



## Unrecovered metals in bauxite leachate and incinerator ashes quantified

With escalating demand of metals, an increasing global population and rapid technology development, Europe is confronted with the challenge to secure a sustainable metal supply to its industry and secure jobs.

In this context, the European Union (EU) has adopted a circular economy approach to products, materials and resources in order to maintain their value for as long as possible with minimal generation of waste.

A priority area for the EU is the reuse of critical raw materials and rare earth elements which are essential for the production of a wide range of technological goods and equipment. However current recycling rates for these critical metals are extremely low, mainly due to a lack of feasible recovery technologies. As a consequence valuable metal resources are being landfilled each year from sources such as municipal and industrial solid wastes, and mine wastes. The practice of landfilling these valuable resources not only impacts the environment due to the potential leaching of metal rich toxic liquids with time, but also represents a significant long term loss to the economy.

Therefore recovery of metals from industrial process wastes, such as bauxite residue and incinerator ashes potentially offers significant quantities of these metals to the benefit of the environment and economy alike. The difficulty with their recovery, however is that the metals of concern tend to be present in low concentrations within complex matrices and can be technically difficult to extract. In deliverable 2.1, the BioMimic consortium quantifies the extent of unrecovered metals in leachates from bauxite residue and incinerated bottom and fly ashes from municipal solid wastes, and examines their potential economic value.

In summary, an estimated global average of between 60 and 220 million m<sup>3</sup> of bauxite residue leachate from alumina production plants is produced annually, comprising trace metals with an estimated current annual value in the range €43 – 159M. The estimated annual average EU bauxite

residue leachate production is approximately 6 million m<sup>3</sup>, representing just over 4% of that generated globally. In addition, an estimated 30 – 40 Mt of bottom ash and 2 - 6 Mt of fly ash is generated annually from municipal solid waste incineration processes, almost all of which is generated in the EU, China, Japan and the USA. These ashes contain trace metals with estimated current global annual economic values in the range €1,500 – 2,000 billion for bottom ashes and €27 – 82 billion for fly ashes. While the metal recovery from bottom ash has been already applied in several countries, this is only occasionally the case with metal extraction from fly ash.

While these amounts reflect the potential value of the metals if fully recovered, they do not however include extraction, processing and treatment costs associated with their recovery. A brief overview of some of the technical advances for metal extraction from secondary raw materials as well as their shortcomings is also included in the deliverable.

