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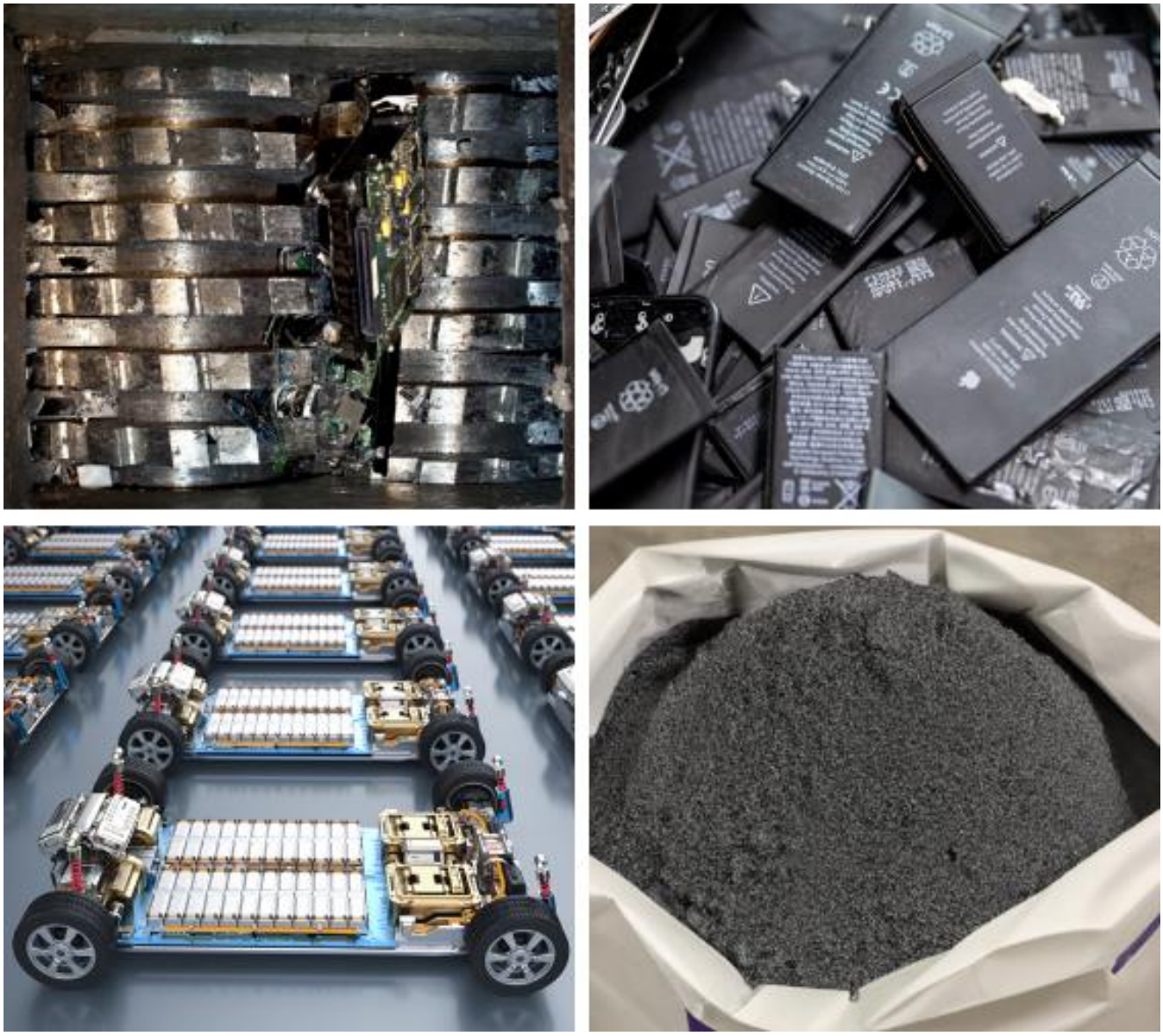

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Trend Study Lithium Battery Recycling

Plants – projects – players – trends

February 2023

ecoprog GmbH

Trend Study Lithium Battery Recycling

The recycling of lithium-ion batteries (LIBs) is one of the most promising recycling markets for the future. Above all, the increasing number of electric cars in markets such as the EU, China, or North America will lead to a boom in the years to come; in the long term, the volume of LIB material that must be treated each year throughout the world will exceed 30 million tons.

