RECYCLING RATES FOR METALS

2012

EUROMETAUX
EUROPEAN ASSOCIATION OF METALS

EUROFER
The European Steel Association

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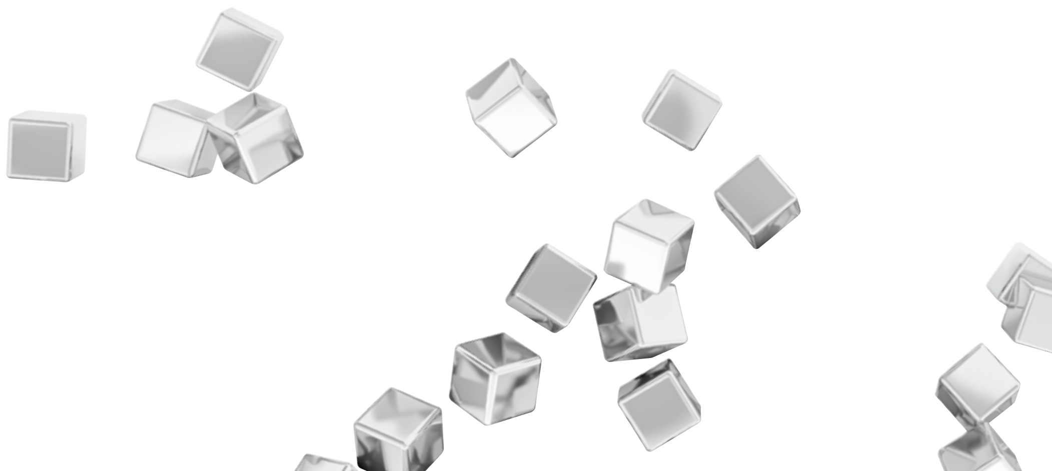
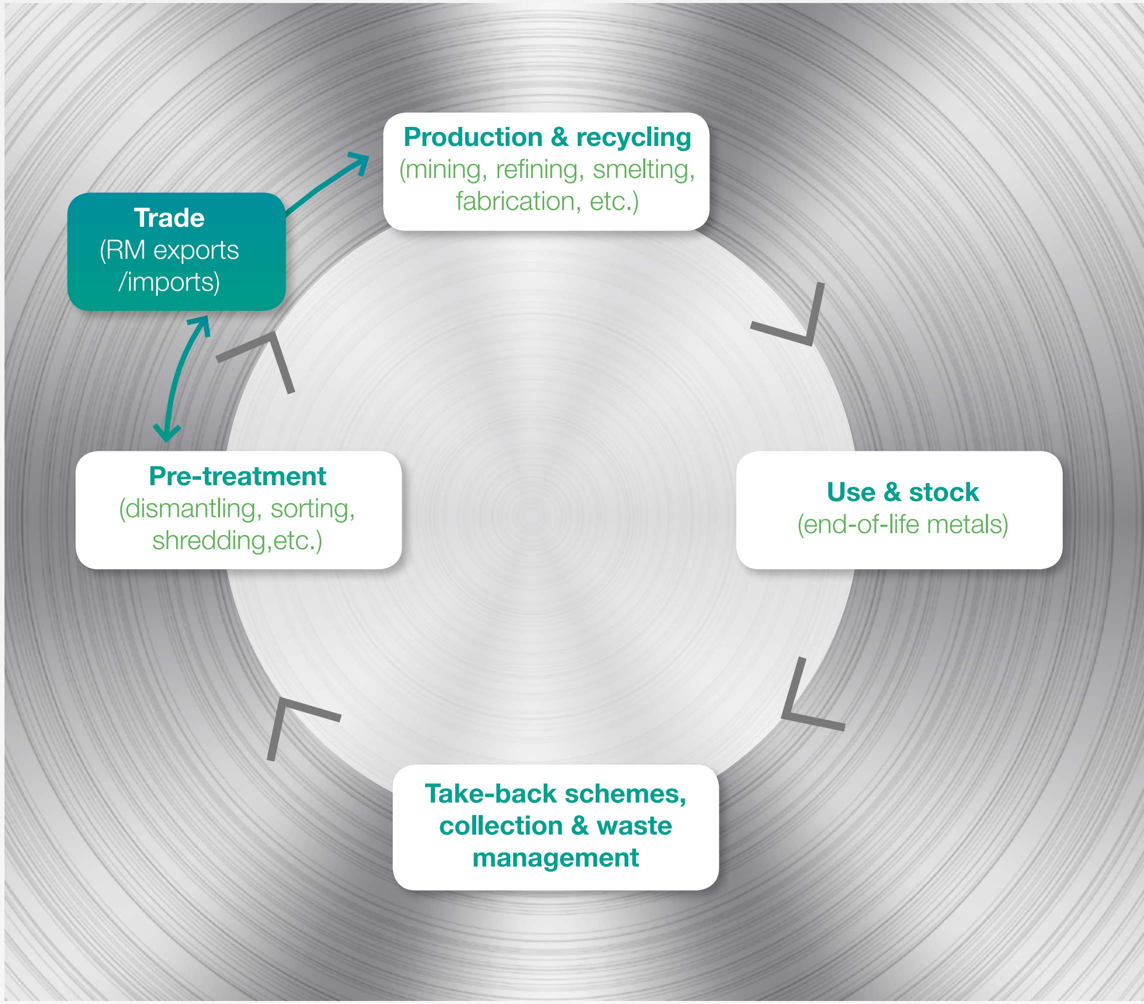


