The Decarbonisation of the Aluminium Industry Between Promises and Reality

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Abstract

Climate change is the 21st century's biggest ticking timebomb.
Things have to change — quickly.

The aluminium sector and companies need to rethink and transform their models, brands and services to survive and become future-proof.

This paper will help business leaders answer fundamental questions when it comes to change and investing in decarbonisation: why is there urgency to act for business in the aluminium sector? What are the solutions? How the net-zero transformation will reshape the aluminium supply chains, and what is the status of progress?

Keywords: Climate change, Net-zero carbon transformation, Aluminium industry, Sustainability, Circularity

1. Introduction: Things Have to Change — Quickly

Too many scientific reports have been published, words written, conferences held, and videos made on climate change, biodiversity loss, pollution and other pressures on the limits of the planet. The alarming consequences of not making dramatic changes to our lives and businesses are well known.

Things have to change — quickly.
Why is it also so important for businesses, and especially the aluminium sector?

Profound transformations are at stake: governments, regulations, investors, businesses, people's mindsets, values, societal narratives — all these need to change.

Most of the largest aluminium producers have already developed a decarbonisation strategy and the sector is equipped with a transformational vision with pathways to net-zero carbon. This paper provides a holistic view of the challenges and their solutions, with updates and insights. It will help readers better understand the challenges and the solutions, and how far companies have progressed in the decarbonisation of the aluminium sector.

2. The Problem: at Global Level the Aluminium Sector Should Abate 1.1 Billion Tonnes of CO_2 per Annum

We are facing a double-level challenge: aluminium demand is expected to grow significantly, and global emissions should decrease in absolute volumes to align with a net-zero carbon world by 2050.

Aluminium demand is expected to grow and reach 174 Mt of aluminium in 2050 (86 Mt for primary aluminium production, 88 Mt for recycled aluminium production), from current levels at 100 million tonnes (65 for primary and 35 for recycled aluminium).

Aluminium is the second most-used metal in the world by tonne produced after iron, hence the most used non-ferrous metal worldwide. Aluminium needs are growing, especially in the context of the energy transition thanks to its qualities (lightness, strength, durability, electrical and thermal conductivity, formability and recyclability). Aluminium is needed for lightweight vehicles, solar energy (solar energy systems use aluminium for various components, including for mounting and framing solar photovoltaic (PV) panels and for reflectors in concentrating solar power systems), and in the electric power grid electrical cables (along with copper).

The aluminium industry is currently responsible for 2 % of global greenhouse gases (GHG) emissions and generates about 1.1 billion tonnes of CO_2-eq annually. Primary aluminium production is highly energy-intensive, with electricity making up a large share of the energy consumed. Figure 1 below presents the breakdown of total aluminium emissions by process in the value chain. Clearly, the smelter stage accounts for most of the total emissions, with 78 % of sectoral emissions. Of this 78 %, 60 % comes from energy generation (electricity) and 18 % come from process direct emissions.

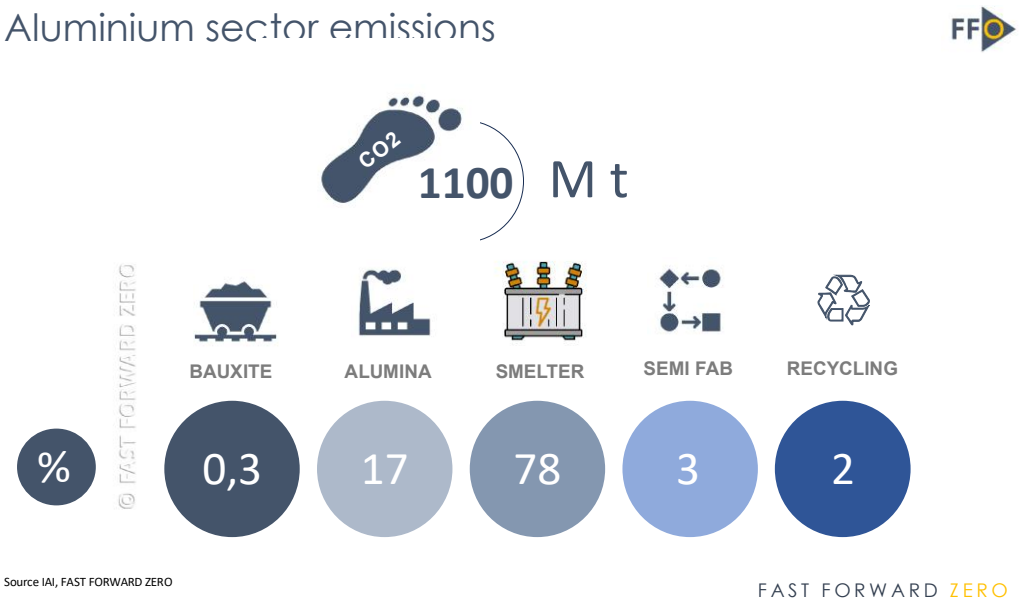

Figure 1. Breakdown of total aluminium emissions by process.

In January 2020, the International Aluminium Institute (IAI) created a GHG working group to understand what a Paris-aligned 2050 aluminium footprint would look like, what the pathways to get there would be, and what challenges can be expected along the way. The reports were finalised in 2021 [1].

In summary three broad areas of emissions reduction have been identified and developed, each with distinct innovation, policy and financial drivers, barriers, costs and materiality:

1. Electricity decarbonisation
2. Direct emissions reduction
3. Recycling and resource efficiency

In 2022, the Mission Possible Partnership [2] developed further a sectoral vision with more details for the different technological pathways and the enabling conditions for producers to effectively

8. References

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