

# Industry Snapshot: Recycling in Europe

STATUS QUO, TRENDS AND CHALLENGES



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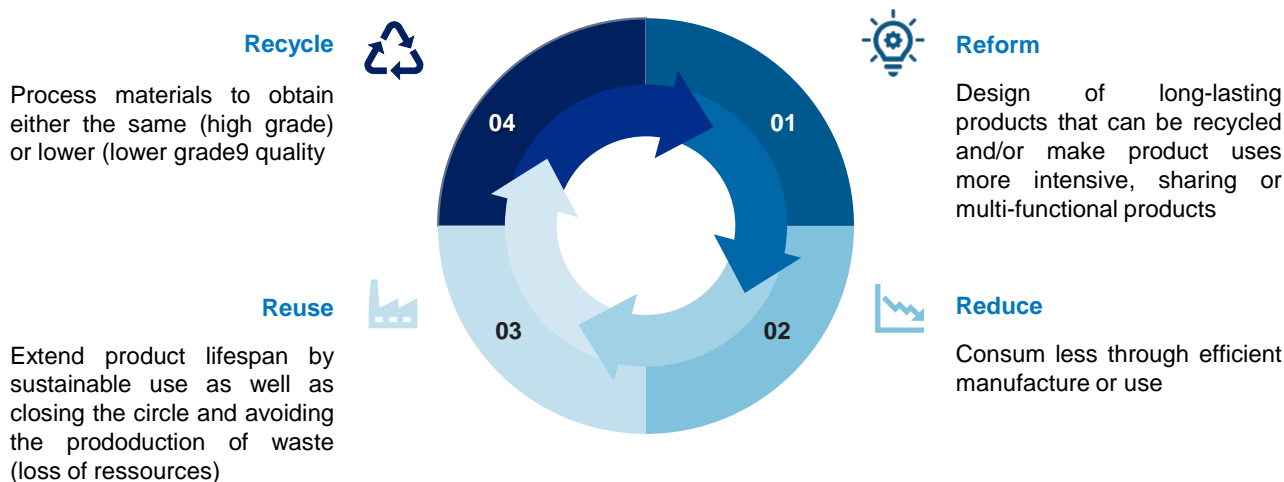
More and more waste is generated each year. Statistics show that the total waste generation (excluding major minimal waste) has increased in the European Economic Area since 2010 by 3% (almost 74.7m and generation went up by 70kg per capita) making the European economy subject to growing pressure to change, particularly as a result of the ecological sustainability crisis as well as subject to a complex and ever-growing EU regulatory framework, which affects its activities.

The European economy is seeking direction as there is growing unanimity about the need for reform resulting in the publication of the EU Circular Economy Action Plan (ECEAP) issued by the European Commission in March 2020. Undoubtedly, this plan is due to impact all industries in the coming years calling for change. The foundation for this plan is the circular economy model which primarily aims to keep

materials and their value in circulation. And although the circular economy model or the ECEAP are not only about recycling but also about new economic operating models, recycling plays an integral part in achieving this ambitious goal.

Over the last decades, the European recycling industry has drastically evolved by modernizing and constantly innovating to turn more waste streams into new resources. However, the significant increase in waste generation as well as the rising significance of the concept of the circular economy will further boost the demand for waste recycling services in Europe. As a result, the recycling industry continues to grow rapidly, not only in Europe but worldwide and counts as a promising growth industry with further increasing market opportunities for companies in this sector.

## Circular Economy



## Key facts & Contents

The total waste in the EU-28 amounted to

**2.3bn tonnes**

of which **>38%** were recycled

A compound annual growth rate of

**~5.2%**

with an annual revenue forecast of

**USD 242bn**

by 2030 was predicted in 2020

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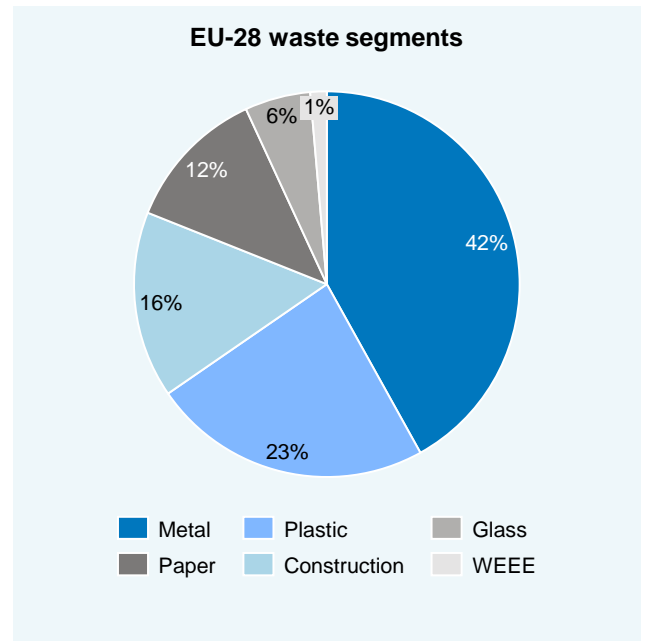


# Overview of the European Recycling Industry

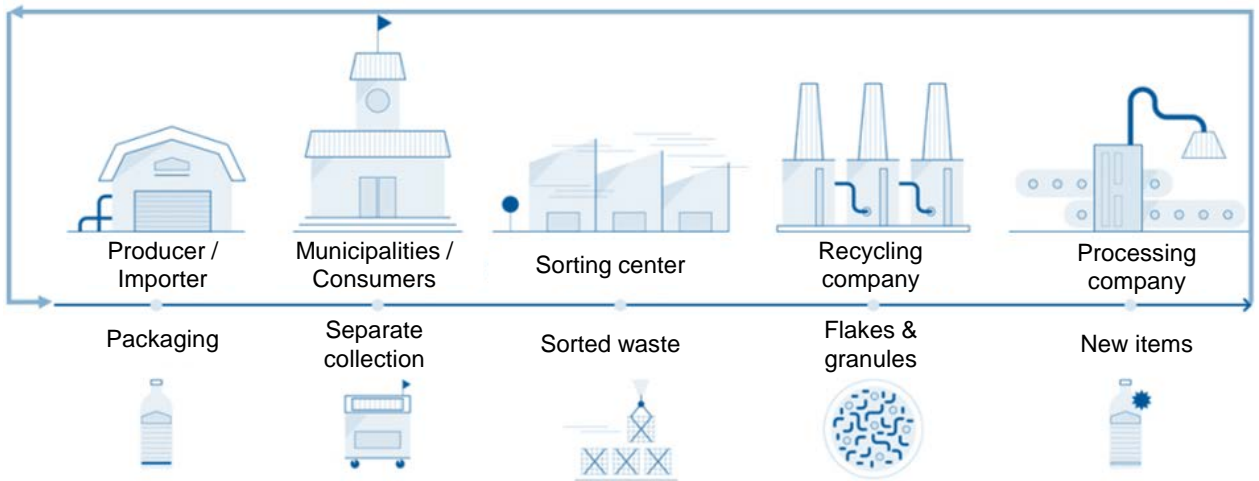
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In 2008, the European Union agreed on the waste framework directive to reduce the impact of waste for the environment and human health. This legislative established a hierarchy of waste treatment. Recycling is the third level in this hierarchy and should be applied if waste reduction or reuse is not possible. In the last years, waste treatment shifted more and more from throw-away to a recycling economy. The steps of the recycling process are collecting, sorting and recycling. Afterwards, the material can be used again for the production of new products, however, it is not possible to recycle 100% of all kinds of waste. A part of it is used for energy production or must be disposed.

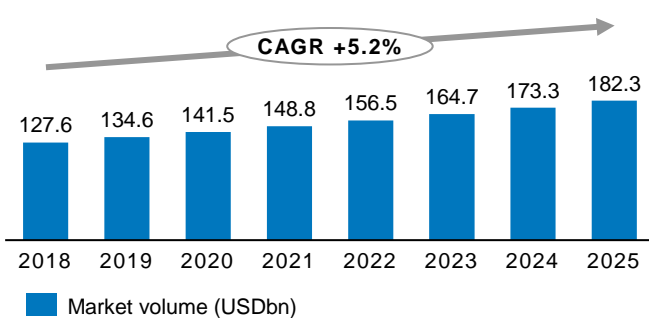


## An intact supply chain is key for effective recycling



Source: Umweltbundesamt

## European Recycling Market Development



Key figures 2020

Market size: USD 141.5bn  
 Market growth 2020-2030: CAGR ~ 5.2%  
 Market potential: high growth

Source: Recycling Magazine; Grandview Research



As our society is striving to establish a functional circular economy, globalization as well as new regulations impact existing business models of companies operating within the recycling industry. Amongst these topics, there are various trends which are relevant to the recycling industry in the current environment:

## 1. Focus on advanced technology

Like in previous years, a more concentrated focus on technology remains on top of the list of industry trends when it comes to exploring recycling and waste management. New recycling technology in the form of Machine learning, wireless monitoring, mobile applications, smart trucks, and robotics will continue to evolve and develop to make the process of differentiating various types of recyclables easier.

## 2. Sustainable plastic packaging

A tremendous amount of excess waste is being generated in the form of packaging materials. In the coming years, manufacturers are expected to focus on their packaging in more sustainable ways. Changes in solid waste management are causing major changes in packaging turning to recyclable forms. This recycling trend of introducing eco-friendly alternatives to plastic packaging solutions will continue to be part of the sustainability debate for the years to come.

## 3. Government incentives

Local authorities and governments are and will become more involved in waste recycling, supplying incentives that have the power to facilitate or create new waste recycling programs or processes that are better to serve the current needs.

## 4. Ban on single-use plastic

Another trend shaping the industry is the continued widespread ban on single-use plastic and polystyrene bags along with new uses of plastic waste and innovations in plastic manufacturing. Currently, experts are working on creating a high-quality resin that uses plastic waste as its primary material which should replace the current greenhouse gas emitting prime resin used in the plastic industry.

## 5. ReOil: Chemical Plastic Recycling

Another emerging trend is chemical recycling in attempt to recycle the unrecyclable. Chemical recycling could see all types of plastic fed into an "infinite" recycling system producing a recycled oil, which is a direct substitute for fossil oil, reducing the demand for natural resources and creating transforming waste plastic into a truly circular resource.

## 6. Plastic waste: enzymes ensure compostability

Additionally, Researchers have developed a plastic that can supposedly be composted. This is made possible by enzyme particles that, once activated, can break down the plastic into its components. The enzyme developed specifically for this purpose is already embedded in the material during production of the plastic. This takes the form of tiny nanoparticles surrounded by a protective shell that prevents the plastic from disintegrating prematurely. All that is needed for activation is heated tap water.

The waste recycling market in Europe is highly fragmented with a few international and many local players who hold a major market share of the European recycling industry. The market was and is growing with the rising adoption of strategies by key players causing a shift in the market paradigm in terms of regional competitive advantage. In terms of region, Germany is anticipated to be a highly attractive region for waste recycling offering

lucrative opportunities during the 2020's to 2030's forecasting period due to already well-established recycling and waste management facilities. In addition, private sector investments have been increasing in regions where the waste management sector is supported by government regulations. It is estimated that these will propel the waste recycling services market in the Europe.

### Key Players dominating the European Recycling Industry<sup>1</sup>

Company	Recycling Focus	Headquarters	Net Sales
	Electronics, paper, plastic recycling	Paris, France	EUR 7bn (2020)
	Plastic, glass	Lünen, Germany	EUR 7bn (2019)
	Non-ferrous/ferrous metal recycling (aluminum, iron, copper, steel)	Paris, France	EUR 4bn (2020)
	Ferrous metal (steel) recycling	Lünen, Germany	EUR 3bn (2020)
	Non-ferrous/ferrous metal recycling (aluminum, copper, steel)	Warrington, United Kingdom	EUR 3bn (2018)
	Paper, plastic, electronic and mixed waste recycling	Gothenburg, Sweden	EUR 1.7bn (2020/21)
	Plastics, batteries, industrial/ construction and electrical/ electronic waste recycling	Paris, France	EUR 1.5bn (2019)
	Non-ferrous/ferrous metal recycling (aluminum, steel)	Berlin, Germany	EUR 1bn (2019)
	Non-ferrous/ferrous metal recycling (aluminum, copper, steel)	Essingen, Germany	EUR 1bn (2020)
	Non-ferrous/ferrous metal recycling (primary iron)	Goetzis, Austria	EUR 544m (2019)

<sup>1</sup>Ranked by net sales; if the company is only partly active in recycling, segment sales are displayed

<sup>2</sup>Part of Remondis Group



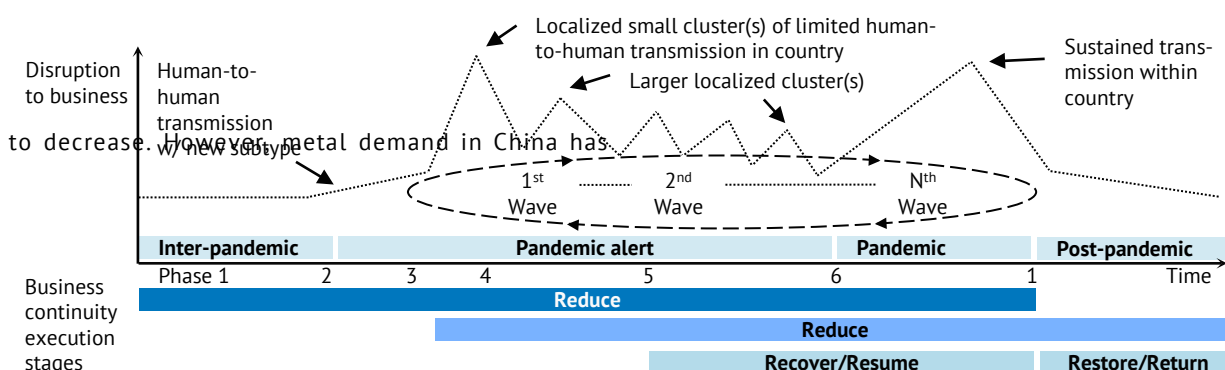
Although the recycling industry was deemed as an essential service at the start of the Covid-19 crisis, the uncertainties over cross-border movement which affected exports and imports, lack of manpower and the lack of collected materials created a logistical nightmare in the recycling supply chain. A survey published in August 2020 showed that 80% of the representatives interviewed felt affected by the crisis, however the magnitude varied considerably by individual business. Covid-19 slowed down business in terms of the decline in demand, issues regarding supply and price drops. Moreover, disruptions such as slowed collection and/or lower quality of sorting of certain waste streams due to a shortage of staff increased volumes of waste ending in landfills deteriorating the situation.

The shift in the supply chain and waste flows has the biggest impact, especially on the paper and glass recycling industries as these sectors struggle with less supply but higher demand. The loss of quality and quantity of input delivered to recyclers can be observed since large centralized sources of recyclable waste are still subject to closures and remain at reduced capacities. The metal recycling sector has seen a fall in production due to closures of recycling plants, which in turn causes the demand for metal scrap

seen a rise in Q2 2020 leading to certain recycled ferrous and non-ferrous metals being cleared for import. In order to counteract the scarcity of metal scrap, various countries including South Africa imposed export bans. Currently, the demand for certain metals is rising in Europe.

Similar to the paper and glass industry, the pandemic has sparked a rush for plastics. In other consequences, the pandemic has intensified the price war between recycled and new plastic. This price gap increased due to a drop in oil prices leading to cheaper primary plastic prices. Even before Covid-19 hit, waste electronic and electric equipment (WEEE) was the fastest growing waste stream at 50Mt of e-waste generated per year. The recent shift to remote working resulted in a flood of technology investments. E-waste recycling companies expect aprecedented amount of e-waste following the pandemic. Covid-19 is continuously disrupting the global economic activities, thus funding for recycling programs could be lower priority. However, the European market is better positioned for increasing recycling rates by 2025 due to necessary legislative inducement propelling investments in infrastructures.

## Impact of Pandemics on Global Supply Chains

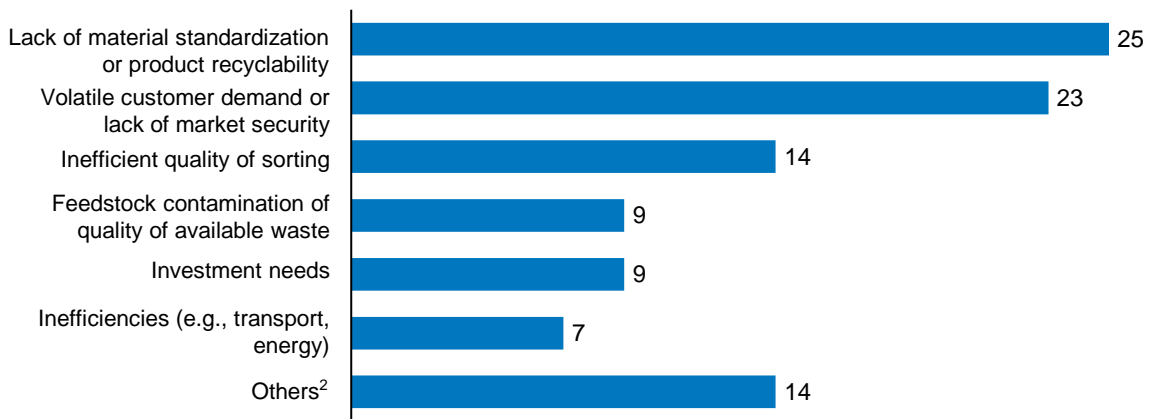


Source: Adapted from Eaton & Connor

Due to the worldwide increase of economic growth and the consumption of finite resources, society faces a growing scarcity of essential resources and a great burden on the environment. Arguably, two of the biggest drivers for the rapidly growing recycling industry is the ever-increasing waste generation as well as recycling's potential to improve Europe's resource efficiency. In addition, the industry is boosted by the public pressure demanding recyclable goods, shifting products to be

sustainable. However, the transition to a circular economy is a global challenge. The industry is confronted with challenges such as the higher costs compared to landfills and incinerators as well as the price competition between secondary commodities compared to primary commodities. Another challenging factor is the growing overseas competition and high levels of exports to non-EU countries e.g. ELV to African countries.