With the boom of battery electric vehicles, new projects for the recycling of LIBs are announced every week. Market participants such as automobile and battery manufacturers, waste disposal companies, and start-ups have already begun their market positioning and to gain experience.

ecoprog has analysed the global plant market for LIB recycling plants to gain greater insight on the opportunities and the market development of LIB recycling. We have identified around 200 plants and projects worldwide.

Our "Trend Study Lithium Battery Recycling" includes:

- The description of the essential technologies and functions of LIB recycling, as well as the analysis of the most important market factors and trends in LIB recycling and an outlook on the worldwide potential of this growth market.
- A list of more than 200 LIB recycling facilities and projects worldwide, including description of capacity, input material, and commissioning (as far as known). Furthermore, we have gathered information on around 70 plants and projects for recycling plants for other battery types.
- In addition to the study, this data is also available as an Excel file.
- The analysis of the main competitors in this market worldwide and in regional submarkets.
- A monthly update of the projects and plants for the next 12 months in the form of short news as well as an update of the Excel file on plants and projects.

The study is available **at a price from 1,200.00 EUR plus VAT.** Customers of our waste & bio Infrastructure Monitor will receive a discount of 600.00 EUR. **See the last page of this extract for detailed information on prices and ordering.**

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The disassembled components of a battery can often be recycled very well due to their material purity, for example in the cases of aluminium or copper foils.

In addition to the benefits for the further recycling process, disassembling also allows for a further inspection of the LIBs, for example to see whether they are damaged, or any modules can be used for second-life applications.

2.6 Shredding and sorting

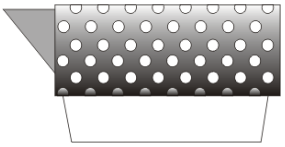
Once disassembly is complete, the remaining battery material is shredded, usually by cutting (currently mainly by rotary shears) or hammering in hammer mills.

Figure 7: Shredding of e-scrap

Source: hroephoto stock.adobe.com

Batteries must be shredded so they can be sorted. In the sorting processes, plastic parts of the outer casing of the batteries are separated, but also aluminium and copper foils. Classical methods of sorting are being used for this purpose, e.g. magnetic separation, sieving, floating-sink methods, or air-based methods such as wind sifting.

Figure 8: Selected mechanical sorting methods

Plant technology	Diagram	Description	Output
Sieve classification	For example: drum screen 	Using sieves, the material flow is separated on the basis of predetermined sizes. There are different sieve shapes: drum sieves, vibrating sieves, etc.	Coarse and fine fraction

(…)

