professional development, SWANA continues to strengthen its board of directors with individuals who bring diverse expertise and a shared dedication to shaping the future of waste management across North America.

The SWANA board of directors includes delegates who represent the private sector, the technical divisions, the young professionals, and the 13 geographical regions that represent the chapters.

The newly appointed board members and leaders bring a wealth of knowledge from various sectors within the industry, including environmental engineering, public policy, and sustainability management. Their collective vision aligns with SWANA's mission to educate, advocate and provide resources that empower professionals to create a more sustainable and resilient waste management infrastructure.

## Terracon acquires Harbor Environmental

Terracon, an employee-owned firm with a history of providing engineering consulting services, has acquired Harbor Environmental, Inc. a firm providing engineering, compliance and sustainability services located in Little Rock, Arkansas.

Terracon's national presence provides Harbor the opportunity to continue providing excellent services to their national and local clients through access to significantly more resources throughout Arkansas and nationwide. Harbor's 38 employees nationwide will immediately become part of Terracon, and the firm will continue to be headquartered locally as Harbor Environmental, A Terracon Company. The transition will be seamless for clients who will still work with the same Harbor teams with an expanded reach.

Terracon's presence in the area has been expanding since the 2023 acquisition of Pollution Management Inc. (PMI), an established provider of engineering and environmental services based in Little Rock and Fayetteville, Arkansas. In addition to PMI, Harbor is joining Terracon's existing operations in Little Rock and Springdale, Arkansas; Springfield and Joplin, Missouri; and Oklahoma City and Tulsa, Oklahoma.

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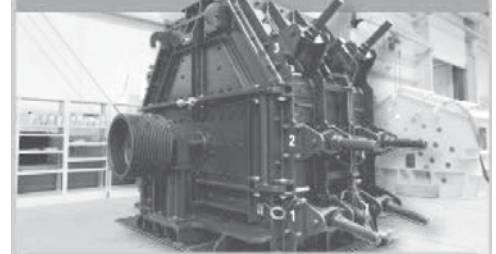


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## Challenges for the e-waste recycling industry

by MAURA KELLER

[mkeller@americanrecycler.com](mailto:mkeller@americanrecycler.com)

E-waste recycling needs attention now more than ever, due to the ever-increasing amount of electronics that are disposed of every year – products with lifespans that grow shorter and shorter.

Russ Ernst, chief technology officer at Blancco Technology Group, said the e-waste industry has evolved and grown in conjunction with the global e-waste crisis. According to the UN’s 2024 Global E-waste Monitor, a record 62 billion kg of e-waste was produced in 2022 with e-waste generation outpacing formal recycling by five times.

“The awareness of the problems e-waste causes, both to the environment and the harm it causes to workers handling these hazardous materials in developing nations, has received widespread attention,” Ernst said. “As a result, consumers and businesses are becoming more attuned to the importance of either recycling e-waste or reusing old IT assets.”

In fact, many corporations now have e-waste recycling programs, and consumers have access to more convenient recycling options through retail “take back” programs and collection events. The awareness has also resulted in more countries establishing standards or regulations (81 had e-waste legislation in 2023 according to the UN) that govern the recycling and disposal of e-waste, as well as its collection, treatment standards, and prohibition of specific hazardous substances in electronics.

Ernst noted that another positive development in the e-waste recycling arena is the rise of certified e-waste recyclers who adhere to strict environmental and ethical standards. Certifications such R2 (Responsible Recycling) ensure that recyclers responsibly manage e-waste and protect worker safety.

According to Adam Shine, president at SunnKing, an electronics recycler, the e-waste recycling industry is continuously evolving, with everything in today’s fast-paced world being interconnected and electronic.

“People now own multiple devices such as computers, laptops, printers, cell

phones, gaming consoles and earbuds, which has worsened the already low recycling rates in the U.S.,” Shine said. “Many people are uncertain about how to dispose of these items, worry about the data they contain, and therefore tend to hold onto them. We, as an industry, are working to enhance public awareness and provide more convenient recycling options.”

In addition to the variety of new materials, Shine noted that the e-waste industry is witnessing a resurgence with advanced technologies leading to cleaner material streams. New international regulations are changing the movement of certain grades of materials across borders, making global trade more challenging.

“By producing cleaner material streams, we can create new domestic and international recycling opportunities,” Shine said.

Christophe Girardier, chief executive officer and co-founder of Glimpact, a sustainability platform that informs C-suite executives of brand’s full environmental impact, said that in recent years, this sector has not really evolved, which is alarming given that the share of recycled e-waste is low and the quantity of this waste is reaching new heights.

“This is largely because the issue of e-waste has not been taken seriously, which is evident by the growing quantity of electronics destined to be recycled and the lack of significant innovation in the e-waste recycling process itself,” Girardier said.

According to the UN institute for Training and Research (UNITAR), a record 62 million tons (Mt) of e-waste was produced in the year 2022 alone. This is enough e-waste to fill 1.55 million 40-ton trucks, roughly enough trucks to form a bumper-to bumper line encircling the equator. This is up 82 percent from 2010, and is only expected to rise, with 82 million tons of e-waste projected to be produced in the year 2030 if we continue at our current pace.

“This is a direct result of the accelerating production rates of electronic devices, since new devices produced inevitably end up as e-waste,” Girardier



E-waste recycling needs attention due to the ever-increasing amount of electronic products with lifespans that grow shorter and shorter.

said. A large problem is that players, mostly governments and organizations, do not dispose of their e-waste properly and above all have not set up credible recycling channels on an industrial scale. Furthermore, the majority of the e-waste sent for recycling is not processed to the point where it can be reclaimed.

“The good news is that recycling electronic devices consumes less energy and causes less harm to the planet than mining more of these metals, which means that this is a space worth advancing for the sake of the planet and for those in the business of manufacturing electronics,” Girardier said.

### Continuous Concerns

Concerns within the e-waste industry vary from region to region, but overall, Ernst said one top concern is the lack of cohesive and comprehensive regulations on e-waste, which leads to profiteers that use improper disposal practices that harm the environment and people’s health.