**Current challenges to the recycling business: values in percent<sup>1</sup>**



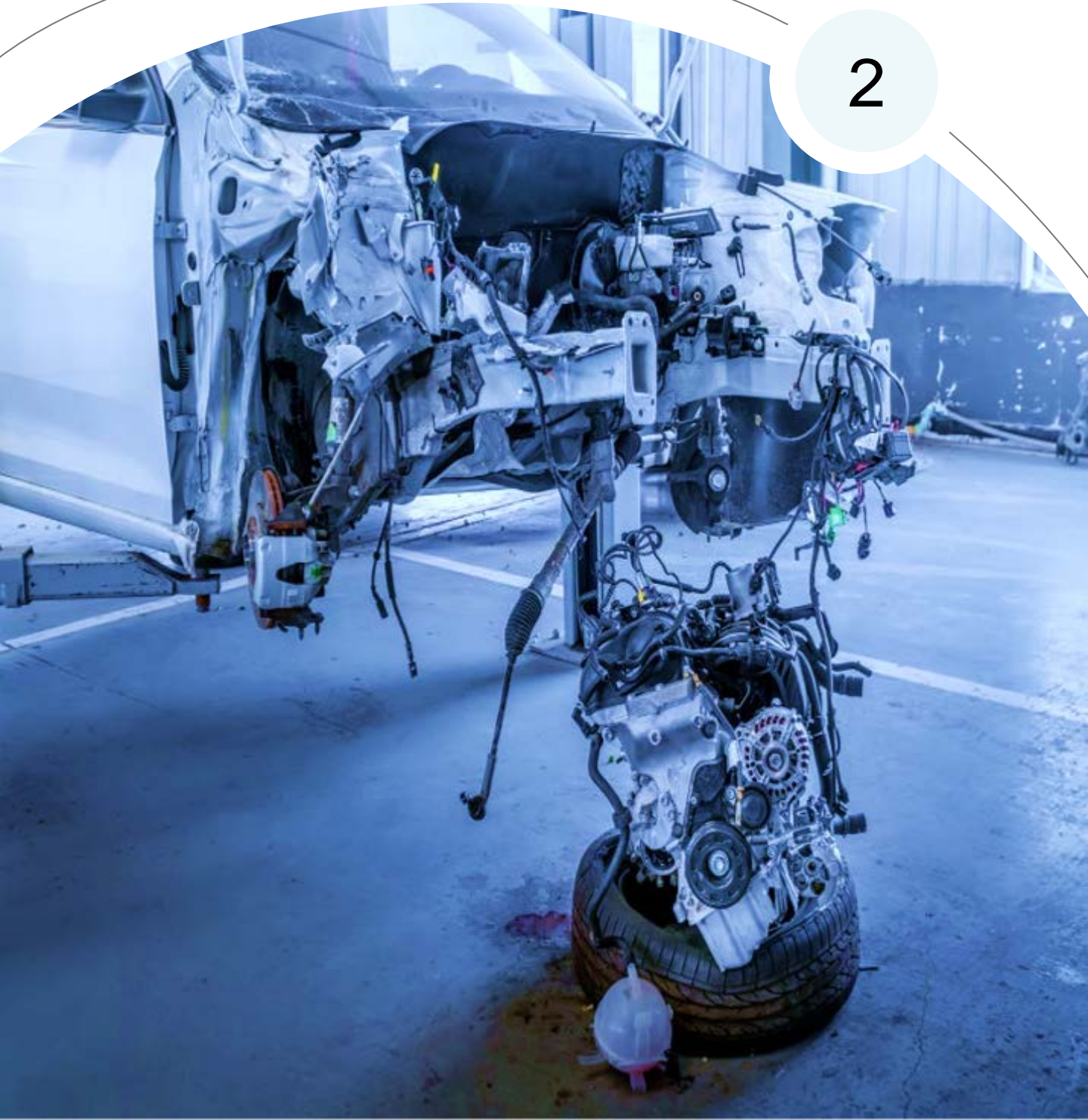
<sup>1</sup>Findings based on McKinsey Survey conducted in 2020. Companies that operate within the recycling industry (primary sector) were interviewed. Percentage of answers provided by respondents.

<sup>2</sup>includes competition with other players from low-cost regions, bidding process etc.

Source: McKinsey

# Emerging Markets: What drives Electric Vehicle Battery Recycling?

2



# ELECTRIC VEHICLE BATTERIES – AN OVERVIEW

Battery electric vehicles (BEV) are a key strategy for reducing air pollution and global warming. They have zero tailpipe emissions, and even when powered by today's sources of electricity, their emissions are significantly lower than those for vehicles fueled with gasoline or diesel. However, as the electric vehicle (EV) industry grows, questions about the availability, recyclability, and sustainability of battery materials rise. Battery recycling will become a key sector where value can be created through the re-use of the major raw materials contained

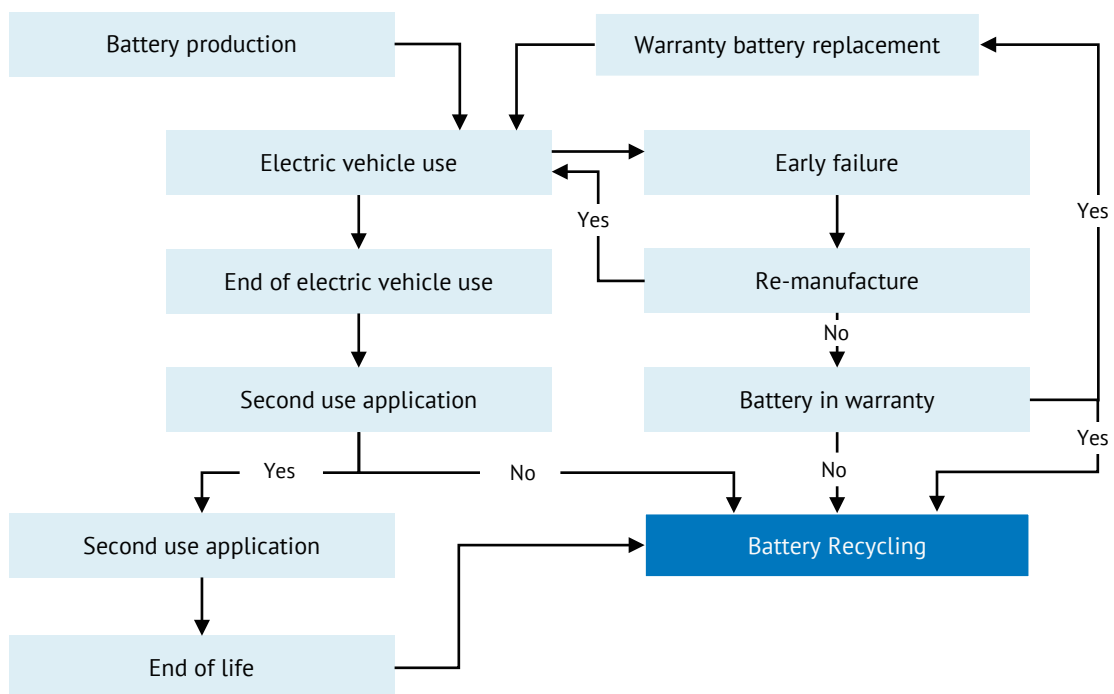
in EV batteries (Cobalt, Lithium, Nickel, Aluminum, Manganese). The recycling process of lithium-ion batteries is very complex, which means that the costs of recycling are generally high, however, this will change as the EV industry continues to grow. Therefore, there is a high opportunity for the EU industry. As of now, the lithium-ion battery recycling industry is not adequately developed to meet future volumes despite some companies (Umicore, Accurec, Recupyl and SNAM) that are already recycling these batteries.

## Expected quantity and capacity of batteries at their end of life between 2030- 2040

	2030	2035	2040
Quantity	1,163,500	2,596,100	5,380,000
Capacity (MWh)	46,540	103,844	215,200

Source: European Union. Calculations based on figures adapted from Bloomberg New Energy Finance (2017); Casals et al. (2017); Myall et. al. (2018); Neubauer et. al. (2015); Curry (2017)

## The modelled life-stages of an EV battery



Source: Abdelbaky et al.



## Comparison of main recycling methods used to recover battery materials

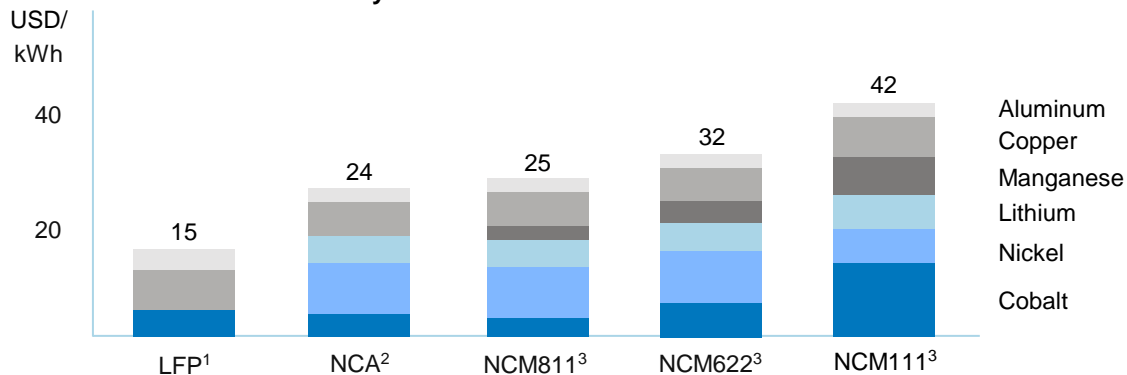
Recycling Method	Process	Pros	Cons	Materials extracted
Mechanical Process	Batteries are dismantled into battery molecules and then crushed into its granular form	<ul style="list-style-type: none"> <li>• Applicable to any battery chemistry and configuration.</li> <li>• Lower energy consumption</li> <li>• Enhance leaching efficiency of valuable metal</li> </ul>	<ul style="list-style-type: none"> <li>• Must be combined with other methods (mainly hydrometallurgy) to recover most materials</li> </ul>	Li <sub>1</sub> CO <sub>3</sub>
Hydrometallurgy	Obtains metals from their ore using water-based chemistry	<ul style="list-style-type: none"> <li>• Applicable to any battery chemistry and configuration</li> </ul>	<ul style="list-style-type: none"> <li>• Only economical for batteries containing Co and Ni</li> </ul>	Copper, Aluminum, cobalt, Li <sub>2</sub> CO <sub>3</sub> , Anode is destroyed
Pyrometallurgy (smelting)	High temperatures to carry out smelting and refining operations to extract metals from their minerals	<ul style="list-style-type: none"> <li>• Applicable to any battery and configuration</li> </ul>	<ul style="list-style-type: none"> <li>• Only economical for batteries containing Co and Ni; gas clean-up required to avoid release of toxic substances</li> </ul>	Cobalt, nickel, copper, some iron
Direct recycling (supercritical CO <sub>2</sub> )	Batteries are discharged, disassembled and shredded. After that, materials undergo separation	<ul style="list-style-type: none"> <li>• Almost all battery materials can be recovered</li> </ul>	<ul style="list-style-type: none"> <li>• Recovered material may not perform as well as primary material</li> <li>• Mixing cathode materials could reduce value of recycled product</li> </ul>	Almost all components (except separators)

Source: Anderson, 2016; De Michelis & Kopacek, 2018; Gains, 2014; Li et al, 2016; Singh & Schwan, 2011; Steward et al, 2019; Panpan et al, 2020; Xu et al., 2020.

## Economic Importance

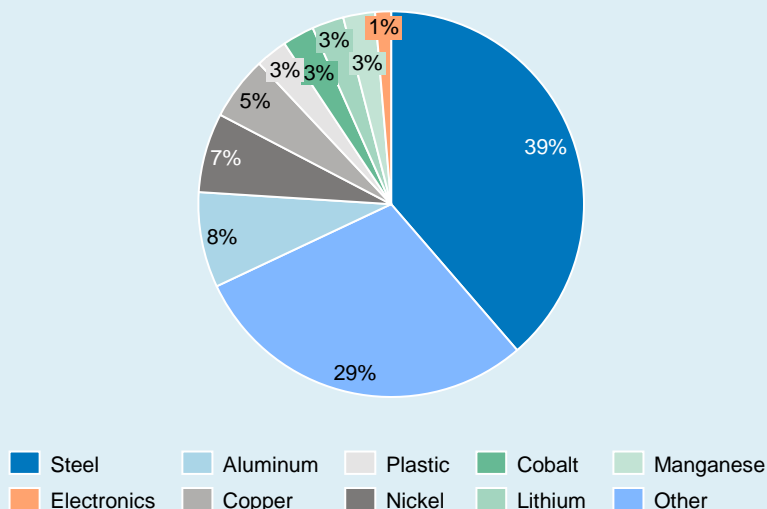
- Value of recycled EV batteries varies depending on their internal chemistry
- EV battery pack could save up to 30% in cost by substituting virgin materials with recyclables
- As of 2021, the majority of EV batteries has not reached their EoL yet
- The EV battery recycling market is dominated by China and South Korea. Both host a significant share of battery and cell productions leading to a strong demand in raw materials
- In 2019, just 5% of EV batteries were recycled in Europe
- In 2016, battery recycling capacity exceeded 94Kt per year from which 30% is held in Europe
- In 2019, 218 GWh of lithium-ion batteries entered the market for an accumulative 700 GWh, around half of which ended up in EV

**Internal chemistry of common Lithium-ion electric vehicle batteries**



Source: Niese et al.

**Battery Pack material composition based on NCM622 battery with 55 kW/h**



Source: Adapted from Bernhart

# BATTERY RECYCLING VALUE

## Assumptions of battery recycling values<sup>1</sup>

	Weight (kg/kWh)	Weight (kg/55 kWh)	USD/kg	A USD/kWh	B USD/kWh	A USD/55 kWh	B USD/55 kWh
Steel	2.9	159.5	0.45	1.3	1.3	71,5	71.5
Electronics	0.1	5.5	0.54	0.1	0.1	5.5	5.5
Aluminum	0.6	33	1.71	1.0	1.0	55	55
Copper	0.4	22	5.68	2.5	2.5	137.5	137.5
Plastic	0.2	11	-0.11	-0.0	-0.0	-0.0	-0.0
Nickel	0.5	27.5	9.79 <sup>3</sup>	5.2 <sup>3</sup>	24 <sup>4</sup>	286 <sup>3</sup>	1.350 <sup>4</sup>
Cobalt	0.2	11	20.45 <sup>3</sup>	3.5 <sup>3</sup>		192.5	
Lithium	0.2	11	9.21 <sup>3</sup>	1.4 <sup>3</sup>		77	
Manganese	0.2	11	1.44 <sup>3</sup>	0.3 <sup>3</sup>		16.5 <sup>3</sup>	
Other	2.2	121	-1.12	-2.5	-2.5	-137.5	-137.5
<b>Total</b>	<b>7.5</b>	<b>412.5</b>		<b>~ 13</b>	<b>~ 27<sup>3</sup></b>	<b>~ 704</b>	<b>~ 1480</b>

## Assumptions of battery recycling costs<sup>1</sup>

	USD/kg	A USD/kWh	B USD/kWh	A USD/55 kWh	B USD/55 kWh
Diagnostic & removal	0.31	2.4	2.4	132	132
Recycling logistics	0.38	2.8	2.8	154	154
Mechanical treatment	0.1 – 0.3 <sup>3</sup>	1.1	2.2 <sup>3</sup>	60.5	121 <sup>3</sup>
Hydro-metallurgy	0.3 – 0.6 <sup>3</sup>	2.2	4.3 <sup>3</sup>	121	247.5 <sup>3</sup>
<b>Total</b>		<b>~ 9</b>	<b>~ 12<sup>3</sup></b>	<b>~ 468</b>	<b>~ 655<sup>3</sup></b>

Legend for Tables 4 & 5

<b>A</b>	Battery graded material
<b>B</b>	Precursor

<sup>1</sup> Based on volume OEM pack using NCM622

<sup>2</sup> Standard EV batteries currently range between 17.6 kWh to 100 kWh. In this scenario, it is assumed that NCM622 runs with 55kWh. Numbers are calculated accordingly.