8.2 Asia

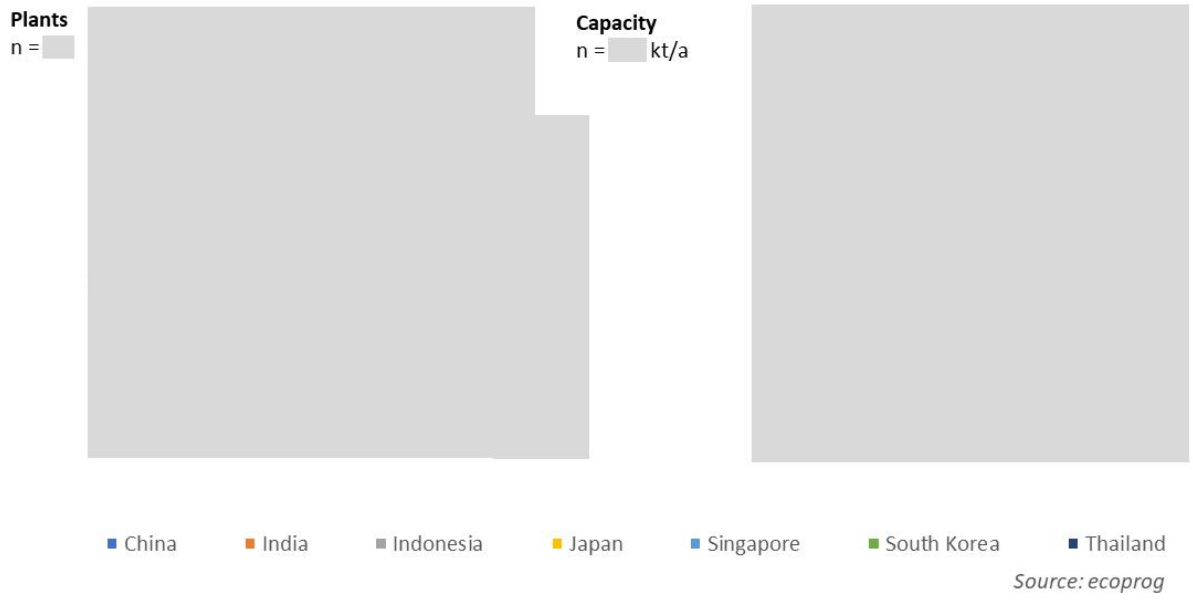
Population [million]	1,492	Operational LIB recycling plants	XX
GDP per capita [USD]	3,058	Projects	XX
Passenger cars [millions]	XX	Passenger cars per 100 inhabitants	XX

Background

Asia is the largest global market region in this study, and at the same time the most fragmented one. The requirements for electromobility vary significantly.

