EuRIC's position on free trade of recycled metals

26 October 2021

Importance of metal recycling to achieve a circular economy

Metals are a central element to achieve the targets set by the new Circular Economy Action Plan and the EU Green Deal - both released in 2020, as they are endlessly recyclable, and metals coming from recycling do not face downcycling or quality related issues. Their continuous introduction into new lifecycles help to secure Europe's access to metals which is considered to be a key building block for a competitive and sustainable EU economy (**Figure 1**). In other words, metals can be qualified as a permanently available resource.

Besides their ability to be recycled over and over again, the recycling of metal waste from a variety of end-of-life products has also demonstrated that it significantly contributes to the reduction of greenhouse gases released into the atmosphere as recycling is far less energy intensive than primary production. For example, compared to primary production, steel, aluminium or copper recycling saves respectively 58%, 92% and 65% of CO_2 emissions while at the same time reducing the burden that overexploitation puts on our natural world. With regard to energy savings, it is widely known that recycling saves energy by reducing or eliminating the need to make materials from scratch. According to eia (2021), '*using recycled aluminium cans to make new aluminium cans uses 95% less energy than using bauxite ore, the raw material aluminium is made from*'. Market prices, however, don't internalise these environmental benefits, and instruments such as EU ETS have failed diverting investments from energy-intensive industrial processes using mostly imported extracted raw materials to circular and climate-efficient industrial processes using raw materials from recycling (RMR) as feedstock.

Incentives based on ambitious carbon pricing and rewarding the use of recycled metal scrap as a substitute to metal ores and concentrates are absolutely essential to achieve the targets set by the Paris Climate Agreement and the European Union 2030 Climate Target Plan to cut GHG by at least 55% by 2030 to make Europe climate neutral by 2050.

Figure 1. This flowchart shows how raw materials from recycling are crucial in fully closing the value chain of metals (EuRIC, 2021).

Moving towards circular value chains is of utmost importance also because mining conditions are expected to become more difficult in the years to come due to problems related to more complexity, greater depths and lower ore grades, among others (Wellmer & Hagelüken, 2015).

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EU recycling industry at the centre of the circular economy

Scrap plays a key role in reducing industry emissions and resource consumption. As it has been already highlighted above, recycling of metals reduces significantly the amount of CO_2 released into the atmosphere, if compared of course to primary production. Besides the obvious environmental benefits, production of high-quality metal scrap can make a region independent in terms of imports while at the same time help that region create its own deposits of strategically important resources. **However, as the demand of metal scrap by the industry is not equivalent with the quantity of high-quality RMR produced, free trade remains essential to balance supply and demand so as to thrive in today's competitive market and to close loops where primary raw materials would have been used instead. Unhampered access to international markets plays in that respect a vital role for European recycling companies in securing competitive commodity prices which in turns allows them to invest in innovative recovery processes and scale up capacities.**

Below is showed – according to recent data - the amount of steel, copper and aluminium old scrap generated at the end of life and how much was collected and recycled by EU recyclers (Passarini, Ciacci, Nuss, & Manfredi, 2018) (BIR, World Steel Recycling in figures 2015-2019, Steel scrap – a raw material for steelmaking, 11th Edition, 2020):

- Steel: The amount of steel scrap used for steel making in the EU is about 77.8 Mt in 2020. 22.6 Mt are exported to countries outside Europe as supply exceeds demand. The ratio of steel scrap used in steel making in the EU has been around 56% in recent years.
- Copper: Of the total amount of copper scrap generated in the EU at EoL (i.e., 2,625 kt of copper), about 1,575 kt of it (60%) were collected and recycled yearly. Overall, about 1,022 kt Cu (approximately 29%) were lost due to inefficiency at end-of-life.
- Aluminium: Of the total amount of aluminium scrap generated in the EU at EoL (i.e., 4,338 kt of aluminium), about 2,986 kt of it (70%) were collected and recycled annually. Overall, about 1,352 kt Al (30%) were lost due to inefficiency at end-of-life.