“In many developing countries, informal recycling operations often employ unsafe practices, such as burning electronic components to extract valuable

metals, which releases toxins into the air, soil, and water,” Ernst said. “Separating materials from these toxic substances takes specialized technology, which is very costly.”

Another concern is the rapid advancement of technologies, such as AI, which is expected to drive an increased demand for data centers because AI applications generate and require vast amounts of data for training machine learning models. As Ernst explained, this data needs to be stored in secure and reliable environments, which typically means data centers equipped with high-capacity storage systems.

“Unfortunately, data center operators physically destroy nearly all of their drives, instead of using secure software based data sanitization, which translates to tons of scrap metal,” Ernst said.

AI may also lead companies to shorten their IT asset refresh cycle. For example, Microsoft will end Windows 10 support on October 15, 2025, and users will need to upgrade to Windows 11 if they haven’t already. Windows 11 requirements are a little bit more stringent than Windows 10

See E-WASTE RECYCLING, Page B6

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# New substrate material for flexible electronics could help combat e-waste

Electronic waste, or e-waste, is a rapidly growing global problem, and it's expected to worsen with the production of new kinds of flexible electronics for robotics, wearable devices, health monitors, and other new applications, including single-use devices.

A new kind of flexible substrate material developed at MIT, the University of Utah, and Meta has the potential to enable not only the recycling of materials and components at the end of a device's useful life, but also the scalable manufacture of more complex multilayered circuits than existing substrates provide.

The development of this new material is described in the journal RSC: Applied Polymers, in a paper by MIT Professor Thomas J. Wallin, University of Utah Professor Chen Wang, and seven others.

"We recognize that electronic waste is an ongoing global crisis that's only going to get worse as we continue to build more devices for the internet of things, and as the rest of the world develops," says Wallin, an assistant professor in MIT's Department of Materials Science and Engineering. To date, much academic research on this front has aimed at developing alternatives to conventional substrates for flexible electronics, which primarily use a polymer called Kapton, a trade name for polyimide.

Most such research has focused on entirely different polymer materials, but "that really ignores the commercial side of it, as to why people chose the materials they did to begin with," Wallin says. Kapton has many advantages, including excellent thermal and insulating properties and ready availability of source materials.

The polyimide business is projected to be a \$4 billion global market by 2030. "It's everywhere, in every electronic device basically," including parts such as the flexible cables that interconnect different components inside your cellphone or laptop, Wang said. It's also widely used in aerospace applications because of its high heat tolerance. "It's a classic material, but it has not been updated for three or four decades," he says.

However, it's also virtually impossible to melt or dissolve Kapton, so it can't be reprocessed. The same properties also make it harder to manufacture the circuits into advanced architectures, such as multilayered electronics. The traditional way of making Kapton involves heating the material to anywhere from 200 to 300 degrees Celsius. "It's a rather slow process. It takes hours," Wang said.

The alternative material that the team developed, which is itself a form of polyimide and therefore should be easily compatible with existing manufacturing infrastructure, is a light-cured polymer similar to those now used by dentists to create tough, durable fillings that cure in a few seconds with ultraviolet light. Not only is this method of hardening the material comparatively fast, it can operate at room temperature.

The new material could serve as the substrate for multilayered circuits, which provides a way of greatly increasing the number of components that can be packed into a small form factor. Previously, since the Kapton substrate doesn't melt easily, the layers had to be glued together, which adds steps and costs to the process. The fact that the new material can be processed at low-temperature while also hardening very quickly on demand could open up possibilities for new multilayer devices, Wang said.

As for recyclability, the team introduced subunits into the polymer backbone that can be rapidly dissolved away by an alcohol and catalyst solution. Then, precious metals used in the circuits, as well as entire microchips, can be recovered from the solution and reused for new devices.

"We designed the polymer with ester groups in the backbone," unlike traditional Kapton, Wang explained. These ester groups can be easily broken apart by a fairly mild solution that removes the substrate while leaving the rest of the device unharmed. Wang notes that the University of Utah team has co-founded a company to commercialize the technology.

"We break the polymer back into its original small molecules. Then we can collect the expensive electronic components and reuse them," Wallin added. "We all know about the supply chain shortage with chips and some materials. The rare earth minerals that are in those components are highly valuable. And so we think that there's a huge economic incentive now, as well as an environmental one, to make these processes for the recapture of these components."

The research team included Caleb Reese and Grant Musgrave at the University of Utah, and Jenn Wong, Wenyang Pan, John Uehlin, Mason Zadan and Omar Awartani at Meta's Reality Labs in Redmond, Washington. The work was supported by a startup fund at the Price College of Engineering at the University of Utah.

# ERI launches new alkaline battery recycling plant in Indiana



ERI, the nation's largest fully integrated IT and electronics asset disposition (ITAD) provider and cybersecurity-focused hardware destruction company, has launched its first alkaline battery recycling plant. The plant is located within ERI's existing state-of-the-art, full-service, 315,000 square-foot e-waste recycling and ITAD facility in Plainfield, Indiana, where millions of pounds of electronic waste are responsibly recycled each year.

ERI's alkaline recycling center is now live and has the capability to recycle millions of pounds of alkaline batteries per year utilizing ERI's proprietary clean technology. ERI plans to expand its footprint by opening additional alkaline battery recycling plants throughout the US in 2025 and beyond.

ERI can arrange logistics and accept alkaline batteries at all of its eight locations

(Arizona, California, Indiana, Massachusetts, New Jersey, North Carolina, Texas, Washington).

"We are proud and excited to take this latest significant step in the evolution of ERI and the services we provide our customers and the public at large," said ERI co-founder, chairman and chief executive officer John Shegerian. "Our innovative alkaline battery recycling process produces zero waste products, is circular economy focused and yields clean commodity outputs – creating a truly circular ecosystem. This is a natural progression for us to be able to offer a complementary service to ERI's existing suite of e-waste, end of life and asset management services."

Shegerian added that the new plant is able to process every type of alkaline battery.

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According to Aluminum Association preliminary estimates, aluminum demand in North America (U.S. and Canada) declined 4.4 percent through the first three quarters of 2023. As of the first half of the year, demand had decreased by 4.5 percent.

