EIT Raw Materials ZeroWaste Cluster Networks of Infrastructure: offering research and pilot infrastructure in a ZeroWaste metallurgical toolbox

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Introduction: the ZeroWaste metallurgical toolbox

Complex low grade industrial residues and wastes can be considered as an important source for metallic and mineral raw materials, of which the primary sources are often lacking in Europe. These streams can include mine tailings, bottom and fly ashes from incineration processes, metallurgical slags and dusts. These secondary products contain often relatively low concentrations of metals, but due to the vast volumes in which they are produced, they can present a significant value in terms of raw materials. Very often, these side products are landfilled, and thus causing a significant cost and environmental burden.

In order to extract value from these secondary streams and stocks, an integrated metallurgical ZeroWaste approach is needed. This approach integrates different types of extractive metallurgy (hydro-, pyro-, solvo-, electro- and biometallurgy), together with pretreatment and valorisation of the remaining mineral matrix, e.g. as added-value binders or cementitious products for the construction industry. This zero-waste toolbox allows for designing of flexible flow sheets in order to design a treatment train for specific streams, optimized both in terms of material recovery as well as economic feasibility and environmental impact.

The top-class European research institutes Ghent University, KULeuven, VITO (Belgium) and VTT (Finland) have joined forces, based on complementarities in expertise, to bring this concept of the 'ZeroWaste metallurgical toolbox' to a next level. This has resulted in a number of joint initiatives: technology development

projects (e.g. the Flemish research program MaRes within SIM-Flanders, http://www.sim-flanders.be/research-program/mares), design of a decision-support framework (e.g. the H2020 project METGROW+, http://metgrowplus.eu/; Figure 1) and a virtual pool of research and pilot infrastructure.

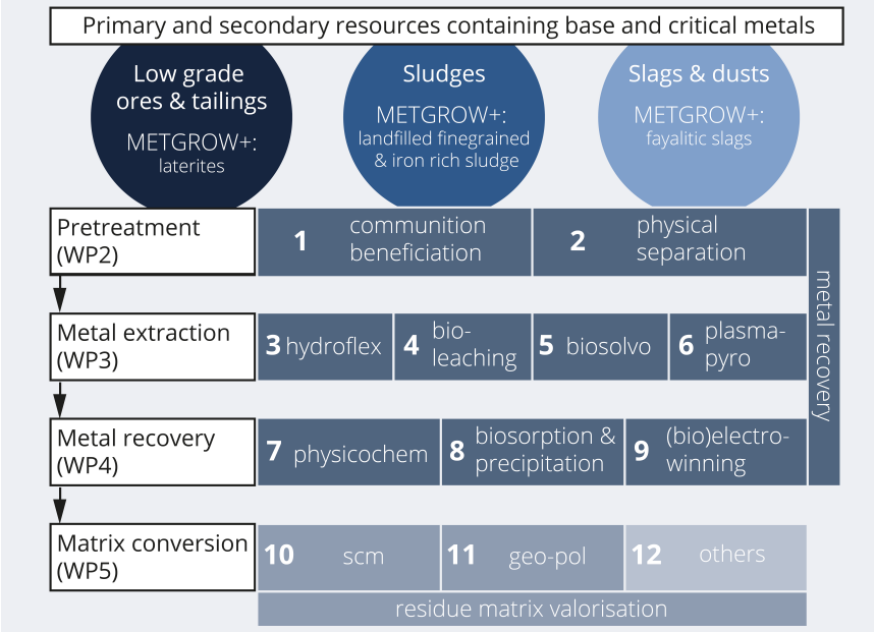

Figure 1: The zero-waste metallurgical toolbox in the Horizon 2020 project METGROW+

EIT Raw Materials

EIT Raw Materials brings together about 120 European partners (Figure 2) from the three different sides of the knowledge triangle (universities, research institutes and companies) to tackle Europe's scarcity in metallic and mineral raw materials. It is the biggest community ever built in Europe to tackle raw materials challenges. EIT Raw Materials therefore funds matchmaking, innovation, education and business projects in exploration, mining, recycling, substitution and circular economy. EIT Raw Materials disposes of an annual budget of earmarked Horizon 2020 funds of 30 to 80 M€ between 2016 and 2022 for these different project types. More info can be found on http://www.eitrawmaterials.eu.

Figure 2: EIT Raw Materials partnership

A specific project type are the so-called Networks of Infrastructure (NoI). A NoI is typically an accelerator aiming at mapping services to provide overview and access to facilities and expertise in a specific field in the raw materials sector, available within the EIT Raw Materials consortium. A NoI presents a virtual pool of infrastructure, a so-called 'virtual laboratory'. These services include pilot plants, process, analytical and modeling infrastructure. One network typically consists of 5-15 partners (industry, research and universities) and is coordinated by a single-point-of-contact (SPOC), located at one of the partners.