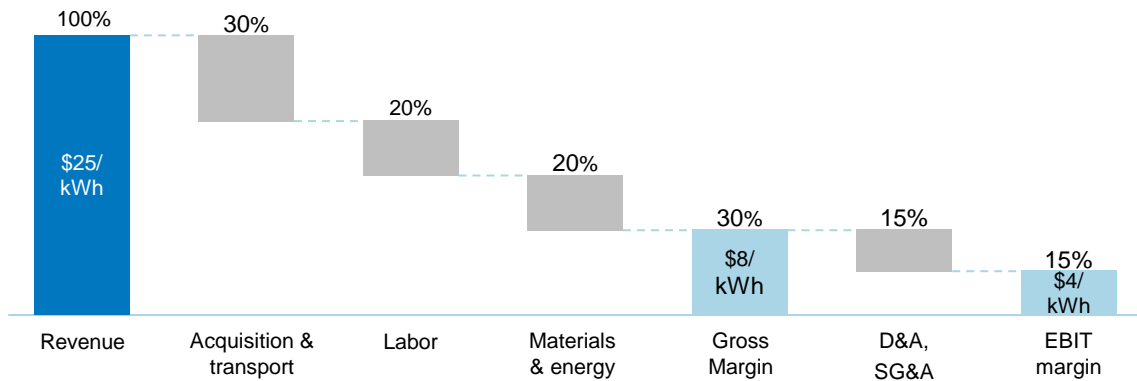
<sup>3</sup> Estimated at 70% of 2019 stock price, with 95% efficiency of recycling

<sup>4</sup> Hydrometallurgical recycling of NCM811 and LiOH at ~ 95% efficiency

Source: Calculations for tables 3 and 4 based on figures adapted from Bernhart

## PROFITABILITY OF RECYCLING EV BATTERIES

Profitability of EV battery recycling for large-scale recyclers. Based on representative economics for at-scale recycler of NCM622 in China, 2020

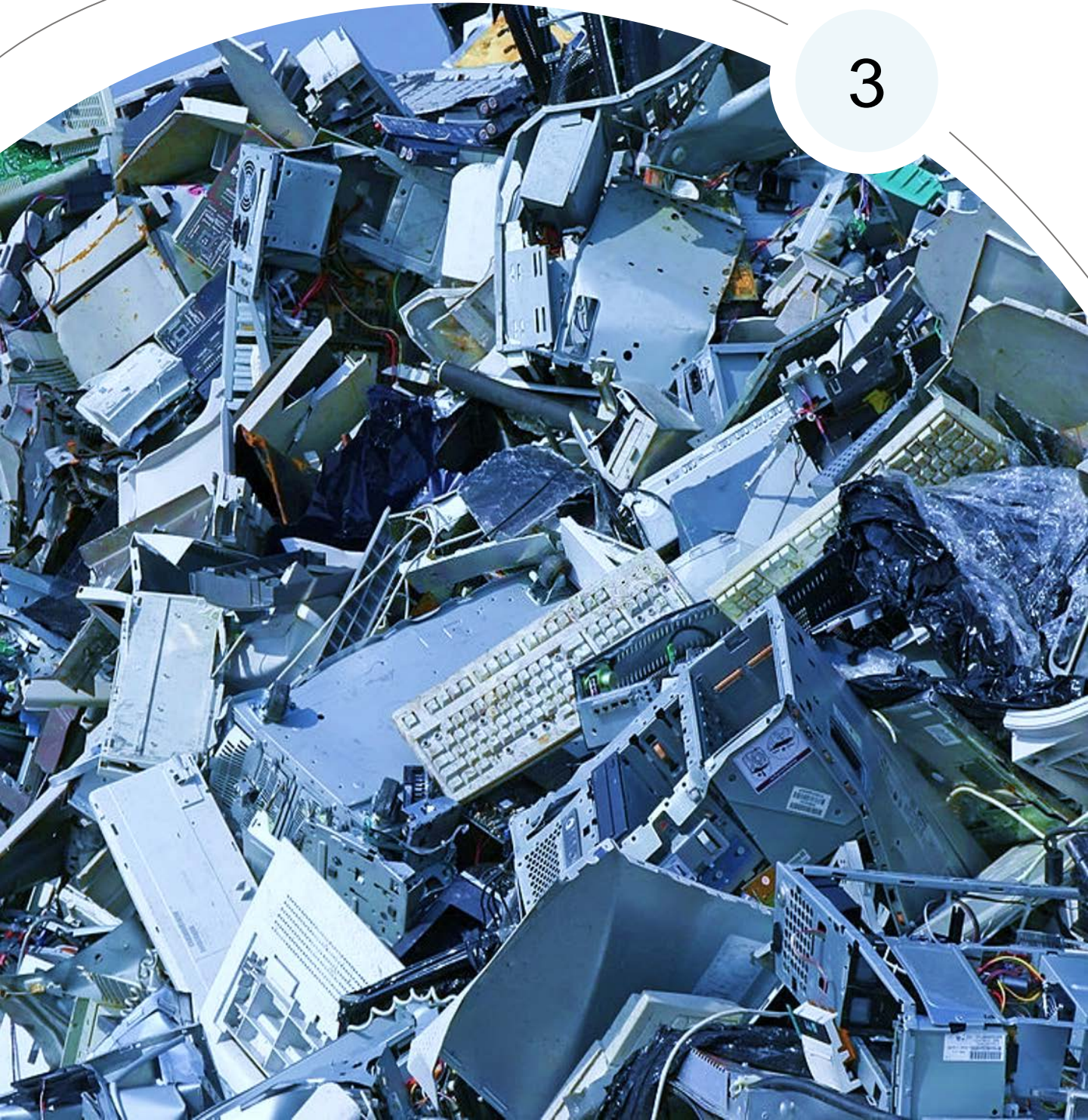


Source: Niese et al.



# Future Markets: What drives E-waste Recycling?

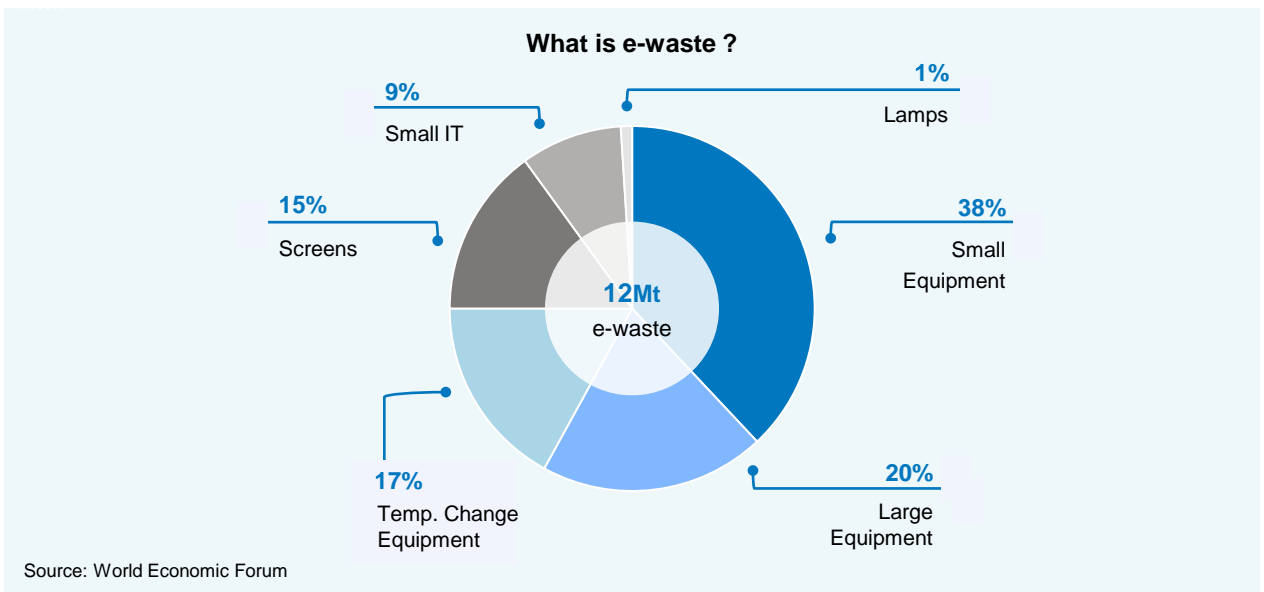
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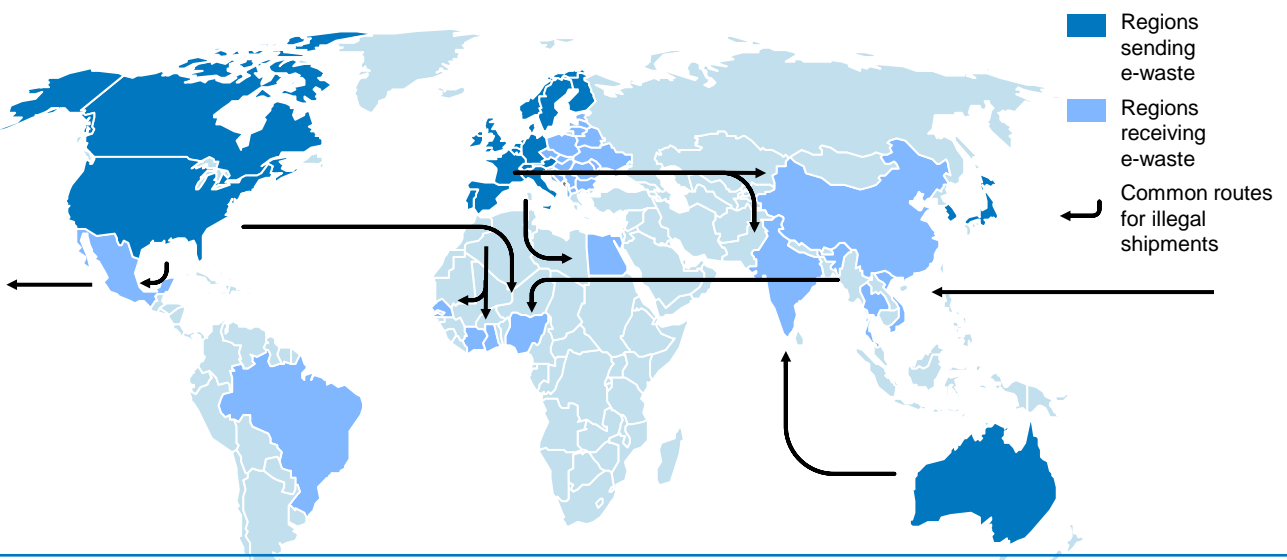
# E-WASTE – AN OVERVIEW

Electronic devices and electrical equipment define modern life. But the waste they generate has become an obstacle to EU efforts to reduce its ecological footprint. Electronic and electrical waste, or e-waste, covers a variety of different products that are thrown away after use. E-waste refers to electronics such as computers, phones, radios, refrigerators, and other devices or appliances that have been discarded. Either these products reached the end of their functional life-cycle prior to disposal or they were simply discarded for newer models. Electronics

are full of valuable materials such as plastic, metals and glass which can all be recovered, reused and recycled. On the other hand, certain types of e-waste are made up of hazardous materials which can cause disruption to human health and ecosystems. This is one of the reasons why more developed countries have made it illegal to dispose electronics. However, many developing countries do not have these laws or the ability to refuse many of these imports.



### Mapping out e-waste



### Top 5 highest e-waste generating Nations:

1.63Mt	1.60Mt	1.59Mt	1.36Mt	1.06Mt
Russian Federation	Germany	United Kingdom	France	Italy

Source: World Economic Forum



# WHAT IS E-WASTE MADE OF?

Periodic table: elements found in e-waste

H Hydrogen																	He Helium
Li Lithium	Be Beryllium											B Boron	C Carbon	N Nitrogen	O Oxygen	F Fluorine	Ne Neon
Na Sodium	Mg Magnesium											Al Aluminum	Si Silicon	P Phosphorus	S Sulfur	Cl Chlorine	Ar Argon
K Potassium	Ca Calcium	Sc Scandium	Ti Titanium	V Vanadium	Cr Chromium	Mn Manganese	Fe Iron	Co Cobalt	Ni Nickel	Cu Copper	Zn Zinc	Ga Gallium	Ge Germanium	As Arsenic	Se Selenium	Br Bromine	Kr Krypton
Rb Rubidium	Sr Strontium	Y Yttrium	Zr Zirconium	Nb Niobium	Mo Molybdenum	Tc Technetium	Ru Ruthenium	Rh Rhodium	Pd Palladium	Ag Silver	Cd Cadmium	In Indium	Sn Tin	Sb Antimony	Te Tellurium	I Iodine	Xe Xenon
Cs Cesium	Ba Barium	57/71	Hf Hafnium	Ta Tantalum	W Tungsten	Re Rhenium	Os Osmium	Ir Iridium	Pt Platinum	Au Gold	Hg Mercury	Tl Thallium	Pb Lead	Bi Bismuth	Po Polonium	At Astatine	Rn Radon
Fr Francium	Ra Radium	89/103	Rf Rutherfordium	Db Dubnium	Sg Seaborgium	Bh Bohrium	Hs Hassium	Mt Meitnerium	Ds Darmstadtium	Rg Roentgenium	Cn Copernicium	Uut Ununtrium	Fl Flerovium	Uup Ununpentium	Lv Livermorium	Uus Ununseptium	Uuo Ununoctium

Lanthanide Series

La Lanthanum	Ce Cerium	Pr Praseodymium	Nd Neodymium	Pm Promethium	Sm Samarium	Eu Europium	Gd Gadolinium	Tb Terbium	Dy Dysprosium	Ho Holmium	Er Erbium	Tm Thulium	Yb Ytterbium	Lu Lutetium
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Actinide Series

Ac Actinium	Th Thorium	Pa Protactinium	U Uranium	Np Neptunium	Pu Plutonium	Am Americium	Cm Curium	Bk Berkelium	Cf Californium	Es Einsteinium	Fm Fermium	Md Mendelevium	No Nobelium	Lr Lawrencium
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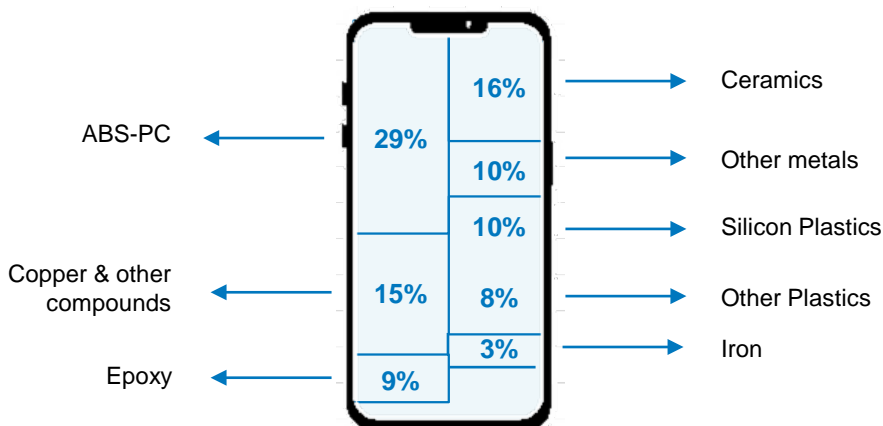
- Non-critical elements found in EEE
- Critical elements found in EEE
- Precious elements found in EEE
- Other elements found in EEE

Source: Deutzer et al.

From a material design perspective, EEE is very complex. Up to 69 elements from the periodic table can be found in EEE, including precious metals (e.g. gold, silver, copper, platinum, palladium, ruthenium, rhodium, iridium, and osmium), Critical Raw Materials (e.g. cobalt, palladium, indium, germanium, bismuth, and antimony), and noncritical metals, such as aluminum and iron. Within the paradigm of a circular economy, the mine of e-waste should be

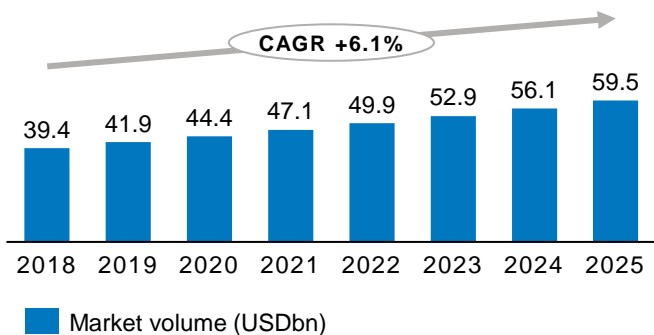
considered an important source of secondary raw materials. Due to issues relating to primary mining, market price fluctuations, material scarcity, availability, and access to resources, it has become necessary to improve the mining of secondary resources and reduce the pressure on primary materials. By recycling e-waste, countries could at least mitigate their material demand in a secure and sustainable way.