**Proposed new legislation aims to restrict plastic foam foodware**  
The Farewell to Foam Act has been introduced by Senator Chris Van Hollen and Congressman Lloyd Doggett and if passed, would restrict the sale and use of foam foodware, foam packing peanuts, and single-use foam coolers beginning in 2026.

**The Government of Canada is seeking feedback on developing a federal plastics registry**  
The Government of Canada is taking action to reduce plastic pollution in the environment and move it toward a circular economy to address the entire lifecycle of plastics.

**BF Goodrich inflation system wins new product**  
BF Goodrich ActivAir is a Popular Science 2023 "Best of What's New" award winner in the automotive category. ActivAir allows off-roaders to adjust tire pressure to fit the terrain without leaving their vehicle.

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## Reworld and Goodwill Keystone Area offer free e-waste recycling

Reworld™, in partnership with Goodwill Keystone Area, unveiled a new initiative to provide free electronic waste recycling across 22 central and southeastern Pennsylvania counties. The program was launched during an event at the local Goodwill Keystone Area store and donation center in Lemoyne, just across the river from the Pennsylvania State Capitol. Reworld is a proven provider of e-waste recycling, recovery and environmentally responsible disposal, having recycled more than 135 million pounds of e-waste.

Jessica Shirley, acting secretary of the state Department of Environmental Protection (DEP), was present at the launch event, underscoring the importance of this pivotal move toward enhancing e-waste recycling access for the state's residents.

"Electronic waste is the fastest growing waste stream in the world, and making electronics reuse and recycling easier and more accessible is critical to keeping these materials out of landfills or worse, illegally dumped," said Pennsylvania DEP acting secretary Jessica Shirley. "This program reduces waste, reuses items that are still good, and recycles the ones that aren't."

Made possible through efforts of the Pennsylvania Recycling Market Center, it began by Recycling Markets Center industry experts mapping Goodwill processes and operations, then understanding and interpreting the facility needs of Goodwill Keystone Area. Understanding Goodwill criteria and the e-waste landscape, the Recycling Markets Center coordinated the introduction of e-waste vendors to Goodwill Keystone Area, resulting in a successful pairing with Reworld.

"In 2023, Pennsylvania had only nine e-waste recycling sites that would accept any electronic device for recycling at no cost, without limitations. The new program at Goodwill Keystone Area now includes 22 counties at 42 locations, approximately 45 percent of the Pennsylvania population," said Robert Bylone, president and chief executive officer, Pennsylvania Recycling Markets Center.

Reworld™ and Goodwill Keystone Area launched the initiative in response to a pressing need in the region, expanding electronic recycling options under the PA Covered Device Recycling Act 108 for many counties currently underserved by existing recycling programs. Many counties, including densely populated areas such as Montgomery, Bucks and Chester counties in the Philadelphia suburbs, lack comprehensive, e-waste disposal services. This gap poses significant challenges for residents, particularly when disposing of items like televisions, which typically incur additional fees and may only be collected on one specific day, if at all.

The new initiative will leverage Goodwill Keystone Area's broad network of 42 stores and donation center sites, establishing each as drop-off points for a wide variety of e-waste items from televisions and computers to other household electronics, including mobile devices, gaming systems, telephones, toasters, vacuums and much more – with an ambitious goal to collect half a million pounds of electronic waste within the first year. The program will not only facilitate easier access to e-waste recycling for residents but also encourage them to donate other gently used items, such as clothing, books and household goods.

If the electronics dropped off are at the end of their life or broken and Goodwill Keystone Area cannot sell them in their stores, they will be responsibly recycled by Reworld.

This initiative represents a significant commitment by Reworld and Goodwill Keystone Area to improve electronic waste management and help preserve Pennsylvania's environment for future generations. Goodwill Keystone Area will focus on the collection and sorting of donated items, and Reworld will play a critical role in the downstream processing and recycling, with the collected electronics being refurbished or recycled in compliance with the Pennsylvania Covered Device Recycling Act and international e-Stewards standards.

## NEO Battery Materials partners with Lotus Energy Recycling

NEO Battery Materials Ltd., a low-cost silicon anode materials developer, announced a Collaboration Agreement with Lotus Energy Recycling – an Australian-based solar photovoltaic (PV) recycler. The partnership will aid the company's sustainable route-to-commercialization and supply chain resiliency for input materials.

NEO and Lotus intend to develop a silicon anode product to co-market directly to battery cell, electronics, and automotive manufacturers. Both companies will explore joint venture opportunities to establish a North American footprint in silicon recycling. Governmental funding for international cooperation will be applied for in advanced manufacturing and clean technology based on availability and criteria-match.

This agreement further bolsters NEO's strategy to build commercial-level relationships and diversify the silicon upstream value chain. NEO Battery aims to enhance the commercial viability and compatibility of recycled silicon as a reliable raw material source for its silicon anode materials.

Lotus Energy possesses a proprietary

recycling know-how to recover solar silicon cells from end-life solar PV cells. The scalable process implements a heat and chemical treatment without the use of hazardous solvents and materials, removing the risk of environmental concern and reducing unnecessary manufacturing costs and overhead. Lotus has consistently achieved high-purity levels of 99.9 percent+ for its recycled PV nano silicon particles.

Headquartered in Melbourne, Australia, Lotus Energy has deployed several magnitudes of megawatt-hour (MWh) solar projects across the country ranging from commercial and industrial to residential applications. Lotus commenced the value-added PV recycling initiative and is expected to complete scale-up to 3,600 kgs per year by the end of this year. Subsequently, the production capacity is expected to increase to 120,000 kgs per year for its Melbourne plant. Lotus Energy intends to construct facilities in Sydney and Germany to supply its high-purity recycled PV nano silicon to various industrial and electronics applications.

## Electrochemistry helps clean up electronic waste recycling

A new method safely extracts valuable metals locked up in discarded electronics and low-grade ore using dramatically less energy and fewer chemical materials than current methods, report University of Illinois Urbana-Champaign researchers in the journal *Nature Chemical Engineering*.

