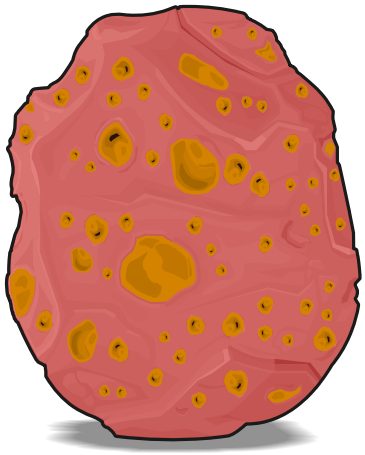
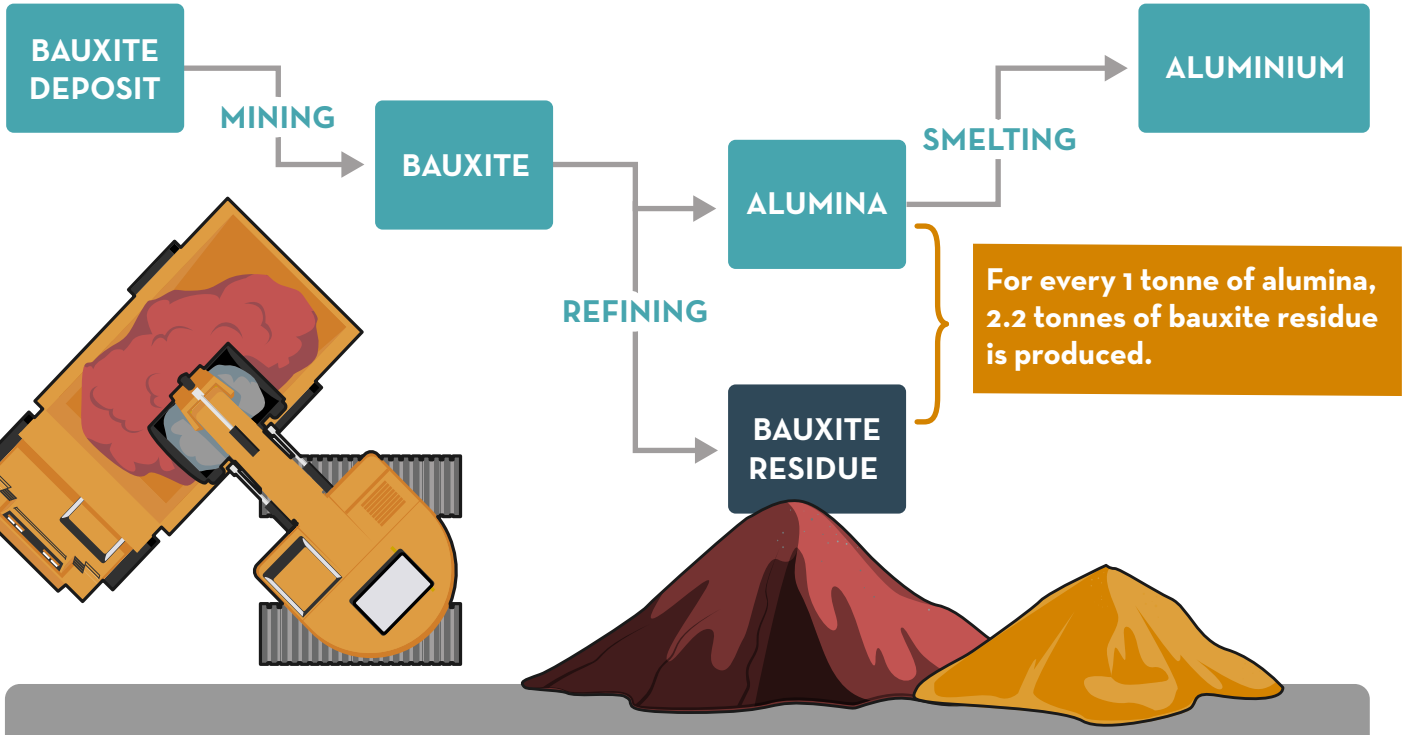
INTERNATIONAL ALUMINIUM

BAUXITE RESIDUE: AN INTRODUCTION



Since the start of large-scale alumina production, Bauxite Residue has been a by product. Looking towards the future, the industry seeks to close the circularity loop through more sustainable use of bauxite residue.

WHAT IS BAUXITE RESIDUE?



Bauxite residue is a waste product from the aluminium production process.

Rich in iron and aluminium, bauxite residue is produced through the extraction of alumina from bauxite, typically through the Bayer process.

The composition of bauxite residue depends on the source and the extraction process.

VOLUMES

10 billion tonnes by 2050

Bauxite residue can be a significant contributor to industrial symbiosis. International Aluminium Institute's dynamic material flow model indicates that, by 2050, there could be a bauxite residue global inventory of 10 billion tonnes.

AVAILABILITY

Demand for aluminium is expected to grow, with supply coming from both primary and recycled sources. This means bauxite residue will continue to be generated and available for industrial symbiosis. Bauxite residue can be used as an alternative raw material in industrial processes especially where traditional materials may become scarcer.

Visit international-aluminium.org/resources/bauxite-residue for more information.

Acknowledgements: Research leading to these results has received funding from the European Community's Horizon 2020 Programme (H2020/2014-2019) under Grant Agreement No. 776469 (REMOVAL). This publication reflects only the author's view, exempting the Community from any liability. Project website: https://www.removal-project.com/

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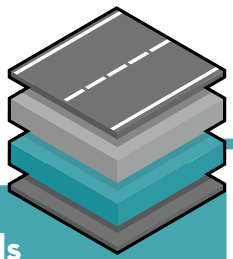
BAUXITE RESIDUE: KEY APPLICATIONS

Cement

3 million tonnes
It is estimated that 3 million tonnes of bauxite residue are used annually in the production of Portland Clinker Cement. The industry is also working to advance the application of bauxite residue in supplementary cementitious material.

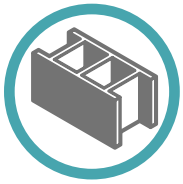
Bauxite residue



Roads

When bauxite residue is dewatered, compacted and mixed with a suitable binder, it can make a building material for haul roads.

This has been the case in the South of France, near the Gardanne Refinery, and for a highway near to the Pinjarra Refinery in Western Australia.



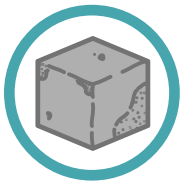
Brick production
Bricks composed of 90% bauxite residue have been made. These are fired at a temperature of 1000°C.

Soil amelioration
Bauxite residue's alkaline properties when blended with sandy soils can be beneficial in improving water retention and nutrient utilisation.

Landfill covering
Bauxite residue can be used for landfill covering thanks to its impermeability. This has been done in Southern France at Gardanne.

Iron production
High iron oxide content of bauxite residue of up to 60% has led to collaboration on the innovation of techniques to improve its economic viability. The use of bauxite residue for iron was seen in war time when minerals were harder to access.

Phosphate removal
Treated bauxite residue has been shown to be effective at removing phosphate. In China, partial neutralisation has been achieved with 99% removal of phosphorous in water.



Geopolymer
Geopolymers are a substitute in some applications, and have a number of advantages over ordinary Portland cement, including a lower CO_2 footprint.

Rare earth extraction
A wide range of rare earth elements are common in bauxite residue. As economically viable extraction techniques develop, valuable materials can be removed but the remaining residue will still need to be managed.

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