## What's in a typical mobile phone?



Source: World Economic Forum

## Global e-waste recycling industry development

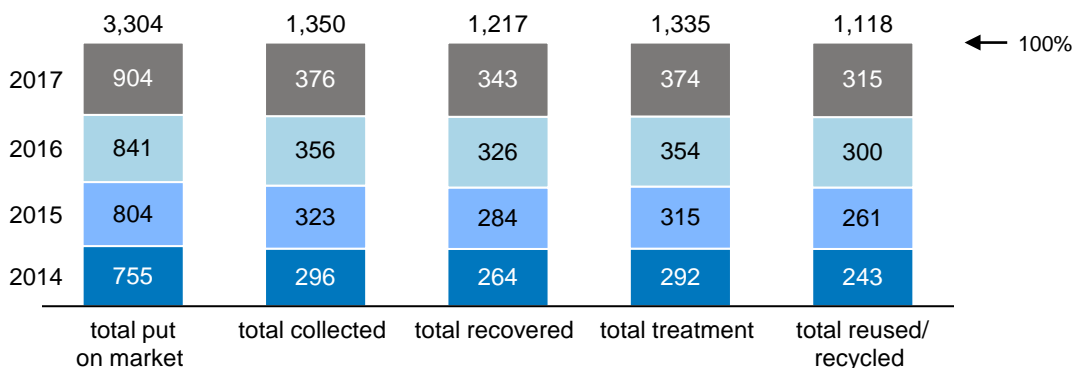


### Global key figures 2020

Market size:	USD 44.4bn
Market growth 2020-2025:	CAGR ~ 6.1 %
Market potential:	high growth

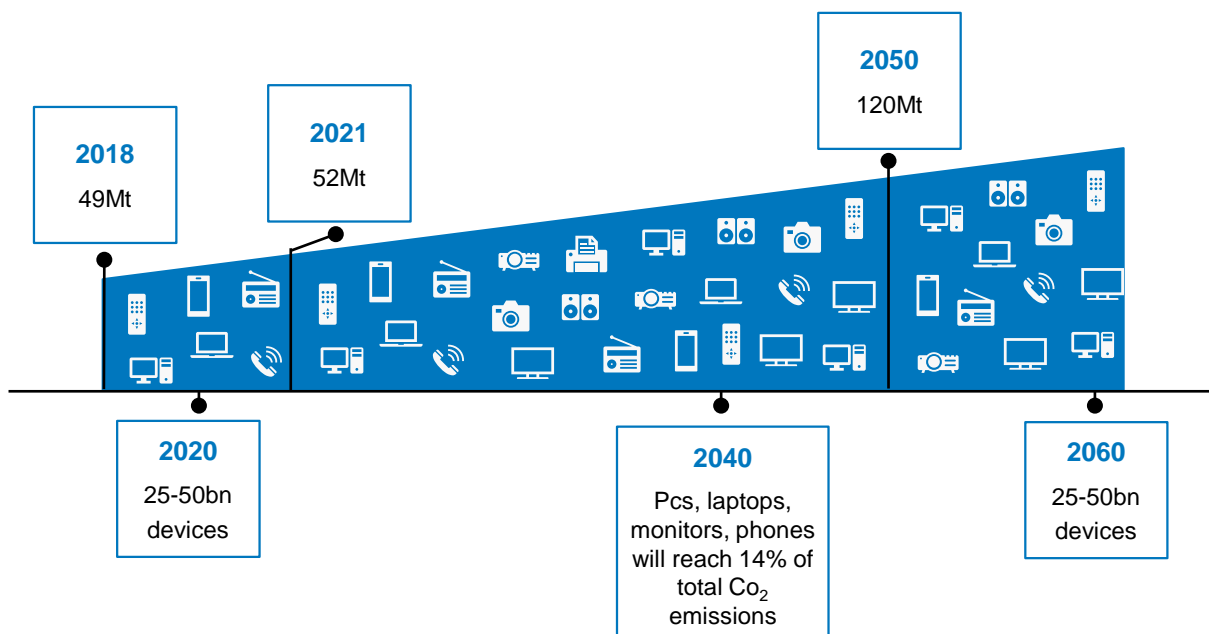
Source: Globe News Wire

## Electrical and electronic equipment put on the market and e-waste collected and treated. Values in Kt for EU-27, 2018



Source: Eurostat

## The future of e-waste



Source: World Economic Forum



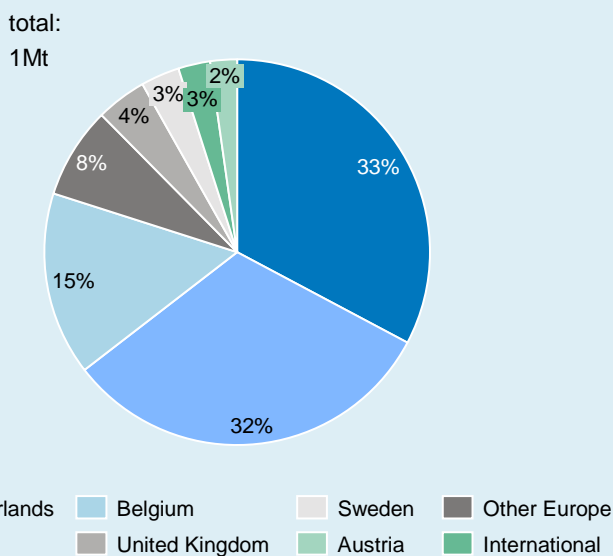
## Economic Importance

- In 2019, the European Economic Area produced 12Mt which also accumulated to a value of USD 12.9bn in raw materials found in e-waste
- In 2018, the EU generated approximately 4Mt of electrical and electronic equipment waste. From those 4Mt, around 21% of e-waste was thrown away.
- Although Asia generates the most e-waste, Europe is the continent that generates the most e-waste per capita (16.2 kg)
- Europe has the highest documented formal e-waste collection and recycling rate - approximately 42.5%
- Europe will lead the global e-waste recycling market by 2024
- Around USD 1.5bn of materials are lost annually

## International Trade

- Although the import of e-waste into China has been officially banned since 2000, it is estimated that around 8Mt of e-waste are imported illegally into China every year
- The Netherlands, Germany, and Belgium are the major importers of e-waste in Europe receiving over 78% of all exports
- A small amount of e-waste leaves Europe and arrives in destinations outside the region. This amounts to approximately 2.7% of total exports. These international export flows are destined for Singapore, China (including Hong Kong), Pakistan, Philippines, and United Arab Emirates

**EU e-waste exports by destination**



Source: Europe Now Journal; Eurostat

# Prices up: What drives Metal Recycling?

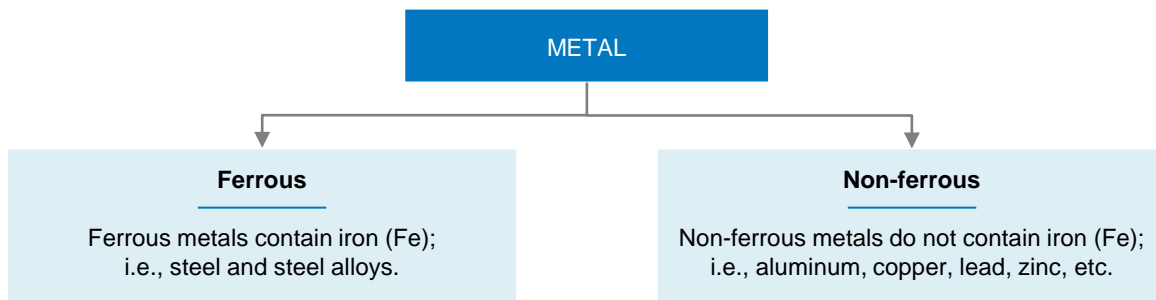
4



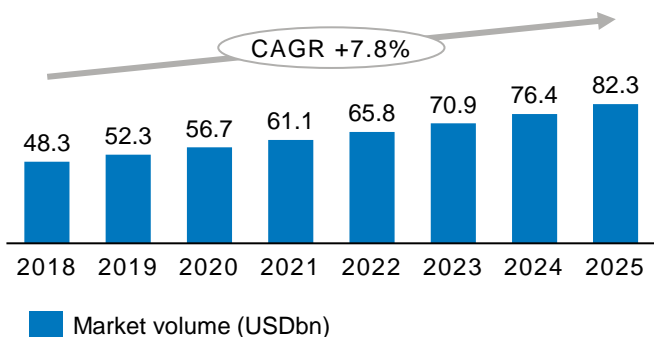
Metals are broadly present in a variety of goods with both short- and long-term use. Common metals that are used in household and industrial applications can be divided into the following

main groups: non-ferrous and ferrous. Steel, an iron alloy (highly ductile), is by far the most used metal in the world directly followed by aluminum and copper.

## Ferrous vs. Non-ferrous Metals



## Global Metal Recycling Industry Development



### Global key figures 2020

Market size:	USD 56.7bn
Market growth 2020-2025:	CAGR ~ 7.8%
Market potential:	high growth

Source: Markets and Markets

## Why are metals important?

The steel industry has long held a strategic place in the EU economy. The EU is the second largest producer of steel in the world after China. Its output amounts to over 177Mt of steel p.a. at more than 500 steel production sites across 23 EU member states, accounting for 11% of global output. Steel-making is closely linked to many downstream industries such as automotive, construction, electronics, and mechanical and electrical engineering, steel acts as the backbone for development, growth and employment in Europe. In the EU alone, the non-ferrous metal sector, which includes

all non-ferrous metal types, accounts for 1.25% (EUR 19.9bn) of EU manufacturing in 2010 and reaching a turnover of EUR 120bn (1.8%) in 2017. Europe accounts for 16% of global aluminum output, half of which comes from recycled sources and 4.6% of global copper output. The EU is one of the biggest consumers of non-ferrous metals in the world with aluminum representing the largest share of manufactured non-ferrous metals. Non-ferrous metals are primarily used within the electronic, automotive, packaging, construction and building sectors.

Steel is 100% recyclable – a permanent material that underpins the economy, but also contributes to environmental goals by reducing

the use of primary raw materials and CO2 emissions. Using recycled steel saves around 74% of energy.

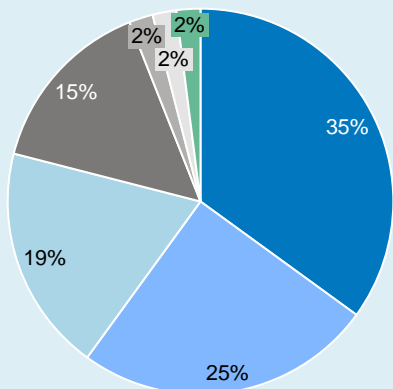
## Economic Importance

- Over 90% of EoL stainless steel is currently collected and recycled into new products
- 35.5% of global crude steel was produced from secondary raw materials in 2017
- Steel scrap use (consumption) for steel making was 87.5Mt in the EU-28 in 2019 accounting for ~5.4% of the EU's crude steel production
- The proportion of steel scrap used in relation to crude steel production in the EU is 56%.
- Annual savings on environmental costs by using steel scrap in the EU can achieve up to EUR 20bn (2018)
- 70% of the steel produced to-date is still in use

## International Trade

- European steel scrap recycling operations collect and re-process more than the demand for steel scrap in the EU. Hence, there is no steel scrap shortage in the EU
- The largest importer of steel scrap from the EU-28 is Turkey, whose imports represent 55% of EU-28 steel scrap exports (12Mt in 2019). The Turkish steel industry relies vastly on the EAF steel production route using steel scrap as main infeed
- In 2019, European scrap recyclers exported more than 21,806Kt and imported 2,899Kt

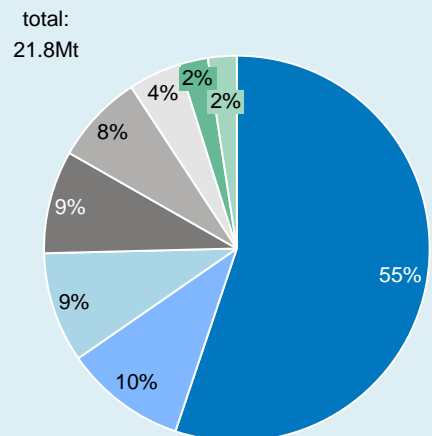
**End-use of steel scrap in the EU**



- Construction
- Automotive
- Mechanical engineering
- Industrial
- Domestic appliances
- Other transport
- Miscellaneous

Source: Eurofer

**EU steel scrap exports by destination**

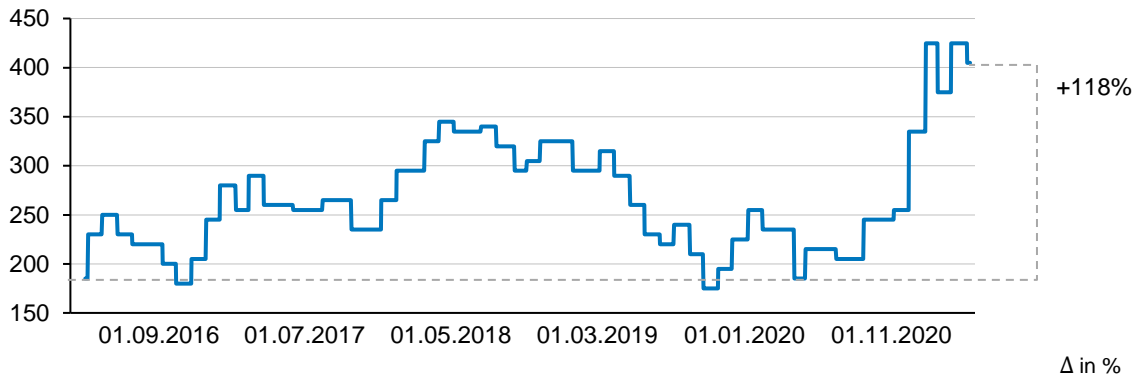


- Turkey
- Egypt
- Pakistan
- India
- Bangladesh
- USA
- Indonesia
- Others

Source: EUWID Recycling



Steel scrap price history (USD/t), April 2016 – April 2021. Valid as of April 13, 2021.

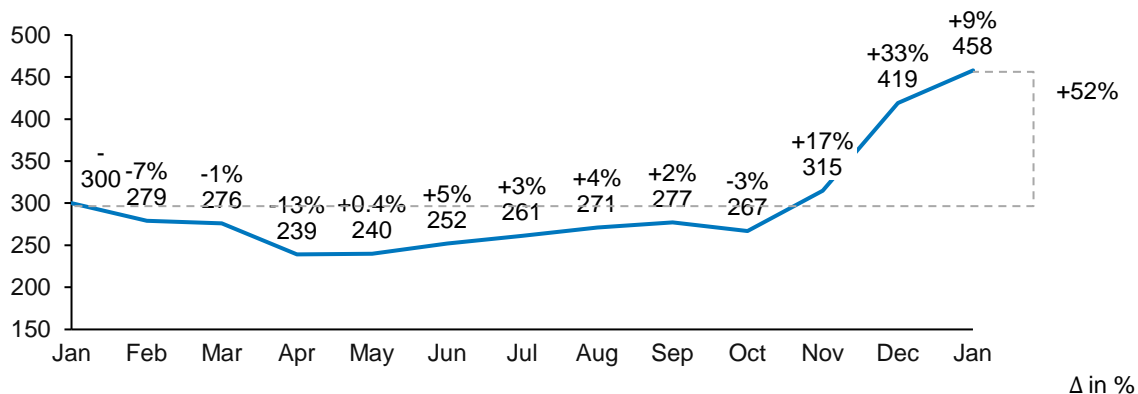


Source: Capital IQ

Overall, steel scrap prices have been fluctuating strongly since 2016. In the Q2 of 2016, steel scrap prices decline with a sharp downturn in November following the presidential elections as well as low oil prices. Prices increased in 2017 and 2018 supporting the recovery of steel demand. A slight downturn can be observed between April 2018 and April 2019 which is caused by falling oil prices and slowed auto and housing industries. Prices sharply declined at the end of 2019 as the market awaits the outcome of U.S.-China trade talks and challenges from the global economy. Prices recovered in the first

quarter of 2020 following a decline as the pandemic hit. A resurgence in demand specifically in the construction, automotive and industrial sectors, as well as an overall steel scrap shortage across both domestic and imported steel products, in the second half of 2020, as well as an overall steel scrap shortage across both domestic and imported steel products, drove a rapid escalation in prices possibly mimicking However, market sources predict a price fall possibly mimicking the 2008 financial/ economic crisis.

CFR prices for shipments of Hms 80/20 Heavy Steel Scrap from the EU to Turkey: price in USD t and month-on-month change in percent, January 2020 – January 2021. Valid as of February 1, 2021



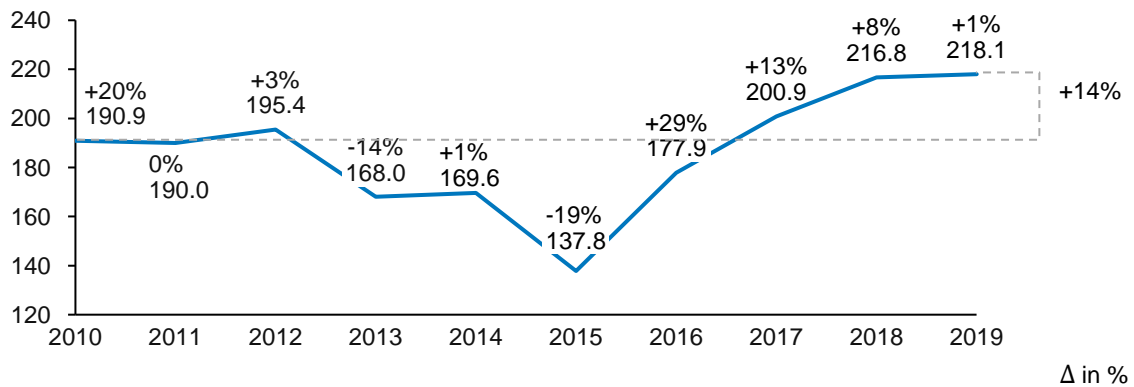
Source: Recycling International

CFR prices started to slightly drop in January 2020 hitting a price low in April as the pandemic shook the market and sparked demand concerns. Between the months of May till October prices have slightly recovered.

Bullish sentiment strengthened the market sharply at the end of 2020 due to positive vaccine news, US elections and expectations of a continuation of fiscal stimulus into early 2021.



**EU Steel Scrap Exports: in Mt and year-on-year change in percent, 2010 - 2019. Valid as of March 23, 2021.**

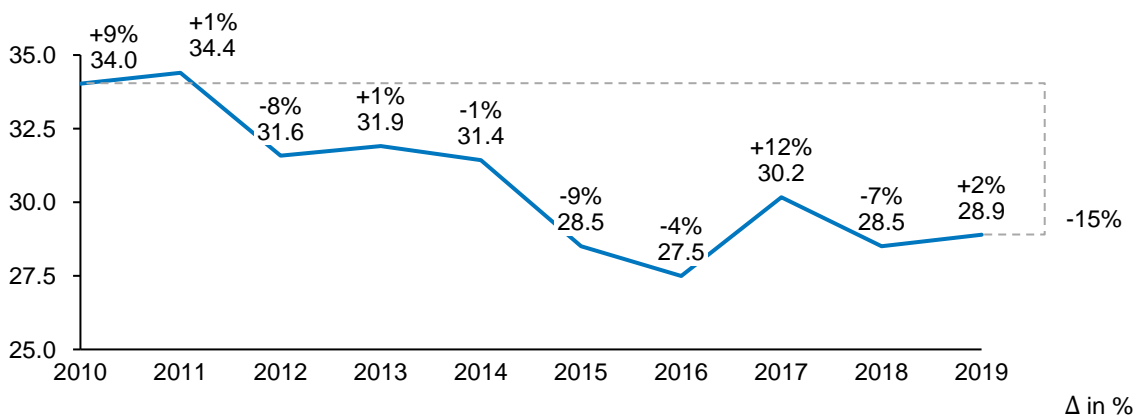


Source: Eurofer

An overall downturn can be observed from 2012 till 2015 with a very sharp decline in 2015. This decline was caused by a global decrease of steel scrap use as well as significant cuts in overseas purchases of most leading steel scrap importers. Since then, steel exports have experienced a sharp rise of 58.2% till 2019 which can be accounted to an increase in steel scrap use of

key import regions as well as Turkey's increase of overseas steel scrap purchases. In addition, exports also rose as EU exporters sought further diversification, away from an increasingly volatile Turkish market by turning to Asia and Africa for export. In 2019 specifically, deliveries to Egypt, Bangladesh and India increased sharply.