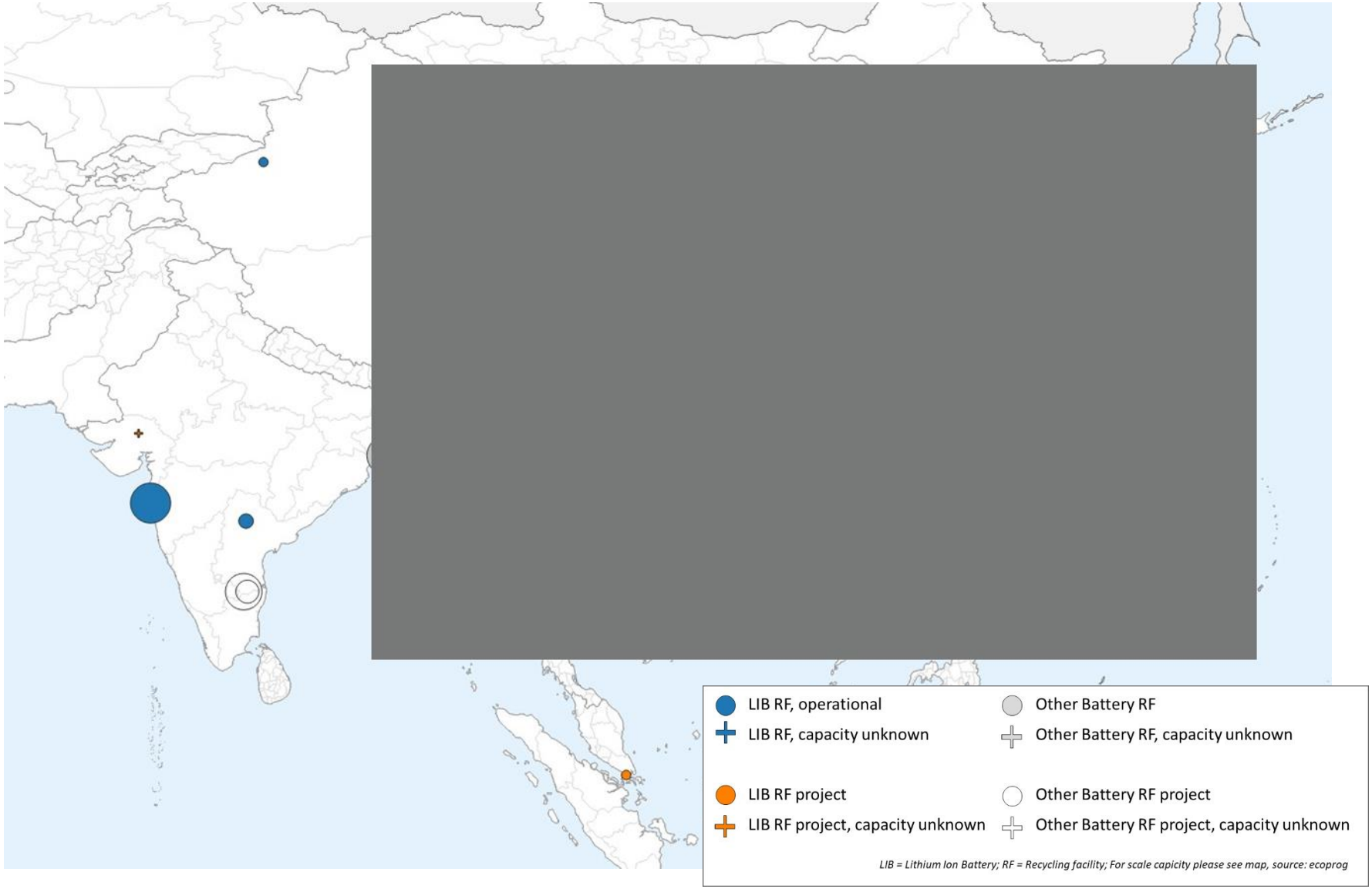
The EV market in China is considered to be prominent, even though as of early 2023, the country does not plan to ban internal combustion engines earlier than 2060 and thus much later than most other countries. However, the country introduced ambitious intermediate targets that are stimulating the EV market already. Until 2030, for example, the market share of so-called New Energy Vehicles (NEV), including both EV and hybrid vehicles, should increase to 40%. This translates into a large number, as the Chinese passenger car market is growing, with around XX vehicles sold in 2021.

Figure 21: Asia, active plants and capacities by country



Furthermore, this measure is comparatively strict. Under the so-called Dual Credit Policy, manufacturers are forced into a quota system. By 2023, they will be required to (…)

Figure 20: Asia, overview of plants and projects



Plants

In early 2023, we are aware of XX plants in Asia that we assume to recycle LIBs already. Of these, XX plants are installed in China, X in Japan, and X in South Korea. In Singapore, Thailand, and India, we are aware of another X plants.

(…)

Projects

In early 2023, we are aware of XX battery recycling projects. Of these, XX projects are located in China, X in South Korea, and X in Japan. [redacted]. X projects are located in India, even though the country does neither have any major battery factories nor a particularly strong introduction of electromobility.

(…)

Figure 23: Overview of known projects in Asia

#	Project	Country	Operator	Capacity (t/a)	Start	Status
1	Pohang GS Engineering	South Korea	Enerma (subsidiary of GS Engineering and Construction)	20,000	2023	under construction
2	Chizhou CN Tech	China	Chizhou CN New Materials Science & Technology Co Ltd	200,000	n/a	under construction
3						
4						
5						
6						
7						
8						
9						