The Zero-Waste cluster

Ghent University, KULeuven, VITO and VTT are coordinating a number of NoIs in specific building blocks of the ZeroWaste metallurgical toolbox, each requiring very specific infrastructure and expertise. The NoI PreFlex (on pretreatment and physical separation, coordinated by VITO) and Inspire (on intensified separation, KULeuven) are the NoI in the pretreatment step of the ZeroWaste toolbox. The metal extraction and recovery infrastructure is covered by the NoI SolvoFlex (VTT), PyroFlex (KULeuven), BioFlex (Ghent University) and ElectroFlex (VITO), on solvo- and hydro, pyro-, bio- and electrometallurgy respectively. Matrix valorization infrastructure is brought together by ResiduFlex (KULeuven). The Sustainability Support and Information Centre (SSIC, Ghent University) groups the necessary

expertise in sustainability assessment, needed to assess the economic feasibility and environmental impact of new ZeroWaste processes. These eight individual NoI have decided to join forces in to the ZeroWaste NoI cluster (Figure 3). This clustering is evident because of the complementarities in infrastructure and expertise and creates benefits in terms of more effective communication and dissemination and a harmonized way to approach potential customers.

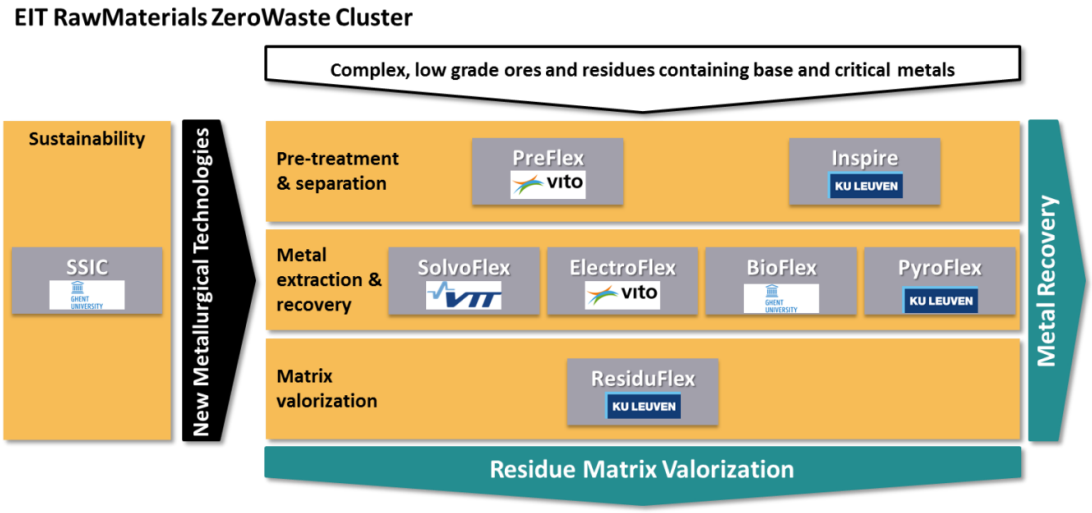

Figure 3: The EIT Raw Materials ZeroWaste cluster of Networks of Infrastructure

The ZeroWaste cluster has a joined website (https://www.zerowastecluster.eu), with links to pages of the individual networks. Dissemination material (posters, leaflets, social media accounts) are developed jointly. Customers of the different networks are guided to the requested infrastructure by a web-based platform, guiding the customer to the parties able to the specific infrastructure he/she needs. This is a much more user-friendly approach compared to presenting the customer a list of all available infrastructure within the network. Due to the different types of infrastructure within the different networks of the Zero-Waste Cluster, each NoI has a different webtool. However, the architecture of the different webtools is very similar, which will allow for an easy integration in the future. The NoI webtool serves as a matchmaking and brokerage platform, but leaves the customer free choice between all parties able to fulfill the request. All NoI partners that are able to handle a specific request are invited to make an offer. It is up to the customer to choose the best value of these offers. The webtool will follow up whether a match has been successful and if it has led to a dedicated project.

The ZeroWaste cluster and enhanced landfill mining

The ZeroWaste cluster could provide a powerful tool in enhanced landfill mining. Industrial landfills (tailings, slacks, bottom and fly ashes, …) often require a combination of metallurgical technologies to unlock their secondary raw material potential. The ZeroWaste cluster could offer powerful (web)tools to guide researchers and technology developers to the infrastructure they need to optimally extract the value of the materials present in these landfills. The NoI coordinators have a more detailed knowledge about the specific building blocks of the ZeroWaste toolbox and about the infrastructure present in Europe at different scales. They can assist customers in their requests for infrastructure.