**EU steel scrap imports: in Mt and year-on-year change in percent, 2010 - 2019. Valid as of March 23, 2021.**



Source: Eurofer

Overall, steel scrap imports have declined by 15.1%. Comparably to the preceding downturn, imports momentarily spiked in 2017 due to higher demand of steel scrap but immediately declined again by 2018 returning to the 2015 import volume. The continuous decrease in imports is

caused by the increasing high level of steel scrap availability in Europe minimizing the dependency of international imports as well as a three-year import safeguards system that was introduced in mid 2018.

Aluminum can be repeatedly recycled without loss of its properties. The high value of aluminum scrap is a key incentive and major economic

impetus for recycling. Using recycled Aluminum saves around 95% energy.

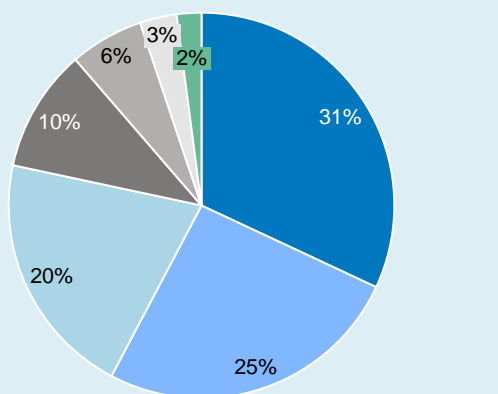
## Economic Importance

- The demand for aluminum is expected to increase by a further 50% by 2050, reaching over 9Mt of scrap demand in the EU
- Due to its endless recyclability, 75% of all aluminum ever produced is still in use today
- >90% of aluminum recovered from construction and transport in 2018
- +/-3.6Mt of EoL aluminum scrap is recycled per year with a forecast estimating an increase of up to 8.9Mt by 2050. Following this recycling scenario, which would ultimately reduce Europe's import dependence, generating EUR 6bn per year for the European economy.

## International Trade

- EU imports dependency on aluminum scrap remains high (50%) in 2019
- In 2019, the EU exported around 1.1Mt of aluminum scrap, representing a 13% increase compared to 2018
- Secondary aluminum production represents globally twice the production of primary aluminum. As a result, aluminum scrap from recycling is a valued commodity, traded worldwide, and the major source of total aluminum production
- Of the total amount of aluminum scrap generated in the EU at EoL (i.e., 4.3Mt of aluminum), about 2.9Mt of aluminum were collected and recycled, resulting in an EoL recycling rate of 69%
- A total of USD 5.62bn export and USD 4.91bn import value was achieved by Europe (2019)

**End-use of aluminum scrap in the EU**

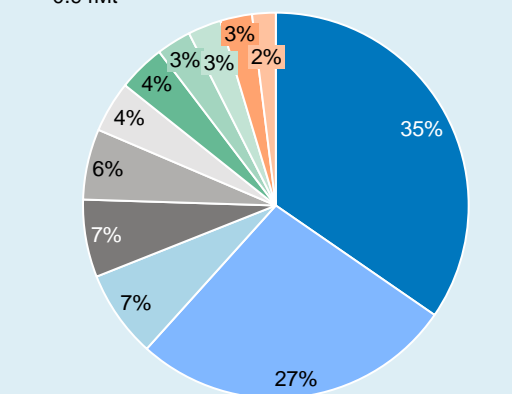


■ Transport    ■ Packaging    ■ Other  
■ Industrial    ■ Electrical engineering  
■ Construction    ■ Consumer durables

Source: European Aluminium

**EU aluminum scrap exports by destination**

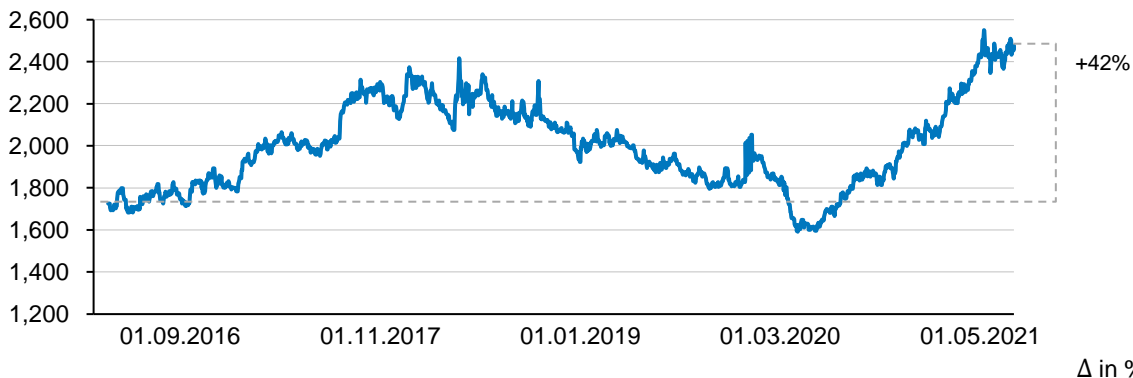
total:  
0.94Mt



■ India    ■ South Korea    ■ Norway  
■ China    ■ Hong Kong    ■ Indonesia  
■ Switzerland    ■ Turkey    ■ Others  
■ Pakistan    ■ US

Source: European Aluminium; EUWID Recycling

**Aluminum – Cash Price History (USD/t), April 2016 – July 2021. Valid as of April 13, 2021**

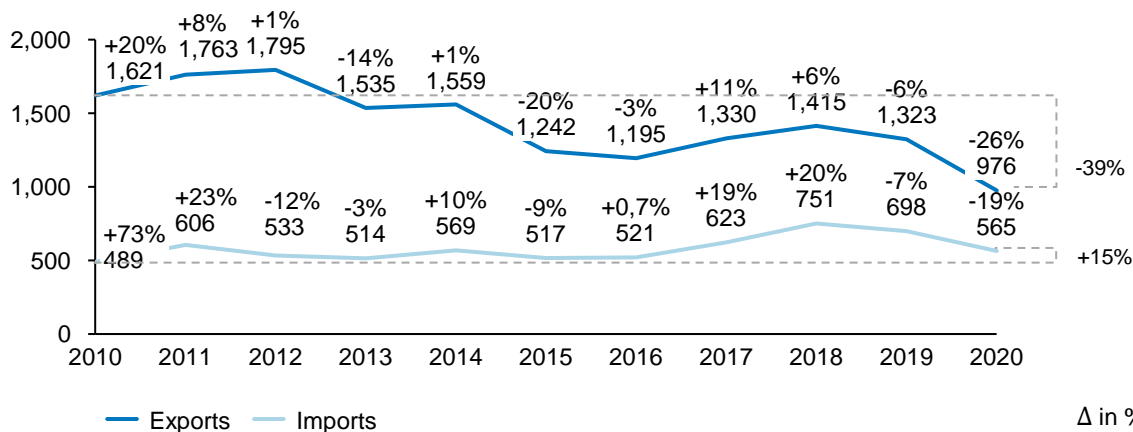


Source: Capital IQ

From April 2016 to July 2018, aluminum prices rose due to forced closures of unapproved plants to curb overcapacity, increase of shortfall warnings and heavy cuts in production. Shortly after, prices declined slowly on the back of threats made by the U.S. that a new set of USD multi-bn worth of tariffs are ready if a deal with China is not agreed. Selling pressure intensified

prompted by rising concerns that the U.S.-China trade war will slow down growth in China and the world. In addition, stocks were falling with LME on-warrant inventories low. Aluminum prices bottomed as the pandemic hit the consuming industries in March 2020. Following this low price level, prices surged again due to continued tightness in supply and starting up demand.

**EU Aluminum scrap import and export: value in USD m and year-on-year change in percent, 2010 – 2020. Valid as of March 23, 2021.**



Source: Trend Economy

A steady decline can be seen in export value with a bigger downturn in 2020. On the other side, a steady rise in import value can be observed until 2018 in which values declined. This was caused by downstream trades across the globe, in tandem with the fall in production, demand and consumption. Import values experienced an even sharper decline in 2020 analogous to export

values. Both the decrease for import and export values in 2020 can be accounted for by supply crunches, slowed production and restrictive measures all relating to the Covid-19 pandemic. Overall, while export values are decreasing, import values are rising. This implies that demand for aluminum scrap is high, and supply is low.

Copper has an infinite recyclable life. Copper ore used in the EU is mainly imported from Chile, Peru, Australia and the USA, though

there is also some production in Europe, including Finland, Poland, Spain and Sweden. Using recycled Copper saves 85% energy.

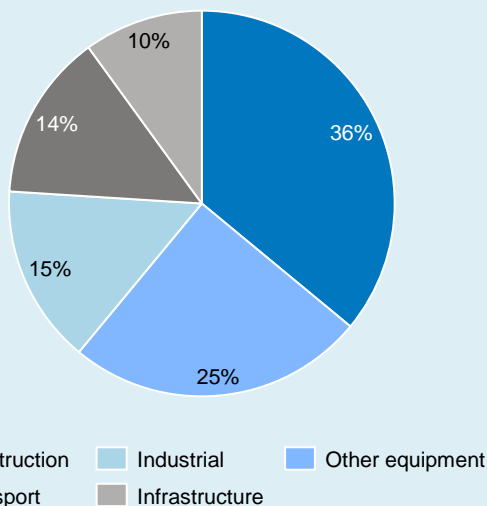
## Economic Importance

- The demand for copper is expected to increase between 275% and 350% by 2050. In 2019, copper scrap demand in the EU reached over 2.7Mt
- Overall, 70% of copper in end-of-life products is recovered. Up to 90% of all copper in European buildings and civil infrastructure is recycled
- Copper has an annual turnover of EUR 45bn turnover p.a.
- 44% of EU copper demand comes from recycled sources (2018); +/- 9Mt of copper is recycled each year (2019)

## International Trade

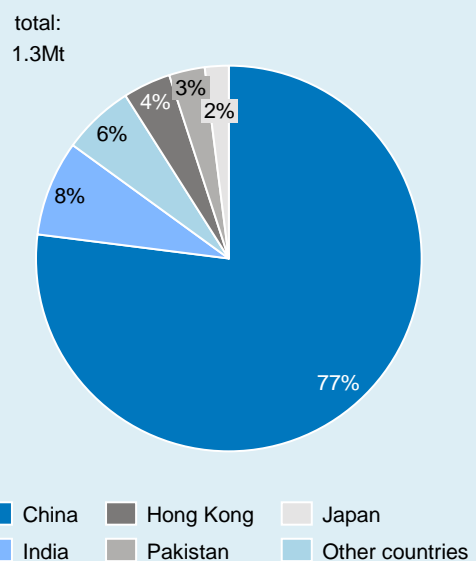
- Of the total amount of copper scrap generated at EoL, 61% were collected and recycled within the EU (2017)
- The EU exported 986Kt of copper scrap with a value of EUR 1.9bn to third world countries and 1.3Mt with an estimated value of EUR 2.5bn to non-EU countries in 2016
- The amount of secondary copper sent to domestic processing is supplemented by imports of copper waste and scrap, however, the EU-28 is a net-exporter of secondary copper forms

**End-use of copper scrap in the EU**



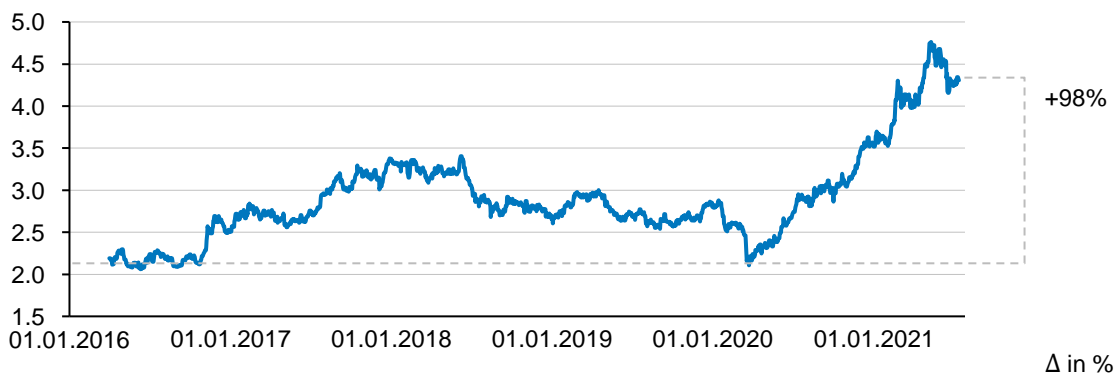
Source: European Copper Institute

**EU copper scrap exports by destination**



Source: EUWID Recycling

Copper – High Grade (COMEX) Price Evolution (USD/lbs), April 2016 – July 2021. Valid as of April 13, 2021

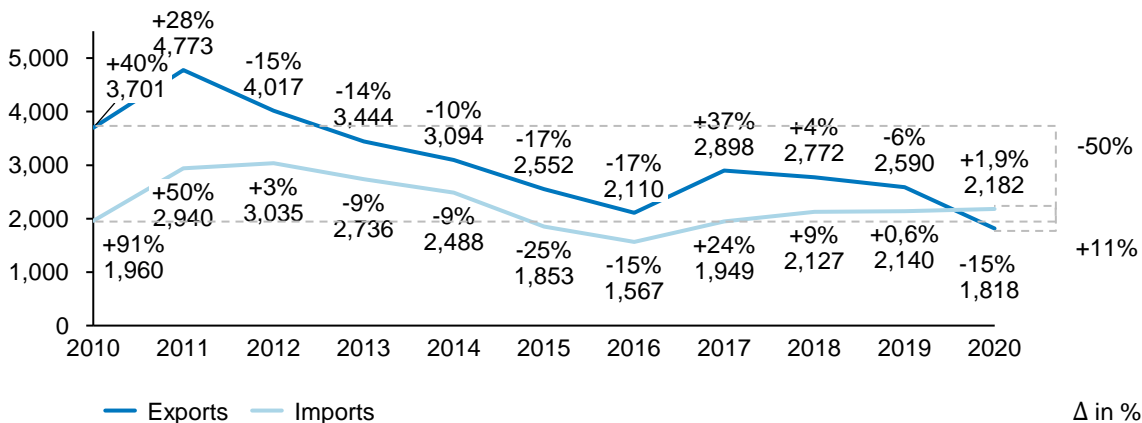


Source: Capital IQ

Copper prices slightly fluctuated in 2016 experiencing a sharp rise in the Q1 of 2017 following strong demand from China. A downturn in prices can be observed in 2018 due to slowed Chinese economy as well as subdued activity in the US and Europe. Copper prices declined slowly in the first half of 2020 due to weaker than

expected demand from China finally bottoming in March for the first time since 2016 as the pandemic hit the market. Since then, copper prices have seen a sharp surge on account of supply crunches, low inventories and a bullish demand narrative.

EU copper scrap import and export: value in USD m and year-on-year change in percent, 2010-2020. Valid as of March 23, 2021



Source: Trend Economy

For both import and export value a spike can be seen in 2011, as copper demand was outstripping supply as industrial output by the emerging markets economies surges ahead of their pre-recession levels. Import value continued to rise till 2012 whereas export values experience a downturn. The increase in imports was caused the drop in world trade growth and economic slowdown. The decline in exports was caused by the decrease of China's copper imports. Both

import and export value continued to slump until 2016 in which both experience a rise. Export and import value rose due to high demand following supply disruptions at three of the world largest mines (Chile, Indonesia and Peru). Import values continued to steadily rise till 2020, contrary to export which declined since 2016. This implies that the demand of copper scrap is high whereas the supply low.



# Acceptance of Secondaries? What Drives Plastic Recycling?

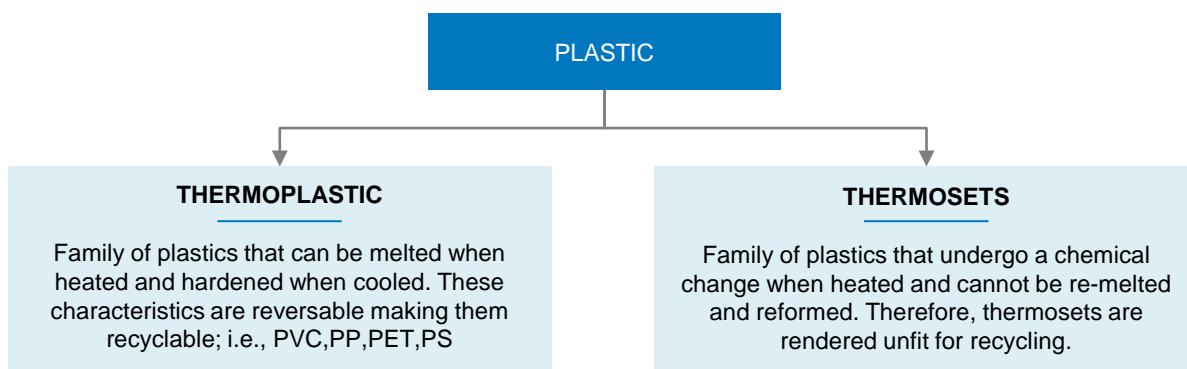
5



Plastic is a highly useful material. It is lightweight, functional, durable, yet plastic pollution is a major global crisis. Common

plastics that are used in household and industrial applications can be divided into the following two main groups: thermoplastics and thermosets.