Gold and platinum group metals such as palladium, platinum and iridium are in high demand for use in electronics. However, sourcing these metals from mining and current electronics recycling techniques is not sustainable and comes with a high carbon footprint. Gold used in electronics accounts for 8 percent of the metal's overall demand, and 90 percent of the gold used in electronics ends up in U.S. landfills yearly, the study reports.

The study, led by chemical and biomolecular engineering professor Xiao Su, describes the first precious metal extraction and separation process fully powered by the inherent energy of electrochemical liquid-liquid extraction, or e-LLE. The method uses a reduction-oxidation reaction to selectively extract gold and platinum group metal ions from a liquid containing dissolved electronic waste.

In the lab, the team dissolved catalytic converters, electronic waste such as old circuit boards, and simulated mining ores containing gold and platinum group metals using an organic solvent. The system then streams the dissolved electronics or ores over specialized electrodes in three consecutive extraction columns: one for oxidation, one for leaching and one for reduction.

"The metals are then converted to solids using electroplating, and the left-over liquid can be treated to capture the remaining metals and recycle the organic

solvent," Su said. "The stream containing the organic extractant is then pumped back to the first extraction column, closing the loop, which greatly minimizes waste."

An economic analysis of the new approach showed that the new method runs at a cost of two orders of magnitude lower than current industrial processes. "The social value of this work is really its ability to produce green gold quickly in a single step, greatly improving transparency and trust in conflict free recycled precious metals," said postdoctoral researcher Stephen Cotty, the first author of the study.

Su said one of the many advantages of this new method is that it can run continuously in a green fashion and is highly selective in terms of how it extracts precious metals. "We can pull gold and platinum group metals out of the stream, but we can also separate them from other metals like silver, nickel, copper and other less valuable metals to increase purity greatly – something other methods struggle with."

The team said that they are working to perfect this method by improving the engineering design and the solvent selection.

Research scientist Johannes Elbert and graduate student Aderiyike Faniyan contributed to this study. Su also is affiliated with the Beckman Institute for Advanced Science and Technology and a professor of civil and environmental engineering at Illinois.

The U.S. Department of Energy supported this study. The University of Illinois Urbana-Champaign has filed a provisional patent on the technology presented in this work. The authors declare no competing financial interest.

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# EQUIPMENT SPOTLIGHT

## Size Reduction

by MARY M. THORNTON

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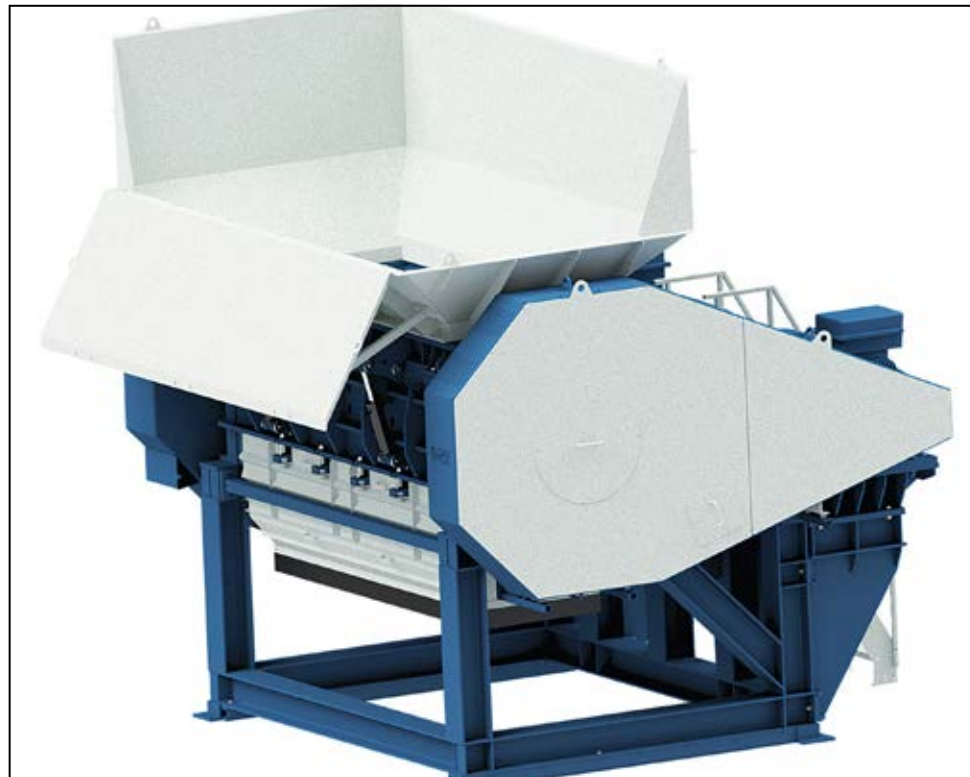
Global e-waste generation is estimated to reach 74.7 million metric tons by 2030. One of the first and key elements for the separation of recycled materials is size reduction. Most of the materials to be recycled are comingled with other types of commodities that usually prevent the materials from being readily sorted and recycled in order for them to be converted into a new finished good. Size reduction assists with the proper liberation of comingled materials and allows for separation technologies to properly segregate the materials into individual constituents. Regardless of the separation technology employed (magnetic technology, dry or wet density separation technologies); liberation and proper size distribution should result in the proper recovery of recycled goods. Size reduction technologies play a critical role to achieve high purity and recovery of products.

The ELDAN Heavy Duty Granulator (HDG) is modified for recycling tough material, including electrical waste such as ASCR cables, low-grade cables with some impurities – as well as nonferrous metals, refrigerators, industrial waste and more. The product's new knife system with integrated rotary knives/knife holders with a rotor provides a solid foundation for the resistance required when processing heavy objects. The knives are straight, can be used on all four sides and grind materials easily.

Friction clutches protect the machine from material overload and the belt drive involved ensures a simple transmission. The HDG also processes RDF well and can produce 20 mm material size. The HDG also performs well as a pre-chopper for these materials and other Cu or Al cables and can include various screen hole sizes—down to 12mm and upwards, according to customer requirements.

