Synergy Fact Sheet – Key

This document shows the structure of the Synergy Fact Sheets helping in reading and comprehending its content.

General description and technical objective →

Overview of in- and output sectors →

Refers to the technical feasibility of the synergy →

Synergy Fact Sheet

BOF/EAF SLAG

Recover basic oxygen furnace slag and provide silicium, iron, calcium and alumina for clinker raw materials

RISERS

A Roadmap for Industrial Symbiosis Standardisation for Efficient Resource Sharing

Introduction

The recycling of basic oxygen furnace slag (BOF slag) is a remarkable example of how industries can work together to turn waste into valuable resources. BOF slag, a by-product of oxygen blast furnace steel production and casting, is rich in useful minerals such as silicon (SiO_2), iron (Fe_xO_y), calcium (CaO) and alumina (Al_2O_3). These properties make it an excellent alternative raw material for cement production, especially in the manufacture of clinker and ground cement. By utilising BOF slag, the steel and cement industries can reduce their dependence on natural resources and adopt more sustainable practises (Demarco et al., 2024).
This process represents an industrial symbiosis in which the steel industry becomes the supplier of the BOF slag and the cement industry uses it to process the raw material. The high calcium content of granulated blast furnace slag helps to meet the lime requirements for clinker production, while its silica, alumina and iron oxides replace other natural raw materials. This collaboration addresses two important challenges: the reduction of waste disposal in the steel sector and the preservation of important raw materials such as limestone and clay in the cement industries (Jexembayeva et al., 2020).

The use of BOF slag in cement production also brings technical and environmental benefits. Modified granulated blast furnace slag, for example, improves grindability, making it easier to process and improving the quality of cement products. In addition, this approach supports environmental goals by reducing carbon dioxide emissions from clinker production and promoting the development of more environmentally friendly building materials (Xiang et al., 2021; Jexembayeva et al., 2020).
The partnership between the steel and cement industries illustrates how waste from one sector can become a resource for another. This industrial synergy not only helps to reduce costs and environmental impact, but is also in line with the principles of a circular economy that creates more sustainable and innovative production cycles. (Aidres, 2023)

Supplying sector(s)		Receiving sector(s)		
Steel	Steel, basic oxygen steelmaking and casting manufacturing	Cement	Various	Cement, raw materials preparation

TECHNICAL FEASIBILITY

Laboratory scale – BOF slag proves to be effective in clinker production and cement grinding, thus confirming its suitability for practical use in the test stage (large laboratory/semi-pilot scale).

Low technical requirements – BOF slag can be seamlessly integrated into existing cement production processes and does not require any significant changes or additional costs

PPP IMPACT – EU wide potential

Profit — **Wins in industry**
ca. 4,000 M EUR value added. The substitution of BOF slag in cement production offers cost savings by reducing the dependence on traditional raw materials and the need for waste storage, making the process more financially efficient. (source: Scaler)

Planet — **Environmental gains**
ca. -10 Mt CO_2-eq. (source: Scaler) The integration of BOF slag helps cement manufacturers to reduce greenhouse gas emissions by lowering the amount of clinker required, significantly reducing CO_2 emissions. Yearly ca. 204 Mt of slag produced (Eurosteel, 2018).

People — **Wins for society**
ca. 40,000 direct jobs. The integration of BOF slag into industrial practice contributes to the creation of direct jobs in sustainable industries and promotes local employment and economic stability. (source: Scaler)