Metals are essential to growth, sustainable development and society

Thanks to their intrinsic properties, metals help to address the sustainability challenges linked to delivering key societal needs such as energy, mobility and communications. During the past decade, strong growth in emerging economies, coupled with an increased use of metals for technological applications, has led to significantly higher demand.

All stakeholders need to work together to ensure that yesterday's metals will be re-used and/or recycled. While this will ensure a progressive move towards a more circular economy, the loop cannot be closed for two reasons. Firstly, demand will continue to increase due to population growth, product innovation and economic development. And secondly, most metal applications stay in use for decades. Consequently, meeting future metals demand will continue to require a combination of primary raw materials, coming from traditional mines, as well as secondary materials (scrap or end-of-life products) recovered from the "urban mine".

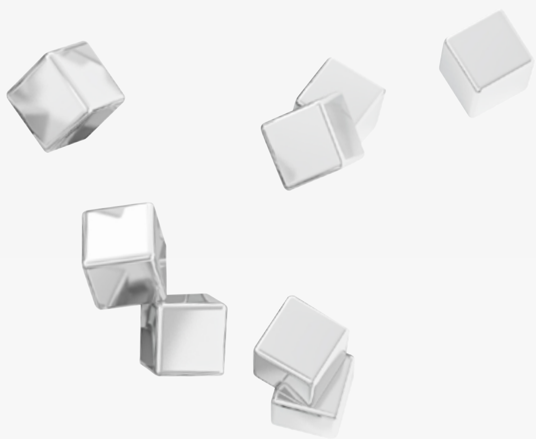


Metals are used, not consumed

Unlike other raw materials, such as fossil fuels, metals are not consumed. Since they do not lose their intrinsic properties during recycling, metals can be used and re-used again and again. Recycling is therefore a highly eco-efficient way of reintroducing valuable materials into the economy, thereby closing the loop. It is a cornerstone in addressing societal issues such as lowering our carbon impact and conserving naturally-occurring raw materials.

Recycling delivers real benefits by:

- Lowering energy consumption by 60-95% compared to primary production;
- Reducing CO_2 emissions and environmental impact on water and air;
- Decreasing the EU's dependency on raw material imports.



How to best measure the recyclability of metals

Valid and harmonised recyclability and recycling measurement approaches are essential to identify improvement potential and to measure the achievement of legislative targets.

In 2006, the International Metal Study Groups, Eurometaux and EUROFER developed recycling indicators that have since been widely used by industry and other stakeholders. The same partners hope that the clarifications provided in this publication will boost the harmonised collection and reporting of data, as well as ensuring that the correct indicators are used in setting future policies.

End-of-Life Recycling Rate (EoL RR)

$$\text{EoL recyling rate} = \frac{\text{EoL metal recycled}}{\text{Metal content in EoL products}}$$

$$\text{EoL RR} = \frac{i}{e}$$

The End-of-Life Recycling Rate (EoL RR) measures the efficiency with which the metal contained in EoL products is collected, pre-treated, and finally recycled. As highlighted by UNEP (Recycling Rates of Metals – A Status Report, May 2011), "the rate is strongly influenced by the least efficient step in the recycling chain, which is typically the initial collection activity".

The EoL RR provides relevant information for metal recyclers, product designers and policy-makers. It is the most relevant rate for metal products as it compares the amount of metals obtained from recycling with the amount theoretically available at the end of the life of products. Since the actions of individual citizens and businesses play a role here, the EoL RR best reflects society's recycling performance, independently from market growth or a product's lifespan.