A summary of HDG features includes: adjustable knife clearance, which optimizes the cutting function; product knives that can be reground multiple times on a “flat-bed” grinder, ensuring long life and low operation costs; the HDG design allows for the quick and easy change of knives and screens; the rotor is manufactured and designed for minimum wear with hard-face welding; screens provide different hole sizes for flexible production; five pieces of screens per set are included and interchangeable, depending on wear and exchangeable wear parts “provide operators with a virtually indestructible machine,” remarked Carsten Nielsen, product manager.

Orbcon/Prall-Tec offers multiple types of size reduction technologies based on the application involved – electronics recycling, C&D recycling, glass, incinerator bottom ash, auto shred residue and metals in general. “Our product line includes impact crushers, fine grinding mills, hammermills, dual shaft shredders and balling mills. Throughputs of our products



Eldan Recycling A/S

extend from 4tph up to 200tph for impact crushers that process aggregate materials,” explained Adam Floyd, process and business development director.

Floyd mentioned that in order to achieve the highest efficiency on metal recovery, it is increasingly important to employ size reduction steps to properly sort comingled materials. “For example, our PTV Balling Mill is a versatile shredding step currently utilized by auto shredder operators to process their fine ASR with the goal of further recovering valuable metals that may otherwise end up as waste. The PTV not only liberates comingled insulation from the copper wires, it changes the shape of fine copper strands to a round and denser particle. This is a crucial step in recovering copper strand in the sorting steps that follow. Also, the versatility of the PTV allows users to also process some low grade byproducts – such as hand-picked shredder wire or electronic wire comingled with plastics, via a balling mill. Similarly, the PTV allows users to further increase the quality of such products into furnace-ready commodities.”

“Of course, our customers prefer high throughput, low operating cost systems. Whether they are processing electronic waste/scrap, auto shredder residue or aggregate materials, it is fundamentally important that

processing is high capacity and high efficiency, but with low operating costs. In order to deliver all of these aspects, most of our units operate in dual rotational directions, further extending the life of the consumable wear parts to almost double,” concluded Floyd.

Schutte Hammermill is “renowned for providing high quality size reduction equipment solutions. Our RAS/DataKiller Pro is the state-of-the-art solution designed to meet the rigorous demands involved, via exceptional throughput – capable of efficient, fast processing of large electronic scrap volumes to below 2mm. This high capacity efficiency ensures that recycling facilities can keep up with the increasing influx of e-waste,” stated Bill Castine, general manager.

According to Castine, the RAS/DataKiller Pro is a multi-stage shredder-mill combo, constructed from high-quality materials to ensure long-lasting performance, even under the most demanding conditions. “This durability typically results in lower maintenance costs and reduced downtime. The machine also delivers precise, consistent size reduction, which is crucial for downstream separation processes and enhances recovery rates of valuable metals and other materials. Through advanced technology, the RAS/DataKiller Pro helps reduce the environmental impact of e-waste while ensuring that sensitive or hazardous materials are safely handled and valuable resources

See Size Reduction, Page B5



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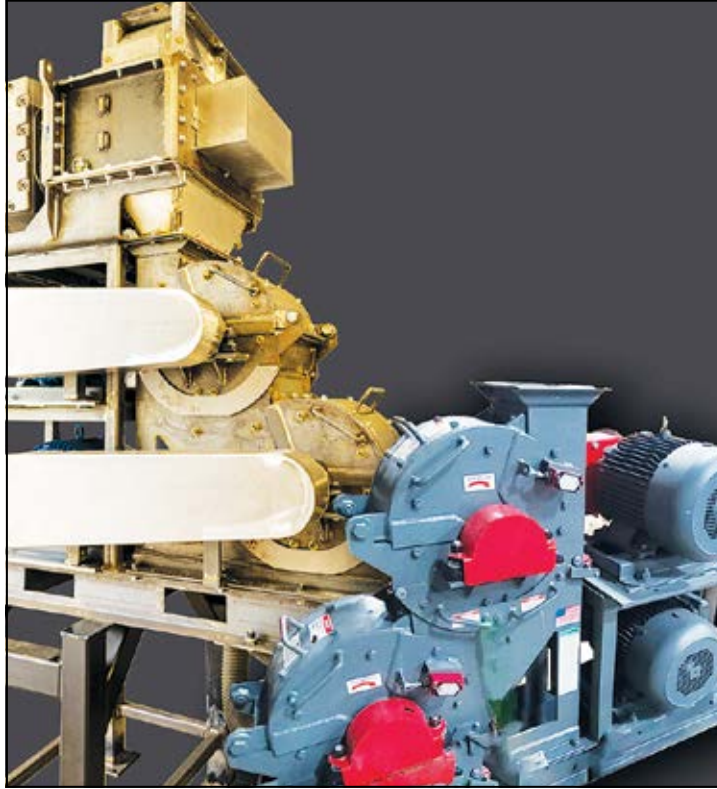
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**Size Reduction**

■ Continued from Page B4

are recovered, which aids sustainability. Combining high efficiency, robust construction and precision makes the RAS/DataKiller Pro an invaluable asset for recycling facilities facing the growing e-waste problem while striving for environmental sustainability.”

Castine noted that such challenges, as electronic devices are becoming obsolete faster, also causes an increase in electronics disposal. This trend necessitates advanced recycling solutions that can handle the intricate mix of metals, plastics and hazardous materials found in e-waste. Schutte Hammermill, established in 1928, with a reputation for manufacturing robust and reliable size reduction equipment, will continue to provide solutions to a diverse field of industries.



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# E-waste Recycling

■ Continued from Page B1

so PCs even five or six years old may not be compatible.

“With the addition of ChatGPT and other AI assistants built into Windows 11, there is less flexibility with hardware configurations and system requirements. Companies may need to update their entire IT asset fleet, so there’s a good chance many of the old devices will end up in landfills,” Ernst said.

One of the biggest challenges in the e-waste industry that Ernst said must be addressed is the outdated notion that electronics must be shredded and destroyed for data security purposes.

“This is a belief that has persisted over time, and is not only less effective, but also exacerbates the e-waste crisis,” Ernst said. “There’s no need to destroy electronics for security purposes when an ITAD partner can use software-based, certified data sanitization and ready each device for the circular economy.”