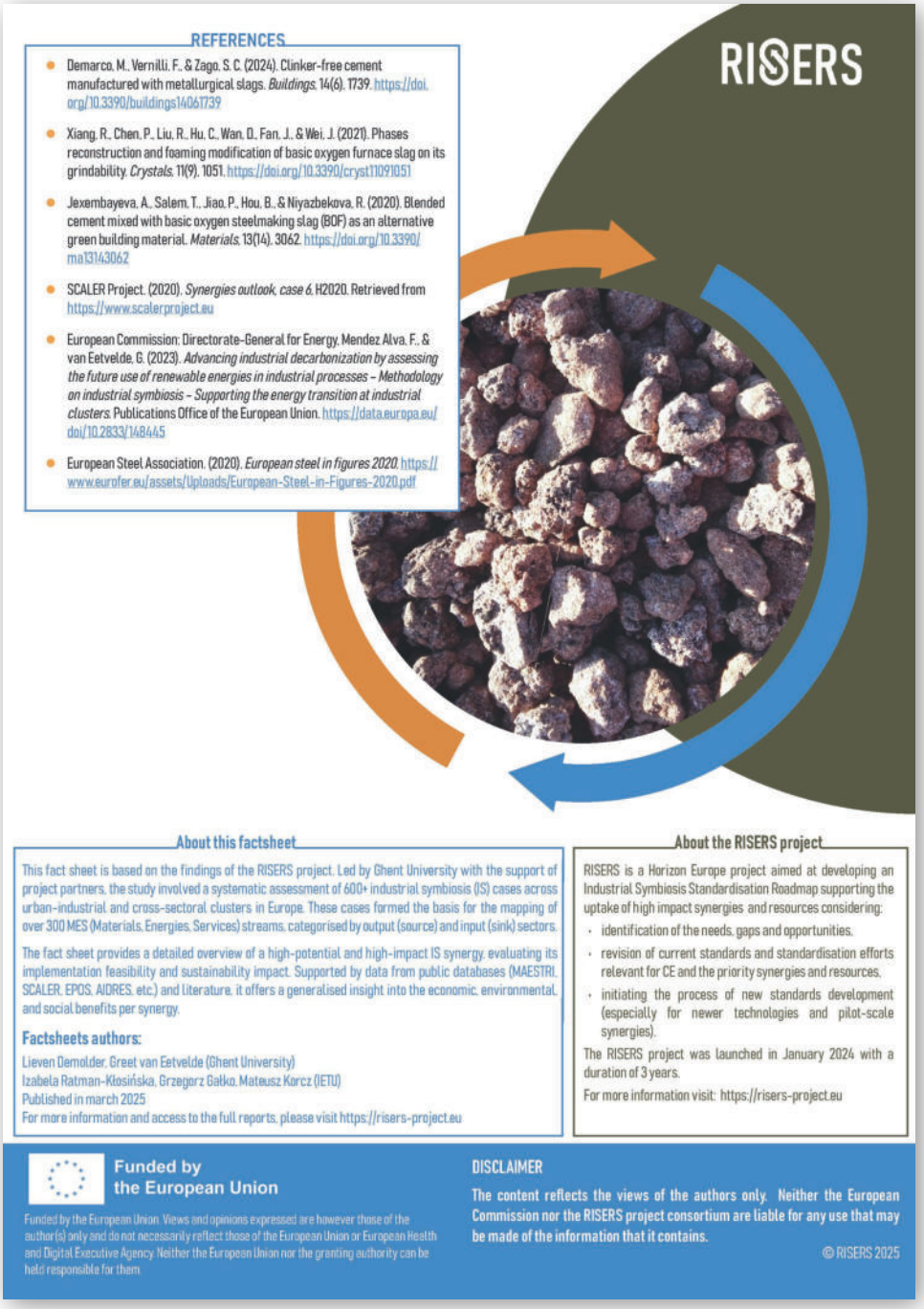
Environmental, social, and economic assessments were conducted for synergies where possible. These results highlight the potential impact of each synergy if implemented at the European level.

Synergy Fact Sheet – Key

References to IS project database and impact data

Short information about the fact sheet

Information about funding of the RISERS project



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About this factsheet

This fact sheet is based on the findings of the RISERS project. Led by Ghent University with the support of project partners, the study involved a systematic assessment of 600+ industrial symbiosis (IS) cases across urban-industrial and cross-sectoral clusters in Europe. These cases formed the basis for the mapping of over 300 MES (Materials, Energies, Services) streams, categorised by output (source) and input (sink) sectors.

The fact sheet provides a detailed overview of a high-potential and high-impact IS synergy, evaluating its implementation feasibility and sustainability impact. Supported by data from public databases (MAESTRI, SCALER, EPOS, AIDRES, etc.) and literature, it offers a generalised insight into the economic, environmental, and social benefits per synergy.

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About the RISERS project

RISERS is a Horizon Europe project aimed at developing an Industrial Symbiosis Standardisation Roadmap supporting the uptake of high impact synergies and resources considering:

- identification of the needs, gaps and opportunities.
- revision of current standards and standardisation efforts relevant for CE and the priority synergies and resources.
- initiating the process of new standards development (especially for newer technologies and pilot-scale synergies).

The RISERS project was launched in January 2024 with a duration of 3 years.

For more information visit: https://risers-project.eu

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Short information about the RISERS project