Free trade of raw materials from recycling: essential to support Europe's circular and climate neutral agenda

A shift from a linear to a circular economy requires undoubtedly more use of RMR in steel making, alternatively also called recycled content. It is not enough, however, for the industry to just use metal scrap in new products/materials to reach the ambitious but necessary targets set by the EU for 2050. To achieve these targets, manufacturers have to ensure that the share of metals coming from recycling used, during the manufacturing process, is steadily increasing year after year. This seems unlikely to happen if the EU continues importing large quantities of iron ores and concentrates (Annex A)

The average amount of recycled metal scrap used within the EU on a yearly basis, during the period 2016-2020, is for steel around 87.3Mt, for copper around 2.1Mt and for aluminium 2,9Mt. With regard to the amounts of the previously mentioned metals exported outside Europe, these are equivalent to 22.6Mt for

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steel in 2020 (with Turkey, Pakistan, Egypt, India and the USA being the main destinations for steel scrap (**Figure 2**)), 1Mt for copper and 0.9Mt for aluminium (EuRIC, 2021; BIR, 2021).

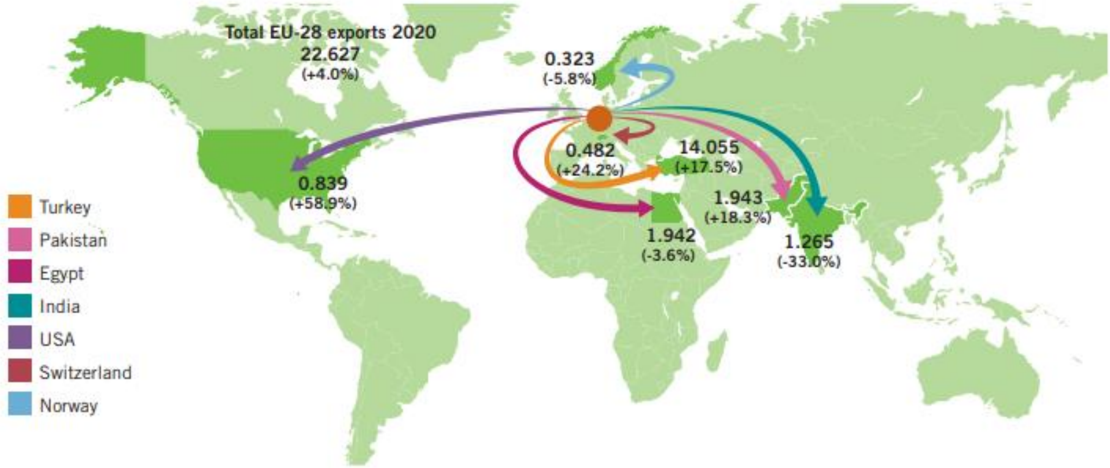

Figure 2. Main flows of EU-28 steel scrap exports 2020 (million tonnes) (BIR, 2021).

The argument on the need of metal scrap exports is not only linked to the amount of scrap that is not used within the EU and therefore has to be exported, but it is also linked to the argument of whether or not we do really want as Europe to achieve a circular economy. **Achieving a circular economy is a global target, and thus to achieve it at a European level there must be collaboration between the EU and other regions of the world. In other words, a global and European circular economy must go hand in hand.**

Furthermore, a fully functional circular economy requires continuous investments in the recycling sector that will allow recycling facilities to acquire the latest – state-of the art – technology which will in turn make possible the recovery of more – in terms of quantity and quality - useful for our society raw materials. This is strongly linked and connected with the price that recyclers receive for the RMR they sell and enable them to be profitable, thus making investments. **For metal recyclers who are competing on commodity markets, international markets enable undistorted and competitive pricing which a captive market will preclude. As a reminder, not only recyclers do not get any incentives for marketing circular and climate neutral materials – contrary to energy-intensive industries who benefit from free allowances under the EU ETS - but they also have to compete on price, quantity and quality with extracted raw materials.**

Shortage of steel scrap in the EU – is that true?