Shine noted that the biggest concern the industry is facing at present is the amount of lithium batteries contained in today’s electronics. These batteries make it labor intensive to recycle, requiring hand dismantling to remove the battery prior to shredding, otherwise may result with a fire.

“Consider items like earbuds – you have a battery in each along with a battery in the case with very little electronics to recover. The smaller items that have non-removable batteries glued into the devices are creating challenges and shifting economics from a revenue neutral scenario to a cost,” Shine said.

While there is equipment that can identify batteries in devices, this technology can also identify the type of battery involved.

“There are many different battery compositions and each one requires different handling and packaging,” Shine said. “Some can provide value while others are a cost. Newer technologies like robotics and AI are being looked at to make the process of identifying and removing batteries easier.”

## Embracing Innovations

There are several innovations that are helping to streamline the electronics recycling industry and curb the e-waste crisis. These innovations include automated sorting technologies, such as optical sorting and robotic systems that can more efficiently separate different types of materials in e-waste, along with modernized chemical processes for increasing the efficiency of resource recovery while reducing environmental impact. AI and machine learning algorithms are also being applied to optimize various aspects of e-waste recycling operations.

“This includes predictive maintenance of recycling equipment, improving sorting accuracy, and identifying valuable components in e-waste streams more effectively,” Ernst said. “Blockchain is one technology that is being explored to improve traceability and transparency in the e-waste recycling process.”

Furthermore, manufacturers are increasingly adopting Design for Disassembly (DfD) principles to ensure that

products are easier to dismantle, separate, and recycle at their end-of-life stage. As Ernst explained, these services often include collection, sorting, dismantling, and recycling of electronic devices, making it easier for businesses to comply with regulations and manage their e-waste responsibly.

In addition, mobile recycling units or “mini-plants” are popping up to bring recycling capabilities closer to where e-waste is generated. According to Ernst, some companies are even offering recycling-as-a-service models where businesses can subscribe to comprehensive e-waste recycling solutions.

Shine also pointed out that AI and robotics are being considered for various applications in the e-waste industry – not only for identifying and removing batteries but also determining ways to process material that is less labor intensive and can create cleaner streams of end commodities.

“Furthermore, robotics can be used for identifying electronics for refurbishing and resale of electronics, extending the life of electronics is the best form of recycling,” Shine said.

Continued investment in research and development, along with collaboration between industry stakeholders and governments, will be essential to further advance these innovations and address the challenges facing the industry.

While the world will continue to face rapid growth in e-waste, complex material compositions, and informal recycling practices, we will also see increasing consumer demand for more sustainable best practices and transparency from businesses. Ernst believes this demand will help drive regulatory changes as governments around the world strengthen regulations related to e-waste management.

“The ability to curb the growth of e-waste depends on these and a variety of other factors, but the adoption of technologies and techniques that increase efficiency and effectiveness of processes will play a major role in curbing e-waste generation,” Ernst said. “I’m encouraged by the evolution in the e-waste recycling industry and especially by the growing emphasis on transitioning towards a circular economy approach, where products and materials are reused, refurbished or recycled to minimize waste and resource consumption. This shift has also put pressure on manufacturers to design products with recyclability, versus planned obsolescence, in mind.”

Girardier agreed that successful e-waste recycling starts with manufacturing. As he explained, separating the various metal and non-metal components within electronic devices while ensuring toxic materials are properly isolated, is a difficult and complex process.

“Design for recyclability would allow for a more streamlined disassembly, and less intermingling between different materials, helping to ensure that once the electronics make it to the recycling plant, they are safely and efficiently processed,” Girardier said.

One way this can be achieved is by reducing the amount of materials and



hazardous materials present in a product. Another strategy is ensuring that products are able to be disassembled rather than entangling various materials, or having components that are hermetically sealed.

“Designing for repairability would encourage consumers to keep their electronics for longer, decreasing the currently rapid turnover of electronics from one generation to the next,” Girardier said. “Innovation in eco-conception and remanufacturing is the key to success for circular electronics but globally speaking, no one has innovated in this space.”

Shine also believes the industry is going to continue expanding rapidly. “More products will make their way to electronics recyclers including solar panels, portions of electric vehicles that house data and many other various electronics,” Shine said. “I believe that technology will continue to lead us to more material, more need for recycling and more challenges. However, that same technology will lead to better, faster and

safer ways to process that material.”

At a regulatory level, e-waste recycling requirements and procedures need universal standards to eliminate confusion and provide clarity. Girardier suggested that there must be clear incentives for the manufacture of new products with re-used or recycled materials and disincentives for improper e-waste disposal.

“As it stands, the use of recycled materials can be more expensive than the virgin alternative. If manufacturers are expected to use recycled or reclaimed material, it must be more affordable,” Girardier said. “Additionally, e-waste recycling must be accessible to consumers and industry alike. It must be incentivized, and there must be clear information distinguishing what is recyclable and what isn’t. With e-waste regulation in place, governments and institutions must mandate that products are repairable and designed for recycling and remanufacturing.”

## Battery recycling plan becomes law in Illinois

Illinoisans will soon have more options when it comes to recycling batteries, under a new law led by State Senator Dave Koehler.

“As the world relies more on technology, we need to take proactive steps to ensure we are responsibly disposing the harmful chemicals contained in batteries,” said Koehler (D-Peoria). “This law ensures Illinois stays one step ahead when it comes to technology and reducing waste.”

Businesses that sell or distribute batteries will be required to develop a recycling stewardship program under the new law. Sellers and distributors would need to have a small to medium sized battery recycling program in place by 2026. Medium sized batteries include batteries made for electric bikes and scooters. By 2029, businesses

must include appropriate labeling for all batteries to ensure proper collection and recycling.

Batteries contain heavy metals such as mercury, lead, cadmium and nickel, which can contaminate the environment when disposed improperly. Koehler’s plan models other successful stewardship programs recently enacted in the state, including one for paint disposal.

“These chemicals can cause significant harm to our environment if we do not act properly,” said Koehler. “Mitigating these risks needs to be a top priority. This law will give residents access to recycling centers and ensure battery distributors are taking responsible measures to address the potential harm from these products.”