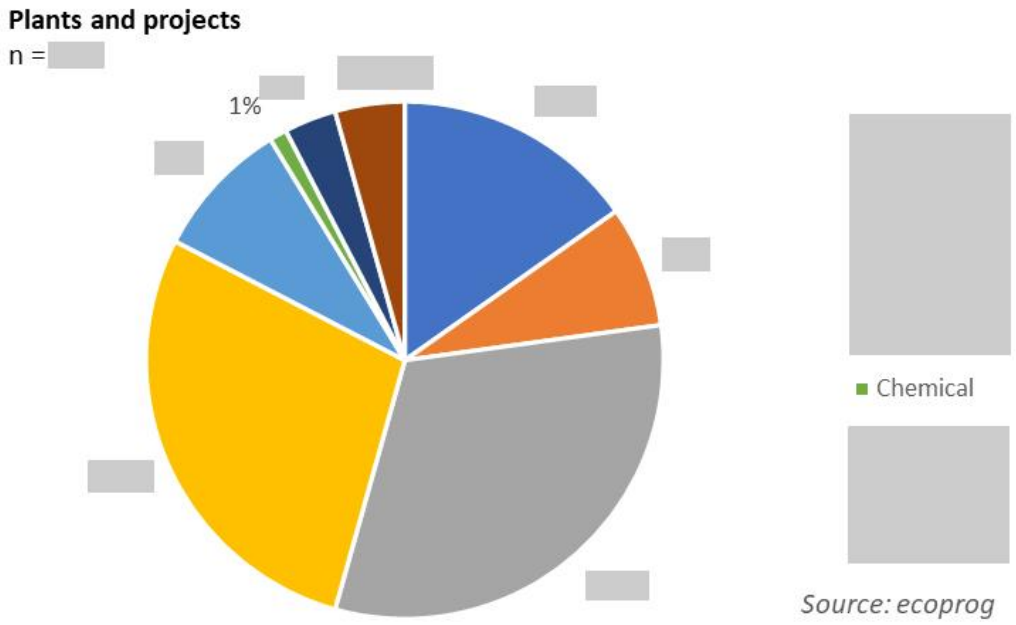
(…)

Competition

For this study, we have categorised the actors that operate or are currently building battery recycling plants in Europe by their origin.

The most important group of operators comes from [redacted]. In total, we have identified XX plants or projects that are conducted by players in this industry. The main players are (…)

Figure 24: Europe, operators by industry



Unlike in Asia, [redacted] are no major players for battery recycling in Europe.

LIB recycling plants

Hoboken, Belgium

Status: active
Capacity (t/a): 7,000
Main input: lithium-ion batteries, NiMH batteries, production scraps
Investment sum: EUR 25 million
Start of operation: 2011

Operator:

Umicore NV
Adolf Greinerstraat 14
2660 Hoboken
info@umicore.be
https://www.umicore.be/

(…)

(…)

LIB recycling projects

Zabok lithium, Croatia

Status: project
Main input: lithium-ion batteries
Start of operation: 2023
Remarks: As of 2021, construction is expected to start soon. The applications for the environmental permits are being prepared.

Operator:
CIAK Grupa
Savska opatovina 36
10090 Zagreb
ciak@ciak.hr
https://ciakgrupa.hr/

(…)

(…)

Plants for the recycling of other types of batteries

Beerse, Belgium

Status: active
Main input: lead-acid batteries

Operator:
Campine
Nijverheidsstraat 2
2340 Beerse
info@campine.com

https://www.campine.com/en

(…)

(…)

Projects for the recycling of other types of batteries

Prices and product information

You can order the study here:

https://www.ecoprog.com/publikationen/abfallwirtschaft/lithium-batterierecycling.htm

Prices:

- Single-user version, 1,200.00 EUR plus VAT
- Company version, 2,400.00 EUR plus VAT
- Corporate version, price on request

Product information:

Single-user version:	Personal copy (personalised, password-protected PDF file by e-mail)
Company version:	Company-wide copy (legal entity) (PDF file by e-mail)
Corporate version:	Copies for different, but legally connected companies (e.g. sister companies, investments abroad). The price depends on the number of companies and persons.

Buyers of the study will receive a monthly update of the projects and plants for the next 12 months in the form of short news as well as an update of the Excel file on plants and projects.

Subscribers of the waste & bio Infrastructure Monitor (Info | Order) will receive a discount of 600.00 EUR (1,200.00 EUR for company versions).

Find all our prices at a glance, including all discounts here.