As it is also highlighted in EuRIC Metal Strategy '***the apparent domestic supply of steel scrap accounting for the steel scrap used in Europe as well as imports and exports of steel scrap remains significantly positive which demonstrates that there is no shortage of raw materials coming from recycling, in Europe***' (**Figure 3**) (EuRIC, 2021). In addition, there is no restriction on imports of secondary raw materials into Europe. As a result, potential cyclical imbalances in domestic markets are compensated by international trade.

Last but not least, EU legislation does not yet have requirements for mandatory recycled content in new products. The combination of possible export restrictions for ferrous and non-ferrous scrap (revision of WSR[1]) with the lack of domestic demand creates an unprecedented legal uncertainty for European recycling facilities. Although the first step to include mandatory recycled content has already been made (with the

1 WSR: Waste Shipment Regulation

proposed Regulation on Batteries and Waste Batteries), there is still a long road ahead before this practice becomes the new normal. To increase circular material use – i.e., the proportion of raw materials from recycling used by EU's industry which currently does not exceed 12%[2] – and boost circular and climate-neutral value chains, minimum **recycled content targets should be made mandatory for all sectors using large quantities of steel and other metals** (e.g., construction, automotive, mechanical engineering etc.) (**Figure 4**).

Under any circumstances, free and fair trade will still be crucial to keep prices competitive and avoid possible monopolies, given the oligopolistic structure of manufacturing sector. It is widely known that monopolies – as lone providers - can set any price they choose with catastrophic consequences for the recycling sector mostly composed of SMEs and hence for the EU Circular Economy.

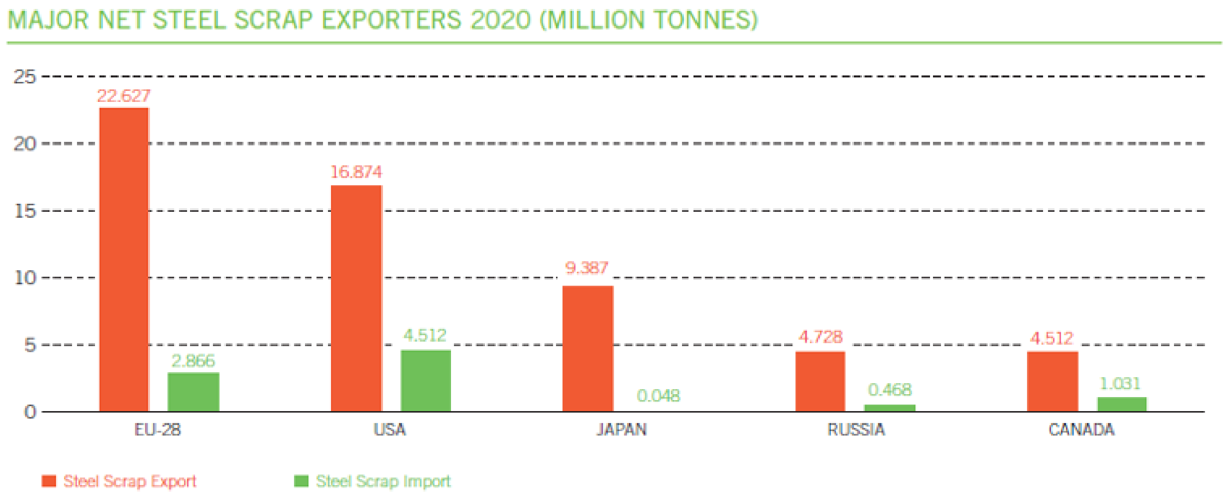

Figure 3. Shows that the EU-28 is a net steel scrap exporter which in turn demonstrates that the region is not facing shortage related issues in terms of steel scrap (surplus of 19,79Mt) (BIR, 2021).