Senate Bill 3686 was signed into law in early August.

*Why didn't the skeleton climb the mountain?  
It didn't have any guts!*

# Michigan improves in electronic waste recycling

It started out as a complaint in 2014 about an unregistered electronics recycler with a pile of televisions behind their place of business. It ended with the U.S. Environmental Protection Agency (EPA) in 2020 spending over \$1 million to clean up over 1.2 million pounds of crushed television tubes left in a warehouse. This was the first hint that the Upper Peninsula (U.P.) of Michigan was underserved when it came to electronics recycling.

Now, after multiple years of grants and cooperative efforts between the Michigan Department of Environment, Great Lakes, and Energy's (EGLE's), Materials Management Division (MMD), local environmental groups, businesses, non-governmental organizations, and several communities, there are nine state-supported permanent collection locations and four retailer supported collection sites in the Upper Peninsula.

"After seeing a warehouse full of gaylord boxes of broken television tubes, I knew there had to be a way to make sure that U.P. residents had access to properly recycling their unwanted electronics," said Steve Noble, EGLE's electronics recycling specialist.

Small grants were the answer. The grants started with sponsoring electronics collection events in several communities throughout the U.P. and grew into setting up permanent collection locations. The effort grew through building private and public partnerships such as those with Bay Mills, Hannahville, and the Keweenaw Bay Indian communities.

Add in a relationship with a couple local waste services companies, a large

environmental group with a passion to support environmental protection efforts, the support of a non-profit retailer known to repurpose and resell almost anything, and you have a successful formula for building a network of collection sites and collection events. This results in around 400,000 pounds of unwanted electronics being collected and properly recycled every year from locations in the U.P.

"The U.P. collection network continues to operate through the support of small EGLE, MMD grants and contracts," Noble added. "Because of the rural nature of the U.P., it is difficult to collect trailer loads of material in any one location. So, the economics of collecting electronics is a challenge. EGLE support keeps the collection of the electronics affordable for residents and small businesses that use the service. Otherwise, simply due to the cost, the material would end up in one of the landfills across the U.P."

All the material collected at the nine EGLE-supported collection locations are handled through a state contract with a nationally certified electronics recycler. The recycler follows proper data sanitization protocol and is inspected annually by a third-party auditing firm to assure compliance with environmental regulations.

In addition to the 13 permanent collection locations, EGLE grants support multiple community collection events across the U.P. The environmental group handles events in the middle and western portions of the UP, while an electronics recycler based in Sault Ste Marie, supports collection events in the Eastern UP.

# Royal Mint opens new factory extracting gold from e-waste

A new factory that provides a more sustainable source of gold and reduces reliance on mining has been unveiled by The Royal Mint.

Located at its site in south Wales, the 3,700 square meter facility uses patented chemistry from Canadian clean tech company Excir, extracting gold from printed circuit boards (PCBs) found in everyday items, such as TVs, laptops and mobile phones, in minutes. Excir's chemistry works at room temperature, creating a more energy efficient and cost-effective method of gold recovery.

The factory has scaled the technology from laboratory to an industrial level for the first time and has the capacity to process up to 4,000 tonnes of PCBs from e-waste every year. It provides the UK's oldest company with a new, more sustainable way to "mine" high-quality 999.9 purity gold. Recovered gold is already being used in the luxury jewelry collection, 886 by The Royal Mint.

According to the United Nations' Global E-waste Monitor, the generation of worldwide e-waste is rising by 2.6 million tonnes every year. A record 62 million tonnes of e-waste was produced in 2022, up 82 percent from 2010.

The new factory offers a more sustainable solution to this growing environmental challenge. It has been designed to ensure that valuable finite resources are recovered, and other materials are appropriately treated for onward processing.

Anne Jessopp, chief executive at The Royal Mint, said: "The Royal Mint is transforming for the future, and the opening of our precious metals recovery factory marks a pivotal step in our journey.

"We are not only preserving finite precious metals for future generations, but we are also preserving the expert craftsmanship The Royal Mint is famous for by creating new jobs and reskilling opportunities for our employees.

"We have ambitious plans, and I am proud that we are safeguarding The Royal Mint for another 1,100 years."

As part of its commitment to being a leader in sustainable precious metals, The Royal Mint has also been actively engaging with major industry bodies to help produce the first standard by the International Organization for Standardization (ISO) for the definition of recycled gold, helping to provide clarity to the industry, end consumer and other stakeholders.

# Electronic waste rising five times faster than documented e-waste recycling



The world's generation of electronic waste is rising five times faster than documented e-waste recycling, the UN's fourth Global E-waste Monitor (GEM) revealed. The 62 million tonnes of e-waste generated in 2022 would fill 1.55 million 40 tonne trucks, roughly enough trucks to form a bumper-to-bumper line encircling the equator, according to the report from ITU and UNITAR.

Meanwhile, less than one quarter (22.3 percent) of the year's e-waste mass was documented as having been properly collected and recycled in 2022, leaving \$62 billion worth of recoverable natural resources unaccounted for and increasing pollution risks to communities worldwide. Worldwide, the annual generation of e-waste is rising by 2.6 million tonnes annually, on track to reach 82 million tonnes by 2030, a further 33 percent increase from the 2022 figure. E-waste, any discarded product with a plug or battery, is a health and environmental hazard, containing toxic additives or hazardous substances such as mercury, which can damage the human brain and coordination system.

The report foresees a drop in the documented collection and recycling rate from 22.3 percent in 2022 to 20 percent by 2030, due to the widening difference in recycling efforts relative to the staggering growth of e-waste generation worldwide. Challenges contributing to the widening gap include technological progress, higher consumption, limited repair options, shorter product life cycles, society's growing electronification, design shortcomings, and inadequate e-waste management infrastructure.

The report underlines that if countries could bring the e-waste collection and recycling rates to 60 percent by 2030, the benefits – including through minimizing human health risks – would exceed costs by more than \$38 billion. It also notes that the world "remains stunningly dependent" on a few countries for rare earth elements, despite their unique properties crucial for future technologies, including renewable energy generation and e-mobility.