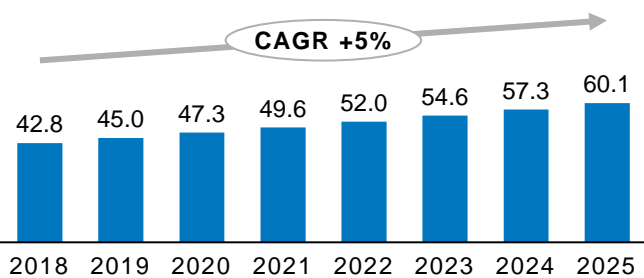
## Thermoplastic vs. Thermoset Plastics



## Examples of Thermoplastic Use

- PVC is used for blister pack/clamshell packaging and window frames
- PP is used for yogurt and margarine containers, bottle caps, ketchup bottles, food packaging, reusable containers and plant pots
- PET is used for beverage bottles, microwavable trays, and clothing fibers
- PS is used for meat/poultry trays, plastic foam cups/plates, CD cases, plastic cutlery, eyeglasses frames, video and CD cases, and egg boxes

## Global plastic recycling industry development



■ Market volume (USDbn)

Source: Grandview Research; Imarc

### Global key Figures 2020

Market size:	USD 47.3bn
Market growth 2020-2025:	CAGR ~ 5 %
Market potential:	high growth

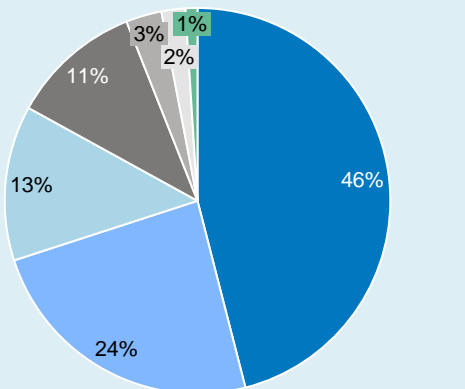
## Economic Importance

- While plastics production from primary sources in Europe has decreased from 2016 to 2018 by 13%, plastics recycling has increased by 4.8%
- In 2019, the European plastic demand reached 50.7Mt
- The European plastics industry, which includes both primary producers as well as converters, had a turnover of more than EUR 350bn in 2019
- In 2018, 9.4Mt of plastic post consumer waste were collected in Europe to be recycled (inside and outside the EU)
- Close to 5Mt of plastic recyclates were produced in European recycling facilities. From the 5Mt of plastic recyclates, 80% re-entered the European economy

## International Trade

- From the 9.4Mt collected in Europe to be recycled in 2018, 19% were exported and recycled outside Europe
- Plastic waste exports to countries outside of Europe have decreased by 39% from 2016 to 2018
- In early 2019, Europe exported around 150Kt of plastic waste per month. This figure was about twice as high as in 2015 and 2016 when exports went to China and Hong Kong primarily. After China's ban in 2018, the volumes of plastic waste exported to China and Hong Kong were 96% and 73% lower than in 2015
- China's ban on importing plastic waste from 2018 has led to a sharp fall in EU export prices for plastic waste. The price had fallen to 246 EUR/t from 324 EUR/t, almost equaling the bottom level seen in 2009 (240 EUR/t) at the height of the economic crisis

End-use of plastic in the EU

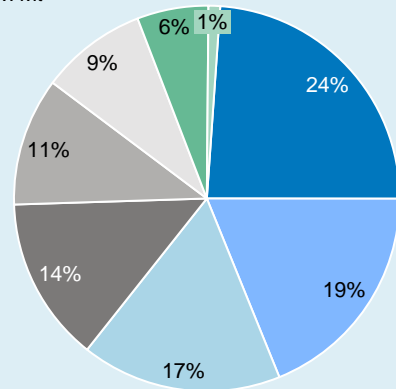


■ Construction    ■ Automotive    ■ Others  
■ Packaging    ■ Electric/ Electronic  
■ Agriculture    ■ Houseware

Source: Plastics Europe

EU plastic waste exports by destination

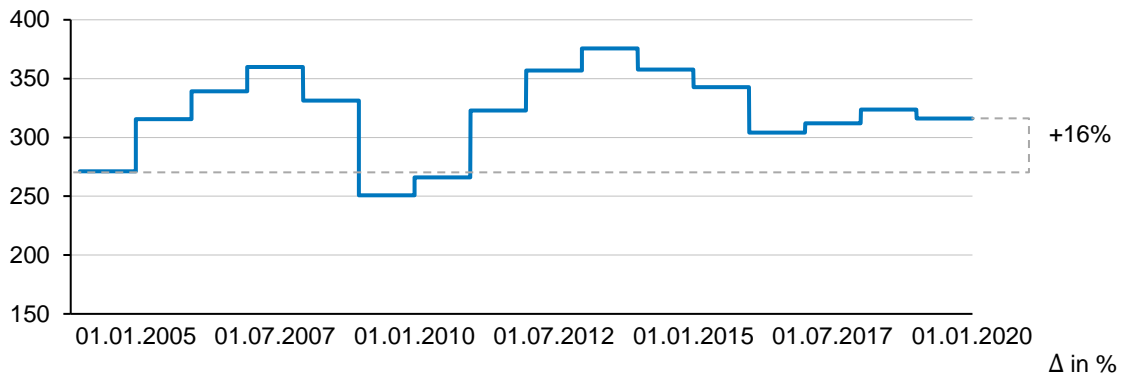
total:  
1.7Mt



■ China    ■ Malaysia    ■ Other Asia  
■ Hong Kong    ■ Turkey    ■ Others  
■ India    ■ United Kingdom

Source: Eurostat

Price indicator<sup>1</sup> of plastic waste by trade flows, EU-27, 2005-2020 (EUR/t). Valid as of 29 March, 2021.



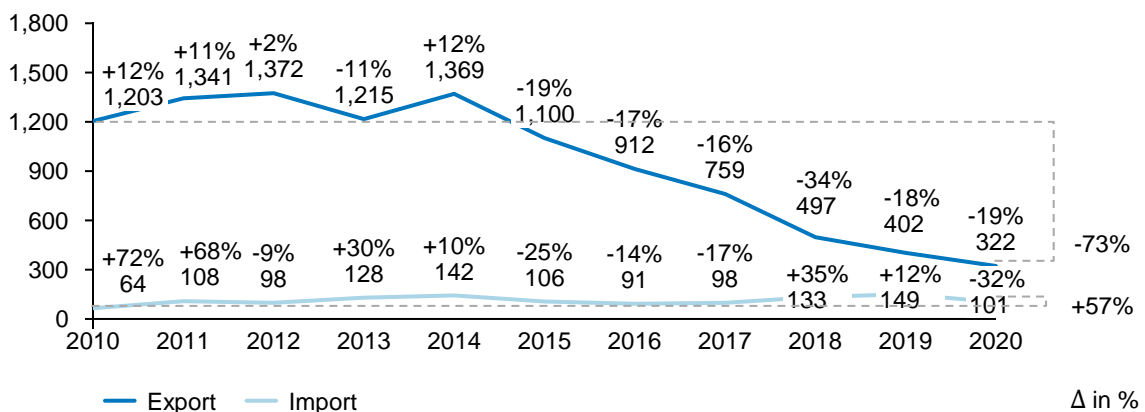
<sup>1</sup>The price indicator sums up all value (in EUR) and volume (in t) of all relevant international trade in goods codes. Value divided by volume gives the specific price indicator (in EUR/t)

Source: Eurostat

Overall plastic prices have fluctuated slightly between 2004 – 2020 however have remained relatively stable with the exception of 2009 – 2010 as prices plummeted in connection to the international financial/economic crisis. After that prices slowly recover only to decline again

in 2018 due to China's announcement of impending import ban. Monthly prices continued to fluctuate over the years. Plastic waste prices sharply declined when the pandemic hit the market as prices dropped by around 17%.

EU plastic waste import and export: value in USD m and year-on-year change in percent, 2010 – 2020. Valid as of 23 March, 2021.



Source: Trendeconomy

On the other hand, export value remained somewhat constant until 2015 after that export values plunged between 2015 – 2020 due to the increase of incineration and landfilling as global demand declined as well as the lack capacities for recycling and reuse. In addition, import restrictions in other countries decreased the export value as well as challenges relating the Covid-19 pandemic.

Overall plastic waste import value remained stable over the years with the biggest year-on-year percent increase between 2010-2011 which can be linked to the financial/economic crisis. Import value began to rise in 2013 following a price increase of plastic waste. until 2016 when prices dropped. Import value spiked again in 2018 as prices and demand simultaneously rose.



# Saturation ahead? What drives Paper Recycling?

6

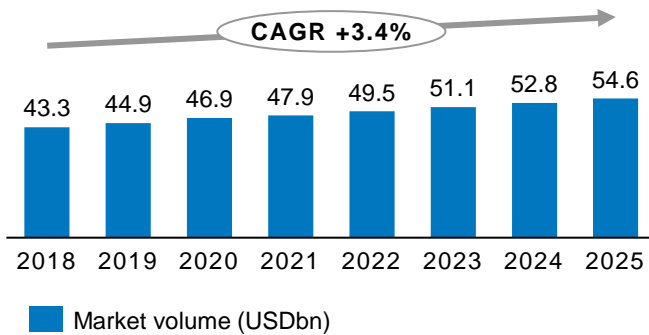




Paper is an important and ubiquitous material, used daily for many purposes worldwide. The global production of paper and cardboard stood at 419.7Mt in 2018. More than half of that production was attributable to packaging paper, one third to graphic paper. The world's three

largest paper producing countries are China, USA, and Japan. Since paper can be classified as a renewable resource, recovery is crucial within the paper industry. Paper, among many materials, has one of the highest recycling rates. Recycling of paper saves up to 40% of energy.

## Global paper recycling industry development

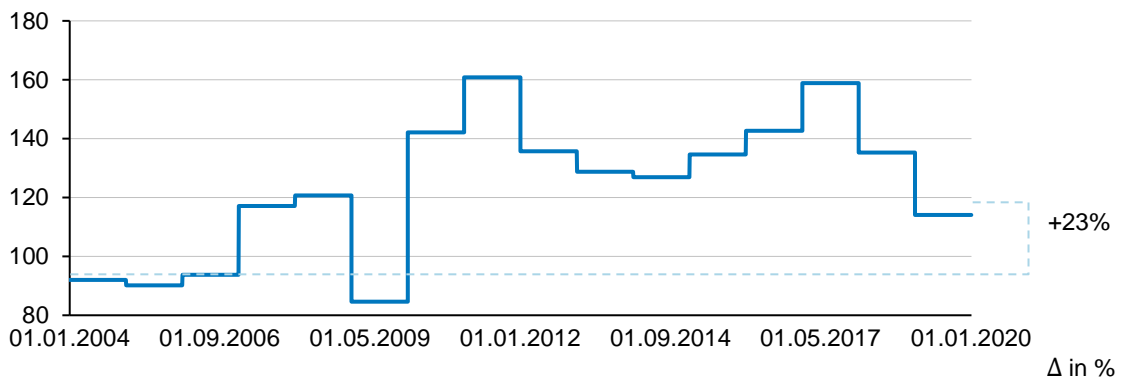


Source: Statista

### Global key figures 2020

Market size:	USD 46.4bn
Market growth 2020-2025:	CAGR ~ 3.4 %
Market potential:	medium growth

## Price indicator<sup>1</sup> of paper waste by trade flows, EU-27, 2004-2020 (EUR/t). Valid as of March 29, 2021.



<sup>1</sup>The price indicator sums up all value (in EUR) and volume (in t) of all relevant international trade in goods codes. Value divided by volume gives the specific price indicator (in EUR/t)

Source: Eurostat

Wastepaper prices stabilized between 2004-2006 experiencing an increase in 2007 and 2008 due to China's growing wastepaper and pulp industry. Prices significantly dropped in 2009 during the financial/economic prices, rebounding in 2010 before tailing of the next few years. Prices increased from 2015 due to higher demand and peak in 2017 following China's announcement of their import ban as paper

producers in China announced price rises catapulted the demand of wastepaper ultimately leading to a price rise of the secondary material. After 2018 prices fell due to China's import ban considering the absence of end-markets for about 8Mt of recovered paper. Since then, prices continued to slump with a massive downturn in 2020 triggered by the pandemic.

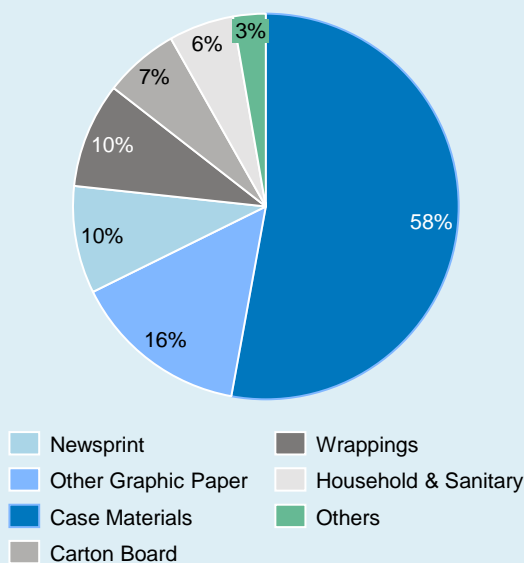
## Economic Importance

- In 2019, the European paper demand reached 82.5Mt. The collection of paper for recycling has increased by 0.8% compared to 2016 reaching 59.6Mt
- The European paper recycling rate has slightly increased from 71.7% in 2018 to 72.0% in 2019
- Despite the rising trend, Europe is reaching maximum potential, as about 22% of paper consumption cannot be collected or recycled
- In 2019, the European pulp and paper industry generated a total revenue of EUR 90bn
- As of 2018, the European paper industry accounted for about one-fifth of the total global pulp and paper production

## International Trade

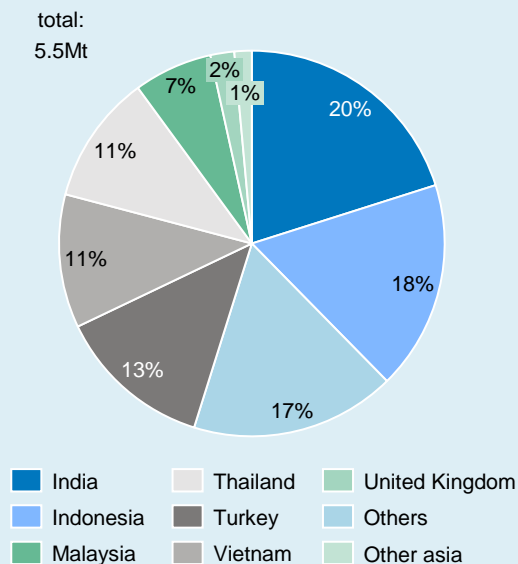
- The biggest exporter of paper for recycling is Asia with a total share of 81.4% of all exports
- The confederation of European paper industries (Cepi) imported around 2Mt of paper for recycling. The largest share of imports originate from Europe (excluding Cepi countries)
- Recent trade restrictions measures announced by China and Indonesia have negatively impacted the European paper recycling sector. The absence of these end-markets for recovered paper (8Mt between 2017-2019) has resulted in a sharp decline of recovered paper prices.
- The European Recycling Industries Confederation (EuRIC) states that market price was 300% lower in June 2019 compared to June 2017

**End-use of wastepaper in the EU**



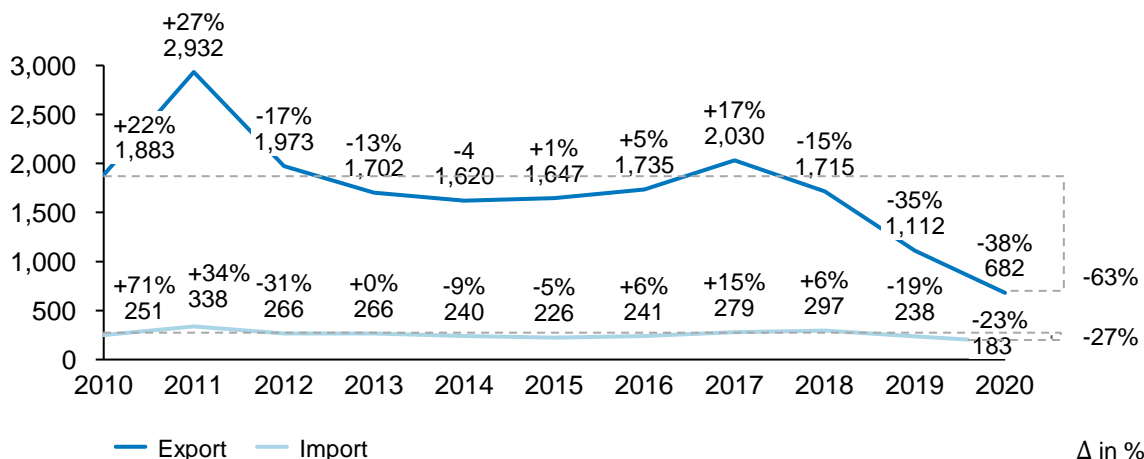
Source: Cepi

**EU paper waste exports by destination**



Source: Eurostat

**EU paper waste import and export: value in USD m and year-on-year change in percent, 2010 – 2020.**  
Valid as of March 23, 2021.



Source: Trendeconomy

Overall supply and demand, regarding the production and the manufacture of paper waste, are being met, in the European market, which is reflected in the generally stable import value. On the other side, export value largely experienced a downturn except for a peak in 2011, exports in increased following the economic/financial crisis and increased world trade. The overall decrease

in exports are caused by high demand in the EU. It should be noted that in 2017 the export value is higher due to the sudden peak in the wastepaper price. Additionally, the steep decline in export value from 2018 can be largely amounted to the 7.6% drop of exports to Asia following China's import ban.