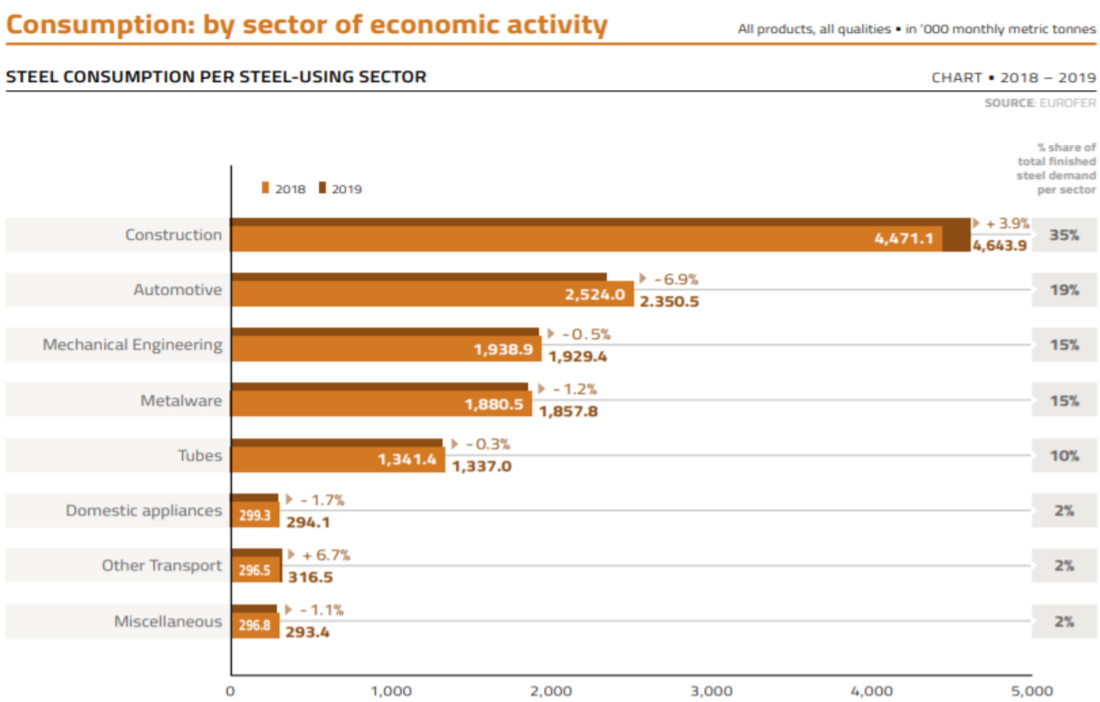

Figure 4. Consumption of steel by sector (EUROFER, 2020).

[2] Circular Material Use Rate, Eurostat.

How to meet the future scrap demand in the EU and still be competitive globally

To produce steel, facilities use one of two processes: the basic oxygen furnace (BOF) or the electric arc furnace (EAF). With the first path - alternatively also known as 'iron ore to steel route', hot metal is mostly produced from iron oxide ores in blast furnaces, and more rarely in smelting reduction plants, and is processed to make crude steel in oxygen converters. Sponge iron produced from iron ore in direct reduction plants is converted to crude steel in electric arc furnaces. With the second path – alternatively also known as the 'scrap-based route', scrap is used as base feedstock and represents around 75% of EAF steel cost (Ruth, 2004; Stahlinstitut-VDEh, 2021). It is known that to meet the increasing demand of steel in the EU – due to population growth and the transition to renewable energy – both processes are needed. However, as BOF has been the prevailing route in many European countries, the amount of steel coming from this route is much greater than the amount coming from the EAF one. Based on data from 2021, crude steel production in EU-28 – in 2020 - amounted to 139.3Mt out of which 79.9Mt were produced via the BOF route and around 59.4Mt via the EAF one (EUROFER, 2021). However, in some EU countries the situation seems to be completely opposite. Some very strong examples are considered to be Italy and Spain where the share of crude steel produced by the electric furnace route is 81.9% and 68.8%, respectively (Worldsteel-association, 2020). Taking into consideration the efforts the EU is making to move towards a circular and climate-neutral economy, it is clear that investments must be directed in increasing EAF steelmaking. This route has a plethora of benefits which can be seen below:

- It is the most circular and climate efficient route to produce steel, better than hydrogen-based steelmaking;
- The furnace charge is generally 100 percent scrap, but it can also melt solidified iron or sponge iron;
- An electric arc furnace is used as the heat source for the refining process;
- The cost of operation is found to be smaller than the cost of the BOF route;
- It can produce almost all kind of steels, from metal for basic products to reinforcing high alloyed special steels;

(EUROFER, 2020; EuRIC, 2021; Werner-Sölken, 2021)

Such investments will therefore, not only allow Europe to become more circular but they will also make possible to meet future scrap demand without depriving recyclers to export metals outside the region.

Consequences from possible export restrictions in the revision of the Waste Shipment Regulation

Recycled metal scrap is for a very long period of time a major commodity priced on metal exchange markets, in particular the LME and traded globally like any other primary material. Availability of RMR metal scrap in Europe is not an issue as it has also been previously mentioned. On the contrary, supply of commodity-grade recycled metal scrap often exceeds demand in Europe. While imports of primary raw materials to the EU generates a negative environmental impact (Annex B) - hampering circular economy, this is not the case for the trade of raw materials from recycling. Exports of high-quality metal scrap for example is considered crucial should the EU wish achieve a Circular Economy. It is difficult, if not impossible to achieve a Circular Economy at the level of a single country and this is why this concept must be conceived at a European and global level.

In addition, the use of RMR instead of primary raw materials avoids emissions along the entire value chain. Therefore, should the revision of the WSR pursue export restrictions, this will undermine the competitiveness of Europe's metal recycling industry by:

- **Creating a captive market for metal scrap from recycling which will trigger a domino effect that will artificially diminish its value**, thus its ability to compete with extracted raw materials, and further weakened the competitiveness of European metal recycling companies. An artificially depreciated prices will in turn disincentivize collection and recycling, thus turning a valuable and sustainable economic activity into a cost that local authorities will ultimately have to bear.

- **Allowing the creation of monopolies which will most likely decrease the value of metal scrap** (like it happens in Ukraine) which, in turn, will affect collection and recycling rates as well as the ability of recycling companies to invest in innovative processes to boost high-quality recycling and scale up capacities, with a real risk of losing this valuable resource that otherwise would have been recycled;

- **Hampering circular value chains at a European and global level which reduce greenhouse gas emissions thanks to recycled materials lower carbon footprint.** It is noteworthy to mention that – as stated by the Green Steel for Europe Consortium (2021), '*decreasing the scrap exports to achieve a circular economy and to mitigate CO_2 emissions in Europe will increase emissions in other parts of the world.* ***Since steel production in many other countries is more CO_2 intensive as in Europe, a decrease of scrap exports may even result overall in an increase of worldwide CO_2 emissions***.' (Draxler, et al., 2021).

- **Leading to the destruction of local jobs** - increasing in that way unemployment, in SMEs and large operators spread across Europe, for which unhampered access to international markets is essential to balance supply and demand and remain competitive. For example, only the German steel recycling industry provides – according to data from 2015 – approximately 37,000 jobs (BDSV, 2016).