This indicator is in fact a combination of two sub-indicators, one measuring the efficiency of collection, the other the efficiency of the final processing steps.

End-of-Life Collection Rate (EoL CR)

$$\text{EoL collection rate} = \frac{\text{EoL metal collected}}{\text{Metal content in EoL products}}$$

$$\text{EoL CR} = \frac{g}{e}$$

The End-of-Life Collection Rate (EoL CR) measures the efficiency with which end-of-life metal is collected. It is especially relevant for scrap collectors and policy makers, as it shows the improvement potential.

End-of-Life Processing Rate (EoL PR)

$$\text{EoL processing rate} = \frac{\text{EoL metal recycled}}{\text{EoL metal collected}}$$

$$\text{EoL PR} = \frac{i}{g}$$

The End-of-Life Processing Rate (EoL PR) measures the efficiency of the end-of-life scrap processed in metal production plants and is strongly influenced by the efficiency of pre-treatment (dismantling, sorting, crushing, shredding, compacting, etc.). It is a relevant indicator for the many industry sub-sectors involved, as it demonstrates the improvement potential.

Overall Recycling Efficiency Rate (ORER)

$$\text{Overall RER} = \frac{\text{Secondary metal input (EoL metal + new scrap recycled)}}{\text{Metal content in EoL products + New scrap from production}}$$

$$\text{ORER} = \frac{i + k}{e + j}$$

The Overall Recycling Efficiency Rate (ORER) measures the efficiency of collecting, pre-treating and finally recycling end-of-life (EoL) metal as well as new scrap. It shows the efficiency of the collection and recycling process throughout the life cycle of metals. While it provides a good indication of the total losses at global level, it does not provide information on where the losses occured. EoL metal refers to the recycling rate related to products put on the market, whilst new scrap is scrap generated from first - metal ore - and/or second - metal scrap - processing.

Recycling Input Rate (RIR)

$$RIR = \frac{\text{Secondary metal input (EoL + new scrap recycled)}}{\text{Primary and secondary metal input}}$$

$$RIR = \frac{i+j}{a+i+j}$$

The Recycling Input Rate (RIR) shows the fraction of secondary metal in the total input. It is more of a statistical indicator than a measure of real efficiency. While the high value of metals does result in reasonably efficient collection and recycling, the data suggest that there are opportunities to do better.

Today's availability of scrap, and hence today's RIR, is highly dependent on what was produced in the past and on the lifetime of products - the longer the lifetime, the lower the rate. This rate for materials is equivalent to the recycled content rate frequently applied to products.

Product vs. sector perspective

While the above rates can be estimated from a sector (e.g. metals) perspective, they can also be used to assess the recycling performance of a specific metal product or product group. *Table 1* highlights the relevance of the above five rates from both a product and sector perspective.