# Long-term Profitability: What drives Glass Recycling?

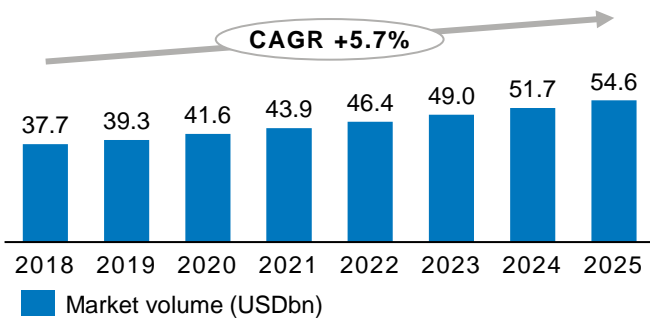
7



Glass is a 100% recyclable material and can be recycled endlessly without loss of quality or quantity. Recycled glass can be substituted for up to 95% of primary raw material. Glass packaging for food and beverages can be recycled, however, not with other types of glass as they have a different manufacturing process. Before glass can be recycled it is necessary to

crush the post-consumer glass into glass cullet. The ready cullet needs to be free of contaminants. Recycled glass is always part of the recipe for glass and with the increase in use reducing costs compared to new production. This makes using recycled glass profitable in the long run.

## Global glass recycling industry development

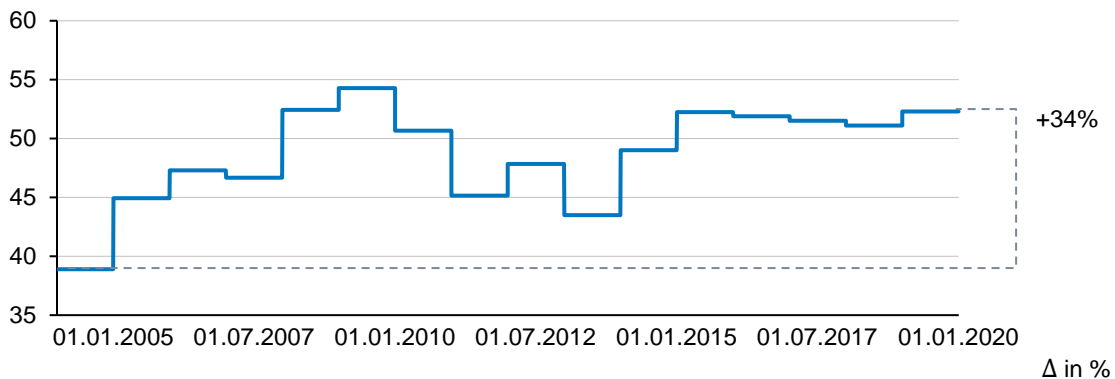


Source: Allied Market Research

### Global key figures 2020<sup>1</sup>

Market size:	USD 41.6bn
Market growth 2020-2025:	CAGR ~ 5.7 % <sup>2</sup>
Market potential:	high growth

### Price indicator<sup>1</sup> of glass waste by trade flows, EU-27, 2005 - 2020 (EUR/t). Valid as of 29 March, 2021.



<sup>1</sup>The price indicator sums up all value (in EUR) and volume (in t) of all relevant international trade in goods codes. Value divided by volume gives the specific price indicator (in EUR/t)

Source: Eurostat

Glass waste prices experienced an increase from 2004 – 2008 implying higher demand for those years. The sharper increase in price between 2008 – 2010 can be linked to the decline of glass production due to the economic/financial recession. Prices fell from 2010 to 2014 due to a

decline in the price for packaging recovery notes (PRN) for glass following a PNR surplus. Since then, the glass waste price rose with the highest monthly peak in 2019 due to a general rise in commodity prices. The overall increase of prices can be linked to higher demand.



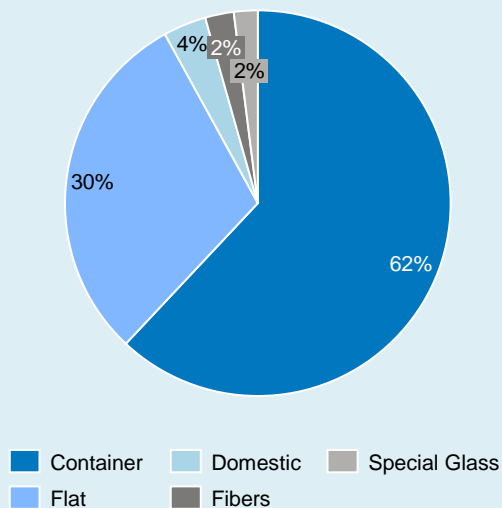
## Economic Importance

- In 2019, 37.2Mt of glass were produced in Europe, increasing at 1.8% compared to 2018, making up for one third of global production
- The global glass recycling market is still dominated by Europe with a share of almost 50 %
- In the leading countries for this sector high growth rates are not expected; however, prospects of strong market growth are particularly evident in North America and in the emerging markets in Asia, South America and Africa
- Around 13Mt of glass bottles and jars were collected in the EU28, giving an average glass collection for recycling rate of 76% in 2018
- The members of the European Federation of Glass Recyclers generated a turnover of EUR 550m in 2018

## International Trade

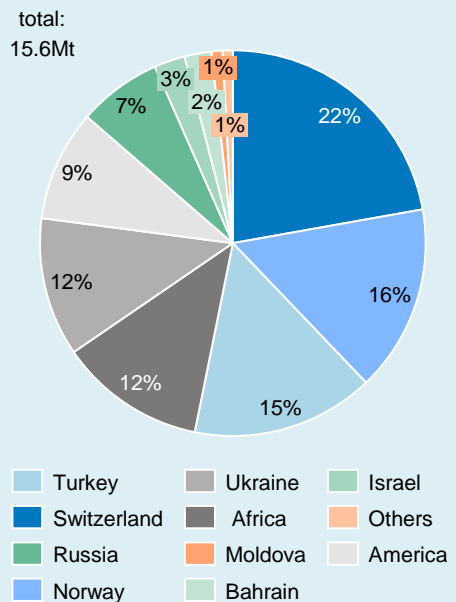
- EU-28 exports remained stable in volume at 3.13Mt (-0.3%) and slightly by in value with EUR 6.9bn (0.7%)
- The EU-28's four major clients for exports in volume are the rest of Europe, followed by Africa and North and South America
- EU-28 imports increased in volume by nearly 4.6Mt (4.1%) and in value by EUR 6.7bn (5.9%)
- The EU exported around 156Kt worth of glass cullet and other waste and scrap of glass in 2019
- The trade volume of glass is low in comparison with the overall recycling volume

**Glass production share by section**



Source: Wits World Bank

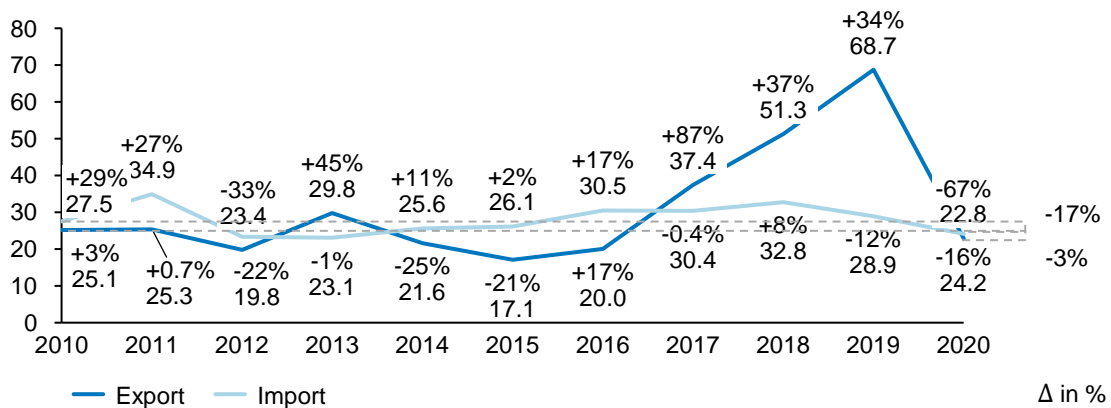
**EU glass cullet exports by destination**



Source: Glass Alliance Europe; Wits World Bank

## GLASS RECYCLING – IMPORT AND EXPORT

EU glass cullet and waste import and export: value in USD m and year-on-year change in percent, 2010 – 2020. Valid as of March 23, 2021.



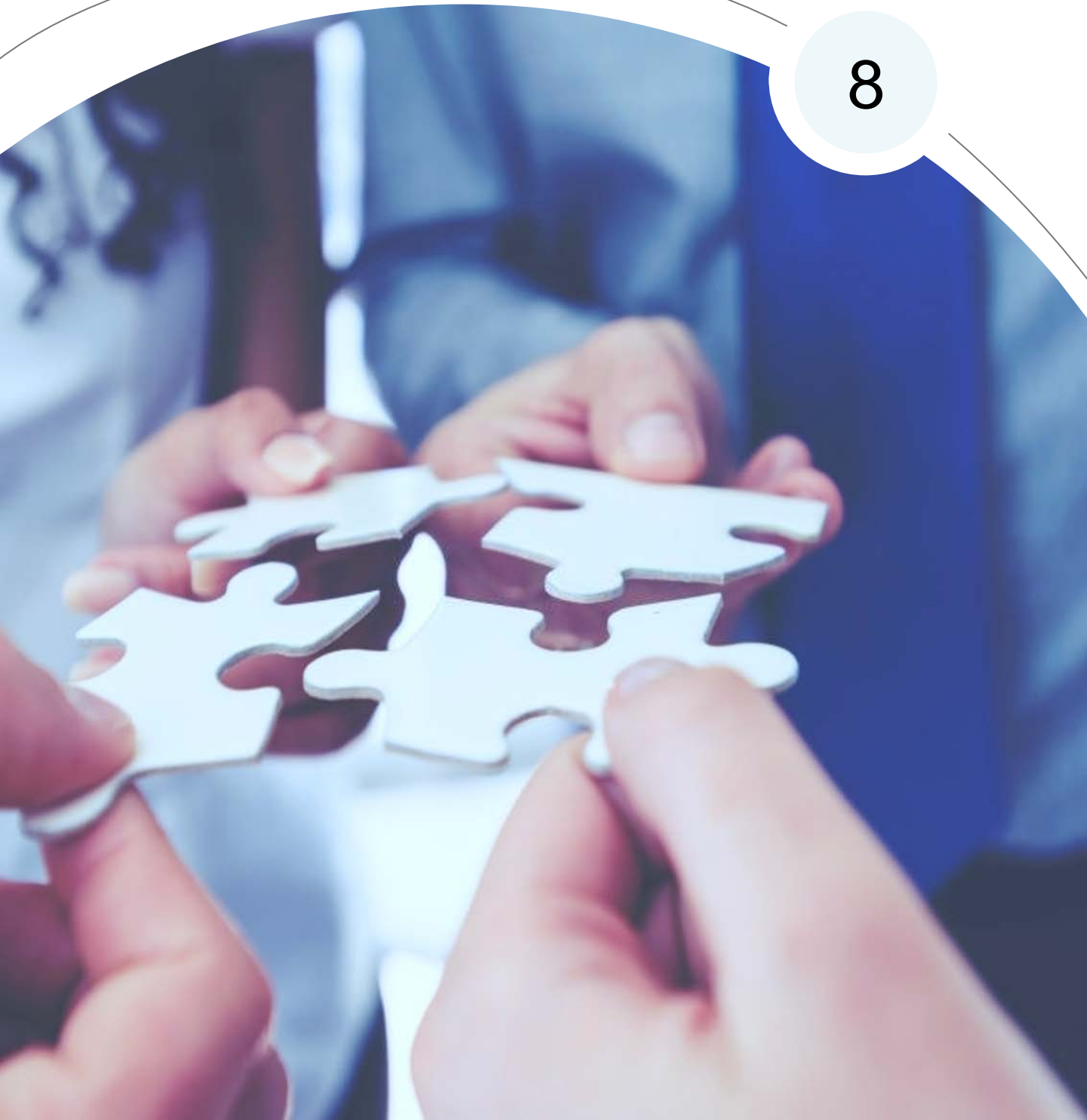
Source: Trendeconomy

Overall exports values have fluctuated over the years whereas import values stayed relatively stable except for an increase in 2010 and 2011 which can be linked to the economic/financial crisis. After that import values trailed off till 2013 only to slightly increase again over the next few years. This is caused by higher demand. A slight decrease in value can be seen from 2019 continuing into 2020 as the rate of circularity for glass material rose increasing glass waste supply in the EU. Export values on the other hand, faced a decrease in 2012 which can be linked to a mellowed-out demand following the demand rush from 2010 as well as price drops. Only to spike by 45% in 2013 as production quantities

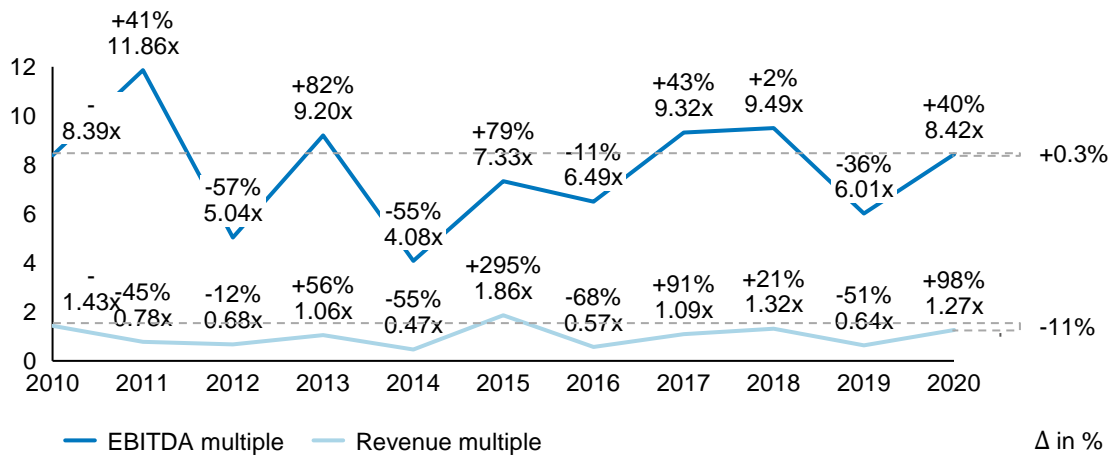
specifically for the construction sector slumped ultimately increasing demand. After that export values decreased from 2014 and bottomed in 2015 as demand and supply weren't met in the EU. This also led to increasing imports. Export values experienced an increase from 2016 with a sharp increase the following years, leading to a historic peak in 2019 due to the increasing glass packaging demand growth therefore leading to higher demand in glass cullet. Export values decrease significantly for 2020 setting back export values by 67% (year-on-year) due to supply crunches, slowed production and restrictive measures all relating to the Covid-19 pandemic.

# Consolidating Tendencies in the Recycling Industry

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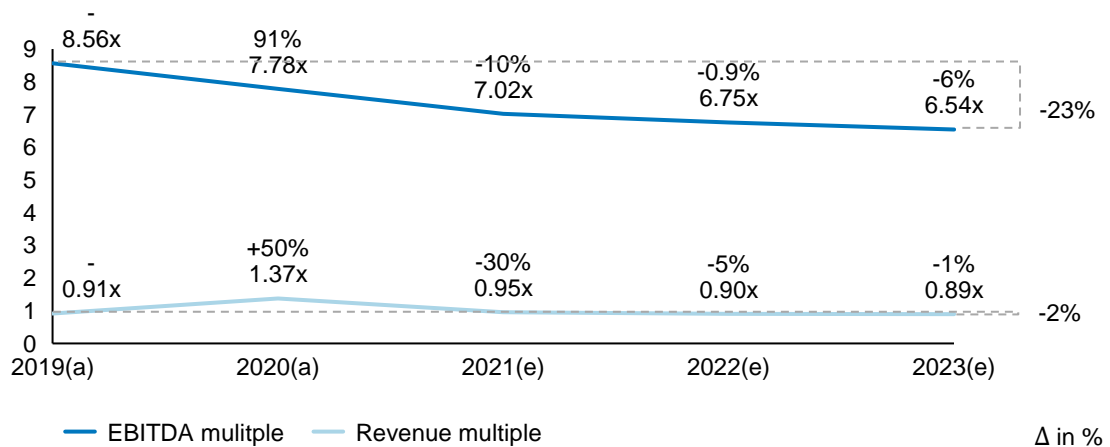
**European recycling industry transaction EBITDA and revenue multiple average and year-on-year change: in percent<sup>1</sup>. Valid as of April 9, 2021**



<sup>1</sup>It should be noted that the data set used to calculate both the EBITDA and transaction multiples was relatively small compared to overall volume of transactions, as the financial information of many transactions were undisclosed. Therefore, outliers can strongly distort the results. Consequently, these transactions multiples can be viewed as an indicator for the European recycling industry.

Source: Merger Market

**European recycling industry trading EBITDA and revenue multiple median and year-on-year change: in percent. Valid as of April 12, 2021**



	2019(a)	2020(a)	2021(e)	2022(e)	2023(e)
EBITDA Margin	9.5%	8.6%	13.4%	14.5%	15.7%

Source: Capital IQ

An overall decrease in the EBITDA multiples can be observed, whereas the EBITDA margin (with the exception of 2020 due to Covid-19) shows continuous growth. Following this observation,

analysis demonstrates that the drop of the EBITDA multiple is offset by a steady rise in the EBITDA margin. Therefore, shareholders could expect higher transaction values.

### ***RPC bpi expands Recycling Capabilities with PLASgran Acquisition***



RPC bpi Recycled Products has given a major boost to UK recycling and sustainability by acquiring the nation's leading recycler of rigid plastics, PLASgran Ltd. marking a major consolidation in the fragmented recycling industry in the UK. A series of strategic investments in recent years has positioned the Wimblington, Cambridgeshire firm as a 'best-in-class' recycler.