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ANNEXES

ANNEX A – Imports of ores and concentrates for the manufacturing of metals in the EU

The European Union despite its increasing availability of high-quality metal scrap coming from recycling – which can easily satisfy the demand within the EU, remains import dependent to meet its minerals and metals needs for the production of metals (e.g., iron, copper, and aluminium (bauxite)). More specifically, according to data from a 2020 study, Europe imports large quantities of copper (Chile and Peru), iron (Brazil) and bauxite (Guinea) ore (European Commission, 2020). In that same study it is stated that the annual average of imports – between the period 2012-2016 - of the aforementioned ores and concentrates amounted to:

- Iron: 102,100 kt per year, consisting of about 75,200 ktonnes (74%) of non-agglomerated iron ore (HS 260111), and 26,900 ktonnes (26%) of agglomerated iron ore (HS 260112). The majority of iron ore originates from Brazil (45% of the total iron ore imports), followed by Ukraine and Canada, with 15% and 14% share respectively of the total iron ore imports to the EU.

- Copper: 766 kt. The EU imported from 24 supplier countries, many of them with very minor tonnages (practically all in form of concentrates). The main countries, from which the European Union imported, were:
  - Chile (27%)
  - Peru (19%)
  - Brazil (14%)
  - Argentina and Canada (each 7%)
  - United States (5%)

- Aluminium (bauxite): 3,360 kt. The EU bauxite imports mainly come from Guinea who exports most of its bauxite to the Union and is thus the EU's main bauxite supplier (representing 62% of the total EU supply) and Sierra Leone, though neither country is a major producer in global terms (Guinea (7%) and Sierra Leone (0.4%)) (European-Commission, 2017) (Schüler, 2017) (Passarini, Ciacci, Nuss, & Manfredi, 2018).

  By taking into consideration that countries such Spain, Ukraine and Ireland were in 2015 responsible for fifty per cent of the total bauxite export from Guinea (approximately 10million tons) it can be deduced that the EU heavily relies on imports for this ore, for the manufacturing of aluminium (Biswas, 2017).

The above presented metal ores and concentrates are some of the core pillars of today's society and as some of the most important engineering and construction materials, they are present in many aspects of our lives (e.g., cars, packaging, building etc.). However, the industry now needs to change to meet Europe's goals for 2050. The EU's recycling industry can help in this journey. Technological advancement and state of the art techniques used by EU recyclers create high quality materials (recycling) which can be used in all applications of our society. **This can be only achieved, however, if manufacturers increase the share of recycled content in the products/materials they manufacture.**

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ANNEX B - Environmental footprint from metal ores imports

Imports of primary raw materials to satisfy metal manufacturing comes with significant environmental impacts, on top of human rights ones when ores are mined in conflict areas.

Waste generation from mining

Mining involves the production of large quantities of waste, in some cases contributing significantly to a nation's total waste output (Matthews et al., 2000). The amount of waste produced depends on the type of mineral extracted, as well as the size and the type of the mine (surface or underground):

- Gold and silver are among the most wasteful metals, with more than 99 percent of ore extracted ending up as waste.

- Iron mining is 'less' wasteful, with approximately 60 percent of the ore extracted processed as waste. It should be noted that mines produce large amounts of waste because the ore is only a small fraction of the total volume of the mined material. For example, in the Cu mining industry, the ratio of material handled to units of marketable metal is 420:1 with a typical proportion of metal in ore 0.6%. The waste generally produced during the mining process include:
    - mine waste (i.e., barren rocks)
    - tailings
    - dump heap leach
    - mine water

In terms of type, the impacts are often more pronounced for open-pit mines, which is also the most common mining practice, than for underground mines, which tend to produce less waste. Disposing of such large quantities of waste poses tremendous challenges for the environment and society as a whole.

(Dudka & Adriano, 1997; Da-Rosa & Lyon, 1997; Sampat, 2003)

Soil degradation and water pollution

In mining areas, soils are affected by disposal of mine waste (e.g., tailings, acid mine drainage etc.). The exposed soils become acidified and contaminated with trace elements. The elemental contamination and acidification i) lower soil fertility, ii) reduce the variety and change the proportion among species of soil biota, and iii) affect the energy budgets of soil fauna.