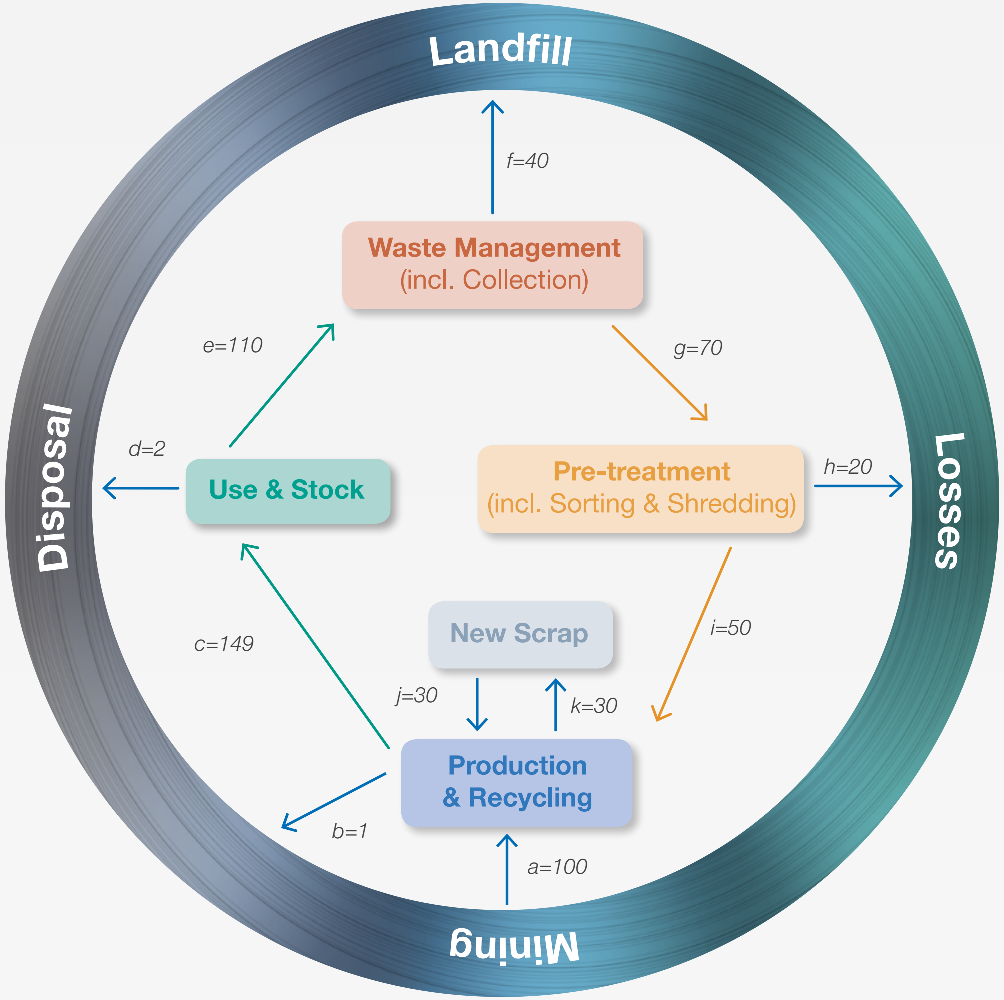
The EoL RR for a specific product can differ significantly from the ORER at sector (metal) level. As an example, long lifespan products can have a much higher EoL RR than the sector's ORER value, because they contribute a limited amount to the metal recycled today. The last two indicators, which depend on the structure of the individual metal supply chain, are not relevant in determining the recycling performance of individual metal products.

Rate	Product-specific	Sector level
EoL Recycling Rate	Yes	Yes
EoL Collection Rate	Yes	Yes
EoL Processing Rate	Yes	Yes
Overall Recycling Efficiency Rate	No	Yes
Recycling Input Rate	No	Yes

Table 1

Example from a sector perspective:

Yale University has developed a set of indicators that are aligned / consistent with the above. It has also developed a graphic representation that provides a better understanding of the various flows. The chart opposite, containing fictitious data, shows this simplified “clock” approach.



Indicators

EoL RR = i / e = 45%
EoL CR = g / e = 64%
EoL PR = i / g = 71%
RIR = (i+k) / (a+i+k) = 44%
ORER = (i+k) / (e+j) = 57%

Legend (kt metal)

a= primary metal input
b = losses (e.g. tailings, slags)
c = metal produced
d = losses (e.g. disposal, in-use dissipation)
e = metal content in EoL products
f = losses (e.g. incineration, landfill)
g = EoL metal collected
h = losses (e.g. residues)
i = EoL metal recycled
j = new scrap from production
k = new scrap recycled

©Yale University – “Reck, B. K., D. B. Müller, K. Rostkowski, and T. E. Graedel. 2008. Anthropogenic nickel cycle: Insights into use, trade, and recycling. Environmental Science & Technology 42(9): 3394-3400.

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European Association of Metals

EUROMETAUX, the European Association of Non-Ferrous Metals, constitutes the interface between the European non-ferrous metals industry and the European authorities and international or intergovernmental bodies. It is committed to establishing dialogue with the latter in order to ensure early consultation in all fields of policy and legislation that may affect industry and to asserting the sector's views and positions in this respect. It asserts the contribution of the European industry and its products to sustainable development, as well as this industry's views and positions, whenever the opportunity to do so arises across all sectors of society. In doing so, EUROMETAUX is the industry's voice on all regulatory matters.

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EUROFER
The European Steel Association

Steel is one of the most attractive and sustainable materials in the world. It is thoroughly recyclable and contributes significantly to the conservation of fundamental resources for future generations. EUROFER, the European Steel Association, founded in 1976 and located in Brussels, represents 100 per cent of steel production in the European Union. Members are steel companies and national steel federations throughout the EU. The major steel companies and national steel federations in Switzerland and Turkey are associate members. The European steel industry is a world leader in its sector with a turnover of EUR 170 billion and direct employment of 360 thousand highly skilled people.

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