## By the Numbers

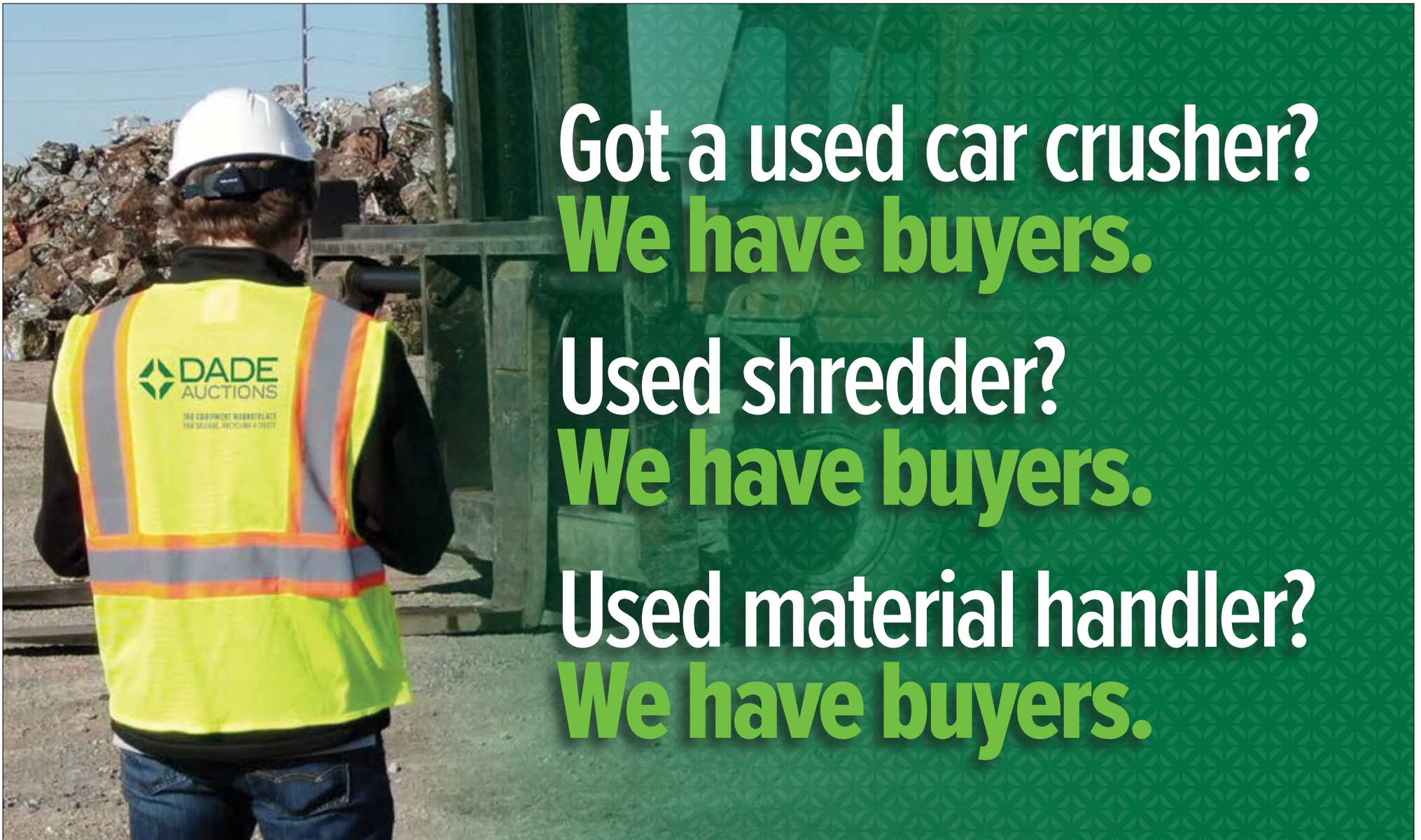
- 62 million tonnes: e-waste generated in 2022, equal to the weight of 107,000 of world's largest (853-seat), heaviest (575 tonne) passenger aircraft – enough to form an unbroken queue from New York to Athens, from Nairobi to Hanoi, or from Hong Kong to Anchorage
- 14 million tonnes (22.3 percent):

estimated mass of e-waste trashed, mostly landfilled, in 2022

- 31 million tonnes: estimated weight of metals embedded in e-waste in 2022, along with 17 million tonnes of plastics and 14 million tonnes of other materials (minerals, glass, composite materials, etc.)
- \$91 billion: The value of metals embedded in 2022 e-waste, including \$19 billion in copper, \$15 billion in gold, and \$16 billion in iron.
- \$28 billion: value of secondary raw materials (mostly iron) reclaimed by "urban mining" of e-waste in 2022
- 900 million tonnes: Primary ore extraction avoided by reclaiming materials through documented e-waste recycling
- 93 million tonnes: CO<sub>2</sub>-equivalent emissions avoided by formal e-waste management – recaptured refrigerants (41 million tonnes), avoided metals mining (52 million tonnes)

## Recycling Rates

- 42.8 percent: Formally documented collection and recycling rates in Europe
- <1 percent: Formally recycled e-waste in African countries
- ~50 percent (30 million tonnes): E-waste generated by Asian countries (of which relatively few have enacted legislation or established clear e-waste collection targets)
- 17.6 kg: Per capita e-waste generation in Europe, followed by Oceania (16.1 kg) and the Americas (14.1 kg). These regions also have the highest documented per capita collection and recycling rates (7.5 kg in Europe, 6.7 kg in Oceania and 4.2 kg in the Americas)
- 16 million tonnes: E-waste collected and recycled outside of formal systems in high- and upper-middle income countries that have developed e-waste management infrastructure.
- 18 million tonnes: E-waste managed mostly by the informal sector in low and lower-middle income countries with no e-waste management infrastructure. Any material values recovered by the informal sector are largely (perhaps more than) offset by extremely high health and environmental costs
- 5.1 million tonnes (8.2 percent of the global total): E-waste shipped across borders in 2022, of which ~3.3 million tonnes (65 percent) was shipped from high-income to middle- and low-income countries through uncontrolled, undocumented paths.



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