Acidification of soil can also cause degradation of the nearby aquatic ecosystems. As ground and surface water has the ability to travel for thousands of kilometres, acidifying compounds may affect also areas far away from the source of pollution. This will obviously have a negative impact on the well-being of (big/small) aquatic organisms which ultimately will result in a negative impact on human health (Dudka & Adriano, 1997).

Biodiversity and habitat loss

Mining, including metal mining, may result in additional indirect impacts that emanate far from the mine site, as also stated above. The most obvious impact to biodiversity from mining is the removal of vegetation, which in turn alters the availability of food and shelter for wildlife. At a broader scale, mining may impact biodiversity by changing species composition and structure. Although some wildlife species benefit from the modified habitat, some native species may decline and eventually disappear (Sonter, Ali, & Watson, 2018).

Energy consumption and GHG generation

The grades of metallic ores have been falling globally for some time and this will have a significant effect on the amount of energy required for mining and processing of these lower-grade ores due to the additional amount of material that

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must be treated in different stages and additional processing steps to achieve optimum concentrate grades required for downstream smelting and refining. Higher energy consumption results in higher CO_2 emissions in the atmosphere.

The various mining and processing stages together with the energy consumption and their CO_2 emissions are described below (**Figure 3**):

- **Drilling:** energy is used to power components of the drill that perform tasks such as hammering and rotation. The number of drilling machines on site is about two to six depending on the mine production capacity
- **Blasting:** The energy consumed in the blasting process is derived from the chemical energy contained in the blasting agents
- **Loading and haulage:** energy consumption data for the loading and hauling fleet
- **Crushing:** energy is used for reducing the size of run-of-mine material into coarse particles
- **Screening and separations:** Screening is an important step for dry beneficiation of iron ore.
- **Stacking and stockpiling:** in this step mechanical stackers are operated using diesel fuel-based machinery or electricity
- **Reclaiming and loading on container/vessel:** Iron ores, either fines or lumps, are reclaimed from a stockpile for loading onto a vessel, container, truck, or ship for transport. Reclaimers use diesel fuel for their energy source
- **Transport:** Iron ores are transported from the mine site to the port for overseas export or to a local steelwork for making iron in a blast furnace

(Haque & Norgate, 2015)

Unit processes	Energy (MJ/t ore)	GWP (kg CO_2-e/t ore)
Drilling	1.3	0.1
Blasting	3.3	0.7
Loading and hauling	92.1	6.0
Crushing and screening	23.1	2.5
Stacking and reclaiming	4.6	0.5
Rail transport	20.9	1.3
Port operations	7.4	0.8
Total	152.7	11.9

Figure 3. Energy and greenhouse gas results from the LCA study for iron ore mining and processing (Haque & Norgate, 2015)

CO_2 Emissions from EU imports

Once different ores and concentrates are mined and pre-processed during the above-mentioned stages, a significant part of them is then conveyed to other regions – such as Europe - for the manufacturing of materials/products (e.g., steel, copper, aluminium etc.). The transportation of these primary raw materials however is not carbon free; fact that has been largely ignored so far. The amount of carbon emissions released into the atmosphere depends on the mean of transportation used, as it can be observed below (Figure 4.)

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Air plane (air cargo), average Cargo B747	500 g
Modern lorry or truck	60 to 150 g
Modern train	30 to 100 g
Modern ship (sea freight)	10 to 40 g
Airship (Zeppelin, Cargolifter) as planned	55 g

Figure 4. CO_2 emissions for shipping of goods depending on the mean of transportation (source: CO2 emissions for shipping of goods - Time for Change)

Taking into consideration that the main iron ore producing countries are China (6775.45 km), Australia (14527 km) and Brazil (9892.99 km), it can be calculated what are the CO_2 emissions depending, of course, on the mean of transportation used:

- China: 67.7545-1,016.3175Kg of CO_2 emissions per metric ton of freight
- Australia: 145.27-2,179.05Kg of CO_2 emissions per metric ton of freight
- Brazil: 98.9298-1,483.9485Kg of CO_2 emissions per metric ton of freight

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