The acquisition of PLASgran created the UK's largest plastics recycling group and will help spearhead national efforts meet a surge in demand for recycled plastic packaging while also making RPC bpi the leading UK plastics recycler.

RPC bpi recycled products is the largest polythene film recycler in Europe, with the scope and expertise to recycle over 120Kt of used plastic a year while PLASgran has developed a major presence in the recycling of rigid plastics with expertise in creating its own recycle blends. The recycle nearly 50Kt of rigid plastics per year.

The GBP 35.5m deal was signed in Q3 of 2018 and was expected to serve the UK and Mainland European markets with recycling capabilities now with an aggregate 120ktpa of recycling capacity.

### ***Schwarz Group expands Business: PreZero on the Advance in the Waste Market***



In addition to its successful discounter business, Europe's largest retail group, the Schwarz Group (parent company of Lidl and Kaufland), is also increasingly making inroads into the waste disposal market. With the establishment of PreZero, one of the major recycling and disposal service providers in Germany, the acquisition of Sky Plastics in 2019, an experienced producer of plastic regranulate, and the development of the dual system PreZero Dual, licensing system for packaging, the Schwarz Group has become a major player in the circular economy in Germany. The aim is to create a company-wide closed-loop system that conserves valuable resources and turns waste into recyclable materials

Now PreZero accelerates growth and has signed a joint agreement for the planned acquisition of

SUEZ's waste management and recycling businesses in four European countries (Netherlands, Luxembourg, Germany and Poland) after already acquiring Suez's waste management activities in Sweden at the end of 2020 with an entries value transaction of EUR 357m.

The part up for sale is valued at EUR 1.1bn and excludes the plastics recycling business and the hazardous waste sector. The acquisition was approved by the European Commission in the Q1 2021 and is conditional on the divestment of Suez's light packaging sorting business in the Netherlands Suez expects the sale to be completed before the end of the first half of the year. For PreZero, this is an important step for further company growth.



### ***French Major Merger: Derichebourg finalizes Ecore Acquisition***



The recycling and services group Derichebourg announced shortly before the turn of the year that it was in exclusive negotiations with the shareholders of the scrap and metals recycler Ecore on the complete takeover of the group. Soon after, it was announced that the shareholders of scrap and metals recycler Ecore have agreed to sell the company to French market leader Derichebourg. The buyer announced the signing of the purchase agreement through its subsidiary Derichebourg Environnement early March 2021. The transaction will be completed after competition approvals are granted.

Derichebourg generated EUR 1.6bn in the fiscal year 2019/20 from scrap and metals recycling

activities and environmental services. Ecore reported annual sales of EUR 1.1bn in 2019, the vast majority of which came from its subsidiary GDE, based in Rocquancourt in northern France.

In its 2019/20 annual report, Derichebourg estimates its own market share in France at 16-17% in scrap and scrap metal collection and 23% in reprocessing. In the same report, Ecore is described as the second largest player in the national market with an estimated 15-20% share in scrap and scrap metal processing. This acquisition would make Derichebourg the market dominating recycling company in France with an overwhelming 38-42% market share.

### ***Aurubis AG: Acquisition of Metallo Group to Strengthen their Recycling Portfolio***



The Aurubis Group, a leading global provider and recycler of copper and other non-ferrous metals, signed a share purchase agreement for the acquisition in Q2 2019 for the acquisition of the Belgian-Spanish Metallo Group to continue actively pursuing its recycling strategy, closing the transaction a year later.

Metallo Group is a recycling and refining company that specializes in recovering non-ferrous metals from recycling materials with lower metal contents. The company has around 530 employees at locations in Belgium and Spain. In fiscal year 2018, Metallo generated revenues of approximately EUR 1bn. The share purchase agreement stipulates a purchase price of EUR 380m.

The acquisition of Metallo, with its attractive growth potential, strengthens Aurubis' metal portfolio, especially in the key metals copper, nickel, tin, zinc, and lead. The Metallo Group complements the investment project Future Complex Metallurgy (FCM), with which Aurubis will process a higher volume of complex input materials. The merger optimizes Aurubis' smelter network enabling sustainable growth in the recycling sector. Aurubis gains another company in Belgium and a company in Spain for the first time adding to more than 1Mt of recycling capacity for secondary material.

The name Metallo, an established name on the recycling market, will be retained.

### ***New Plant in Lanseria: Alpla Group Expands Market Presence in South Africa***



In the past 5 years the Austrian based company ALPLA, a leading provider of plastic packaging and recycling worldwide, has expanded its market presence in Africa with acquisitions and partnerships. This included the company's up to date biggest acquisition of the African market leader for PET preforms, PET bottles and closures, Boxmore Packaging, in 2017. The company, headquartered in Samrand, Johannesburg, currently employs around 1,000 members of staff at nine Locations and approximately manufacture 4m Mt of the aforementioned products each year.

With the construction of a new production site in South Africa, the specialist for plastic packaging

is now creating the basis for long-term growth and competitiveness in the sub-Saharan Africa region. Through the acquisition of Boxmore Packaging, who is also a founding member of PETCO (the South African PET industry-funded organization that promotes recycling), Alpla seizes the opportunity of working with a leading team in recycling PET and participating in POLYCO, the newly developed polyolefin (HDPE and PP) equivalent.

Following the consolidation, the production of five existing plants in Harrismith, Denver, Isando, Kempton Park and Park and Samrand will be transferred to the new plant in Lanseria.

# Your Industry Experts

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# Helbling Business Advisors

Helbling Business Advisors has been advising mid-sized companies and corporate divisions in the areas of Business Transformation & Turnaround, M&A & Corporate Finance, and Value Chain Management & Digitalization for over 25 years. We support our clients in strategic and operational challenges with a holistic

approach and deep industry expertise. Our goal is to sustainably improve competitiveness and profitability. As part of the international Helbling Group, we gain our expertise from a unique combination of competencies in Management Consulting & Engineering.

## Our advisory services for the recycling industry:



### Strategy | Restructuring

- Strategic transformation
- Business model innovation
- Optimization of organization and business processes
- Identification, development and planning of measures
- Implementation support and execution
- Option analyses: asset and company valuations (in scenarios)
- Turnaround concepts
- Reorganization reports (IDW S6), Independent Business Reviews (IBR)
- Liquidity planning and control, business planning, financial modelling



### M&A | Corporate Finance

- Buy- and Sell-Side Mandates
- Transferable reorganizations/ share deals
- Business planning, sales documentation, investor search
- Contacting, management presentations, site visits, expert interviews
- Worldwide approach by Corporate Finance International - CFI
- Support during the finalization phase (purchase contract negotiations, signing, closing)
- Financial advisory, due diligence and company valuations
- Capital procurement & financing incl. subsidies



### Operational Excellence

- Process and cost optimization
- Supply chain management
- Optimization of material flow and value stream
- Optimization of processes & IT along the value chain
- Working capital improvement
- Production planning & control
- Lean management
- Support in the development of digitalization strategy and business model up to the SMART Factory
- Operational implementation of measures and management of project management office (PMO)

# Helbling Business Advisors

## Broad Expertise In The Recycling Industry Our Credentials

**Metals; Recycling**

Raw Materials & Raw Materials Processing;  
Waste Management

EUR 190 m turnover

300 employees

Project duration 2 months

---

**Financial & Operational Due Diligence  
of a Logistics Company**

---



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**Metals; Recycling**

Raw Materials & Raw Materials Processing;  
Waste Management

EUR 190 m turnover

300 employees

Project duration 2 months

---

**Financial & Operational  
Due Diligence**

---



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**Metals; Recycling**

Raw Materials & Raw Materials Processing;  
Waste Management

EUR 190 m turnover

300 employees

Project duration 1 month

---

**Refinancing Support**

---



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**Metals; Recycling**

Raw Materials & Raw Materials Processing;  
Waste Management

EUR 2,300 m turnover

5,000 employees

Project duration 1 month

---

**Company Valuation**

---



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**Industrial Services;  
Waste Management**

Services

EUR 30 m turnover

340 employees

Project duration 2 months

---

**Restructuring Concept**

---



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**Metals; Recycling**

Raw Materials & Processing; Waste Management

EUR 1,200 m turnover

1,250 employees

Project duration 13 months

---

**Cost Savings  
due to Process Optimization**

---



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**Plastics Recycling**

Waste Management

EUR 25 m turnover

30 employees

Project duration 6 months

---

**Support M&A (sell-side)**

---



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**Nuclear Power (Disposal)**

Waste Management

CHF 80 m turnover


100 employees

Project duration 10 months

---

**Coaching Strategic Process**

---



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**Metals; Recycling**

Raw Materials & Raw Materials Processing;  
Waste Management

EUR 2,400 m turnover

6,700 employees

Project duration 2 months

---

**Validation Medium-Term Planning;  
Optimization/ Future Concept**

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**Metals; Recycling**

Raw Materials & Raw Materials Processing;  
Waste Management

EUR 2,400 m turnover

6,700 employees

Project duration 30 months

---

**Implementation Support;  
Reporting**

---



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**Metals; Recycling**

Raw Materials & Raw Materials Processing;  
Waste Management

EUR 2,400 m turnover

6,700 employees

Project duration 5 months

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**Restructuring Report;  
Business Plan Validation**

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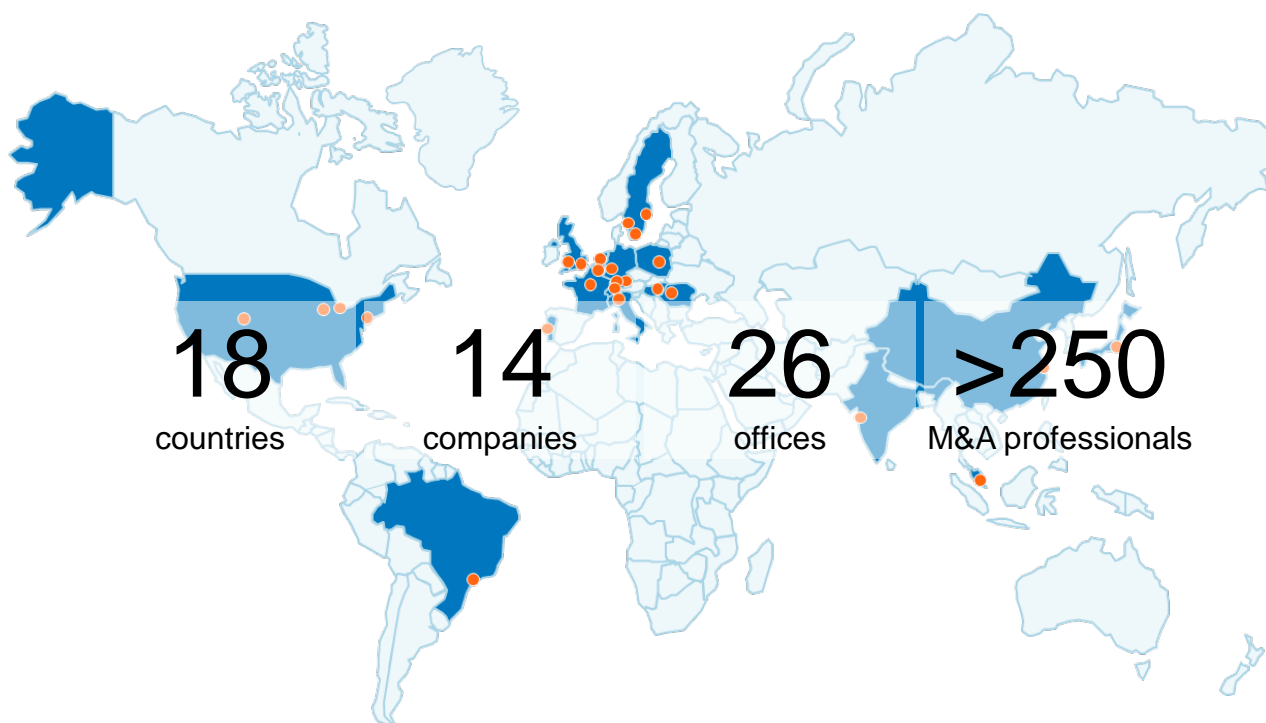


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A Global Network Of Independent M&A Boutiques



**International group of M&A boutiques**

- Global presence with strong European footprint
- Selected geographical core markets worldwide
- Profound expertise in industrial key segments
- Capitalistic link between the partners
- Top 15 for European mid cap M&A processes

**Mid-market focus**

- Transactions up to EUR 1bn
- Typical deal size approx. EUR 20 to 500m
- Privately held businesses
- Public companies
- Private Equity firms/financials investors


**Successful track record**

- Close to 400 collective cross-border M&A transactions since 2000
- Transaction volume of approx. EUR 25bn since 2000





**We Are Part Of Corporate Finance International**

Our International Credentials



has been sold to



cfi sell-side 

A majority stake of

**DEMAP S.R.L.**

has been acquired by



cfi sell-side 



has been acquired by



WORKING FOR THE FUTURE

cfi sell-side  



€ 40 000 000

Medium Term Loan Facilities

cfi capital raising 



has sold a minority interest to



cfi sell-side 

Internal buy-out of Eco-oh! Distribution

out of the




cfi debt 



€ 20 000 000


Syndicated Medium Term Loan Facility

cfi capital raising 



signed a loan agreement with

Banco BPM and Ubi Banca

cfi debt 



has sold a majority stake in



the Portuguese subsidiary of



cfi sell-side  

## Your Contact to our Industry Experts



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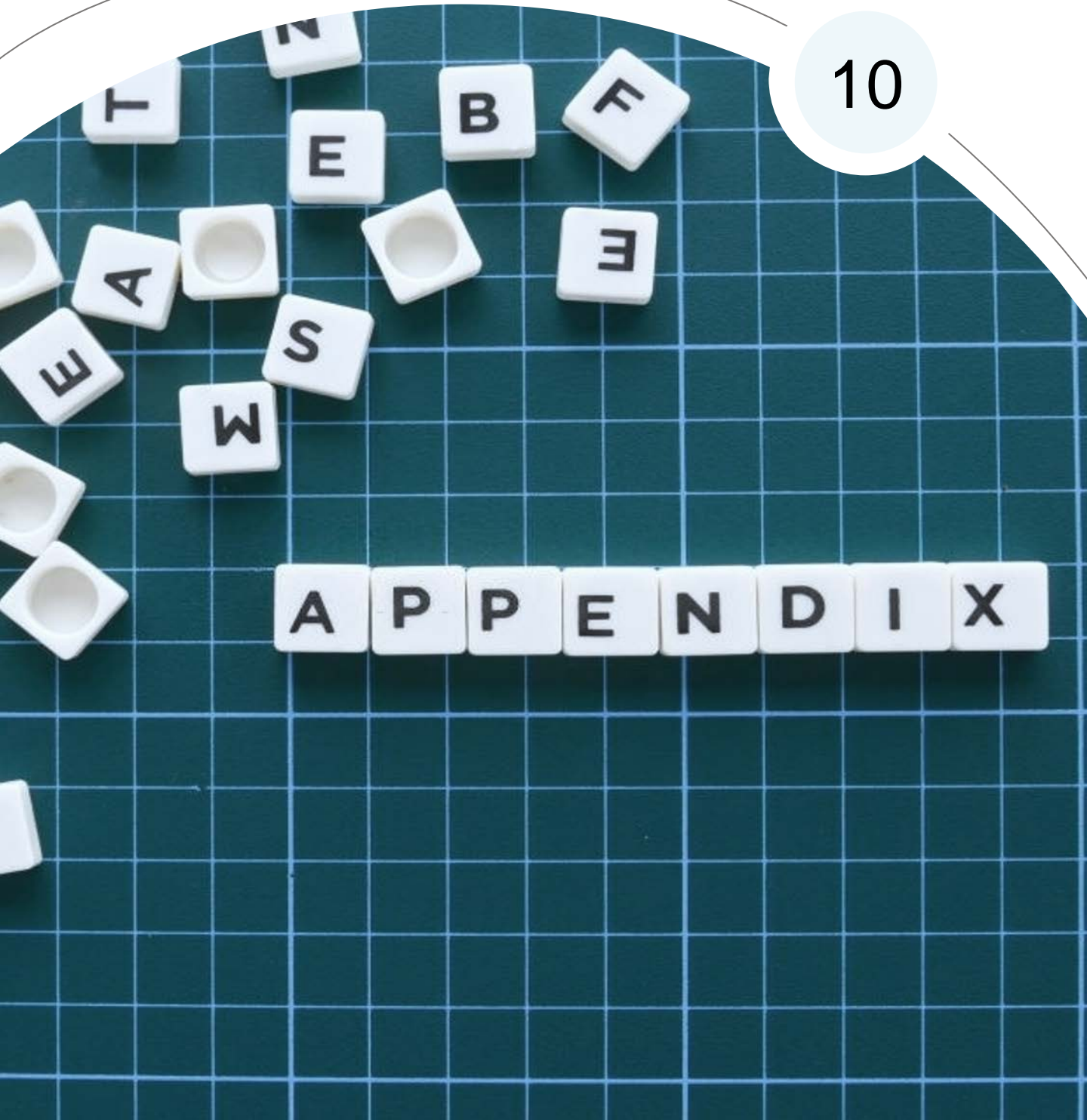
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# Appendix

10





## LIST OF ABBREVIATIONS

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Abbreviation	Explanation
<b>Mt</b>	Megatonne - equivalent to 1 million (10 <sup>6</sup> ) tonnes
<b>Kt</b>	Thousand tonnes
<b>kw</b>	Kilowatts
<b>ktpa</b>	Kilo tonnes per annum
<b>Δ(Upper-case delta)</b>	"change" or "the change in"