



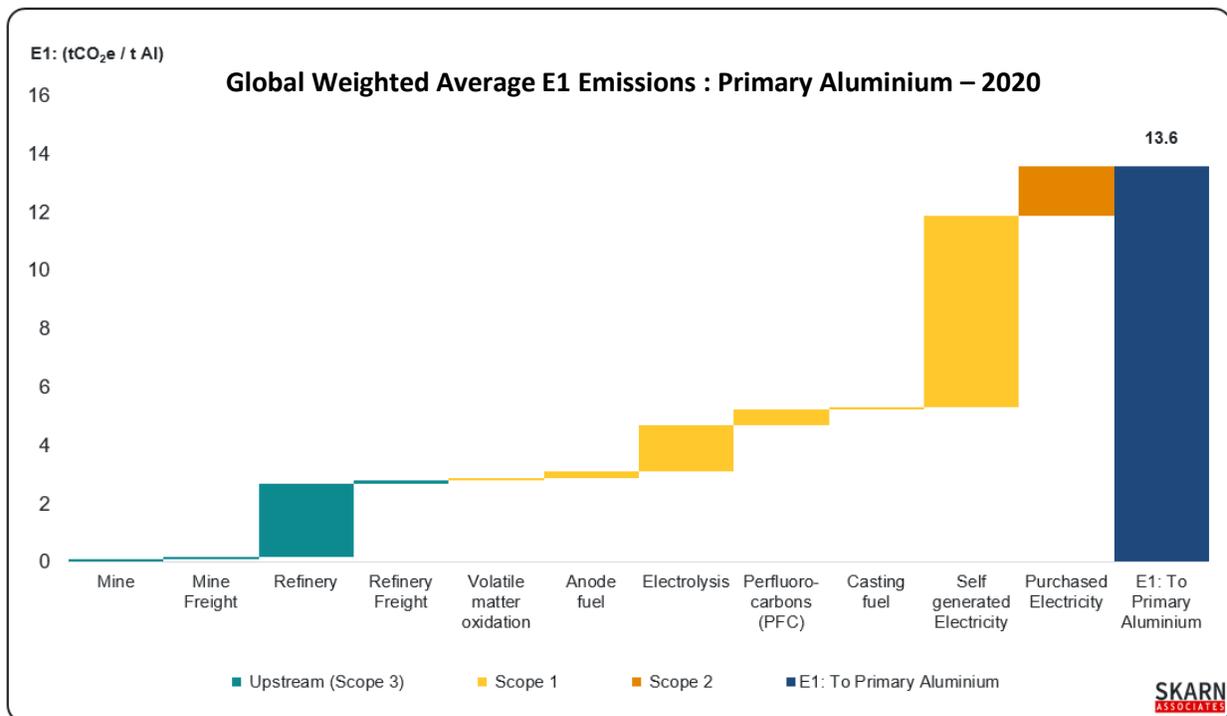
Skarn Associates Limited - Press Release

Carbon Emission Curves for Bauxite, Alumina & Primary Aluminium

Tuesday 12th January 2021

Skarn Associates is pleased to announce the latest additions to its range of GHG Emission Curves, covering bauxite mining, alumina refining and primary aluminium smelting.

Skarn's newly released analysis covers 100% of global bauxite, alumina and primary aluminium production for 2018, 2019 and 2020 at a granular (asset) level. Skarn's proprietary E₁ emission metric encompasses Scope 1 and 2 CO₂e emissions*, plus freight, to primary metal. Our analysis is carried out according to carefully defined supply chain system boundaries, to facilitate like-for-like comparison of assets.

