

## EPOS WP 1 – Scope and (de)limitations

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Preliminary SWOT analysis of the EPOS sites and their cluster  
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## Summary

The overall aim of the EPOS project is to enable **cross-sectorial Industrial Symbiosis (IS)** and provide a wide range of technological and organisational options for making business and operations more efficient, more cost-effective, more competitive and more sustainable across process sectors. In order to build a review of the EPOS sites and clusters, UGent carried out the preliminary site analysis of all EPOS sites. This work converges to provide an analysis of EPOS industrial sites and their potential for clustering in order to achieve resource and energy efficiency, especially focusing on IS.

Under EPOS, 5 industry based clusters in four countries are investigated. All 5 clusters are characterised by the presence of a big process industry that drives the symbiosis activities. Four of them are led by EPOS process industry partners, one is led by a local SME, also partner in EPOS. The EPOS clusters are further divided into either an industry cluster or a district cluster, depending on the kind of symbiosis activities that are already in place. There are three industrial clusters and two district clusters under EPOS. In industry clusters other geographically collocated EPOS industries act as satellite sites.

To set the context for the site analysis, literature review was carried out, to understand the general profiles of process industry and their potential to engage in IS. Then a preliminary study of each industrial site (lead and satellite) within all EPOS clusters was carried out. For this, publically available information about each EPOS cluster was collected. Then a list of potential IS was prepared, based on academic literature. This was done to draw a reference for IS options, which will then be used to propose specific opportunities for each of the EPOS clusters.

Information from each EPOS site was collected via an **LESTS (Legal, Economic, Spatial, Technical, Social)** survey, prepared to focus on aspects which are essential for proposing IS opportunities. The collected information has been graphically presented on an LESTS pentagon to visualise the existing level of collaboration between the partners in each EPOS cluster. Further, a **SWOT analysis** of each of the EPOS cluster was carried out to propose a set of strategies for achieving IS. Based on these SWOT strategies, recommendations were made to provide a reference for possible improvement in resource efficiency on individual EPOS site or by EPOS inter-site symbiosis.

For each of the EPOS clusters, the LESTS analyses resulted in understanding the existing collaborations involving EPOS partner in the five EPOS clusters. This helped to set the frame for further collaborations, and drawing inferences about needs, duties and wishes of each industry partner at their respective EPOS sites. It was then attempted to provide a set of opportunities for each EPOS cluster to meet these individual needs, duties and wishes of industries with joint actions, in essence to initiate (where absent) and strengthen (where existing) clustering activities.

Different IS potentials exist for each cluster. In fact, each EPOS cluster is distinct in the challenges and opportunities it provides for IS. The most prominent need, expressed by all EPOS industrial sites, is the reduction of carbon emissions and improved efficiency of energy and material utilisation. However, considering the low prices of fossil fuels, the financial costs of setting-up renewable energy infrastructure, coupled with the risks and liabilities intrinsic to IS, case specific investigation needs to be carried out, to provide valuable information for the proposed IS projects.

EPOS clusters are located in Poland, France, UK and Switzerland. The Rudniki cluster in Poland consists of CEMEX as the lead industry and Omya (Jasice and Romanowo) and ArcelorMittal (AM) Krakow as satellite sites. The Lavéra cluster (France) is represented by INEOS (Lavéra) as the lead site and AM (Fos) as the satellite site. In Hull cluster (UK), Omya (Melton) has the lead and CEMEX (South Ferriby) and INEOS (Hull) act as the satellite sites. AM represents the EPOS

industry in Dunkirk cluster (France). AM engages with the neighbouring industries and the city of Dunkirk in a number of activities. Visp cluster (Switzerland) has a large pharmaceutical industry engaged in district heating with the city of Visp. The EPOS Visp cluster is represented by CimArk.

The SWOT analysis of EPOS **Rudniki cluster** resulted in two recommendations. To overcome the perception of distance between the different EPOS sites, the existing supply chain routes of EPOS partners could be used to create connections between the different sites. A deeper study of supply chains of each EPOS partner could also result in optimising their respective supply chains, and possibly improving the impact on environment and society. The second recommendation, is about by-products valorisation. For instance, a possibility have been individuated to set-up a slag processing unit close at AM Krakow site or on the empty plots on CEMEX Rudniki site. This processing plant can process slag from AM (and possibly other steel manufacturers) and sell the derived products on the market. Experience of AM Dunkirk can exemplify how this synergy may work, as AM Dunkirk has a slag treatment plant on the site, owned by a third party. In conclusion, the EPOS Rudniki cluster will need to engage in IS activities, which produce a high value for the partners that significantly outweigh the costs of connecting the sites via different transport options.

**Lavéra cluster** also conveys a number of opportunities for EPOS industries, with the added challenge of overcoming the distance between the two sites. In spite of the distance and infrastructure limitations between the sites, it was found that the industries already engage in sharing the services of the same person for their human resource department. To initiate material based IS between the two industries, it is crucial to utilise the existing platform of Grand Port of Marseille Mediterranean and seek funding from third parties to engage in district cooling network. Another possible opportunity was identified for AM, to use the existing business ties of INEOS with Messer and possibly set-up a new plant which separates carbon dioxide from exhaust gases (a replication of INEOS-Messer collaboration on Lavéra). For every opportunity identified, the investment costs, pay-back time and the low prices of existing solutions presented themselves as a recurring challenge.

The highest number of IS opportunities were identified for the **Hull cluster**. Since the EPOS sites are located in relatively close vicinity, there was a higher opportunity to engage in by-product exchange. Among the 19 opportunities identified for the Hull cluster, two present the highest potential. These two major opportunities involve all partners on EPOS Hull site. One, to utilise the waste stream from INEOS as fuel in the cement kilns; two, to use the reject stream from Omya as raw material for their production process, in exchange for using Cement Kiln Dust (CKD) to replace the current use of that reject stream. Veolia's presence has resulted in providing a further ease to exchange information between CEMEX and INEOS, as Veolia provides waste management services to both parties and thus has access to information from both companies.

The **district cluster of Dunkirk** provides a good example of collaboration between a number of private and public bodies. The different platforms that are available to AM in Dunkirk provide a great opportunity to strengthen the ties between industry and community and have an overall positive impact on the regional development. The opportunities identified for AM in Dunkirk cluster reach beyond the conventional IS and aim for closed-loop solutions and business model. The district heating network of Dunkirk brings together a number of industries and provides heat to the Dunkirk city. The port of Dunkirk, Urban Community of Dunkirk and the presence of Ecopal, an industrial ecology platform, provides an added advantage to AM to reach for innovative solutions to resource and energy related challenges, in future.

Similar to Dunkirk cluster, the **Visp cluster** exhibits a high level of trust between industry and public bodies in the Visp city. The existing district heating network provides a good case study

to learn the importance of stakeholder willingness to initiate and maintain a project even if the costs only balance the profits. EPOS SME partner, CimArk, can utilise the opportunity to learn from the experience in Dunkirk cluster and propose a number of interesting projects to the City of Visp and other industries in the region.

All of the opportunities, identified in this report have been presented to EPOS partners and will be further analysed for economic and technical feasibility, by EPOS academic and SME partners. The further progress of these activities will be assessed in the second and third LESTS surveys, to provide a deeper look into implementation of these IS opportunities and their contribution to sustainability of EPOS industries.