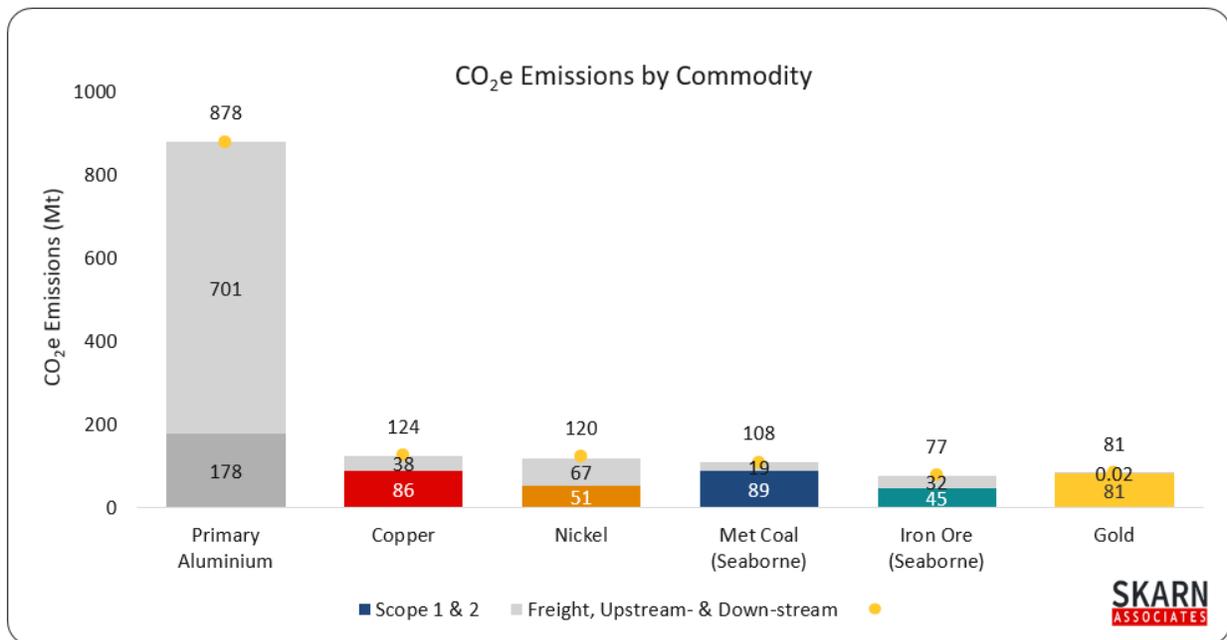


For **primary aluminium**, the **Scope 1** GHG emissions include all energy and emissions from on-site anode manufacturing, emissions from electrolysis and PFCs, plus emissions from casting and from company owned power plants. **Scope 2** GHG emissions are from purchased electricity. The E₁ metric also includes CO₂ from bauxite mining and alumina refining, plus freight within the supply chain. The world's aluminium smelting industry produced an estimated 65Mt (million tonnes) of primary aluminium in 2020 and

accounted for 701Mt CO₂e of Scope 1 and 2 CO₂ equivalent emissions, plus an additional 178Mt CO₂e associated with alumina refining, bauxite mining and freight to importing country port.

The **alumina intensity** curves include **Scope 1** emissions, with energy used in the digestion and calcining operations, plus on-site power generation. **Scope 2** GHG emissions are generated at sources owned or controlled by another organisation. The world’s alumina refineries produced about 130 Mt alumina (metallurgical plus non metallurgical) in 2020 and accounted for over 160Mt CO₂e of Scope 1 and 2 CO₂ equivalent emissions. Alumina is currently produced using almost exclusively fossil-based fuels. However, a number of producers are seriously examining alternatives, with biomass and solar both under consideration.

The **bauxite GHG intensity** data includes Scope 1 emissions from sources that are owned or controlled by the reporting organisation, to the 'mine gate' boundary. They typically include emissions from consumption of diesel in haulage trucks or onsite power generators. **Scope 2** GHG emissions relate mainly to purchased electricity. Bauxite mining accounted for 4.3Mt CO₂e of Scope 1 and 2 CO₂ equivalent emissions, which is relatively insignificant in comparison to emissions from alumina refining and aluminium smelting.



2020 E₁ carbon emissions for the aluminium mining-refining-smelting chain were over 878Mt CO₂e, which roughly equates to 2.4% of global non-land-use carbon emissions, as estimated by the Global Carbon Project (<https://www.globalcarbonproject.org>). It is notable that as a producer of 57% of the world’s primary aluminium, due to its heavy reliance on coal-fired power **China** accounts for over 70% of global Scope 1 and 2 emissions from aluminium smelting. Given China’s recently announced target to be carbon net-zero by 2060, a viable plan for decarbonisation of the aluminium sector has to be a priority.

Skarn's extractive sector asset-level GHG emissions analysis for aluminium, copper, gold, iron ore, metallurgical coal and nickel now accounts for 1,388Mt of CO₂e in total, or 3.8% of global non-land-use carbon emissions. The aluminium sector comprises 63% of the extractive sector emissions accounted for by Skarn.

How green is green aluminium? Skarn's GHG aluminium curves are released at a time of huge awareness for the need to improve the aluminium industry's carbon footprint. A number of the industry leaders are promoting green brands. These are typically produced at smelters powered by hydroelectricity. Skarn's analysis includes upstream emissions, from alumina, bauxite and freight to provide a fuller picture of GHG from aluminium smelting.

The analysis also arrives at a time when the LME is considering the launch of a spot trading platform for 'low carbon' aluminium. This comes after producer pressure for the LME to force aluminium suppliers to disclose their carbon footprint on the exchange. As yet, there is no generally accepted consensus of what 'low carbon' aluminium actually is. Arbitrary cut-offs of 4t CO₂e /t Al, 4.5 CO₂e /t Al and 8t CO₂e /t Al have been discussed, but these usually only take into account direct and indirect smelter emissions. Skarn's analysis indicates that relatively few smelters would qualify at the lower cut-off points, particularly when the full bauxite-alumina-aluminium supply chain is considered. We estimate that 48 smelters, accounting for 20% of global primary aluminium production, would meet the 4t CO₂e /t Al emissions threshold on a Scope 1 + 2 basis. Using Skarn's E₁ metric, which includes emissions from the bauxite and alumina components of the supply chain, only 19 smelters, accounting for 7% of global primary aluminium production, would meet the 4t CO₂e /t Al emissions threshold. We don't know yet how this will play out - whether consumers will actually pay a premium for lower-carbon products, or whether a discount for higher-carbon aluminium will emerge instead.

Skarn's aluminium product range is led by Martin Haller, who brings over 30 years of experience in the aluminium industry. Martin started his career at CRU, researching aluminium semis and end-use markets. Later he moved to Dresdner Kleinwort where he was manager of metals and mining equity research. He later worked with Billiton in the Mergers & Acquisitions team. Subsequently he spent 11 years at Brook Hunt (now Wood Mackenzie), as Manager of Aluminium Research and Consulting.

**As defined by the GHG Protocol Corporate Accounting and Reporting Standard*

<https://ghgprotocol.org/corporate-standard>

For more information about Skarn's unique Mining-ESG research services, contact:

Mark Fellows

mark@skarnassociates.com

+44 203 290 2492

or visit skarnassociates.com