Cultivating Industrial Symbiosis between Process Industries

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Challenge
Setting the frame for industrial symbiosis between different process industries within the EPOS project

Methodology
On the industry clusters, a case study approach is adopted as to cope with the complexity of the system and its actors.

Scope – to gain understanding of the activities on an industrial site.
Boundary – EPOS industrial clusters.

The full LESTS survey covers three levels:
1. Regional
   » weigh landscape elements
2. Cluster
   » engage with IS facilitation platforms
3. Company/plant
   » sound IS bottom-up appreciation

EPOS
- 5 global process industries
- 5 cross-sectorial clusters
- 5 key relevant sectors: steel, cement, minerals, chemicals and process engineering

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### Background

Why process industries?
- 20% of European manufacturing industry (employment and turnover)
- EPOS industries represent
  > 400 manufacturing sites
  > 160 billion euros in sales
  > 500,000 employees
  > 250 million (metric) tonnes of steel, cement, minerals, refining, petro-, bulk & fine chemicals, bio-based products, etc.

Industrial symbiosis (IS) is a means to achieve resource efficiency via (1) mutualisation of resources and (2) substitution of raw materials with wastes or by-products from other sources, thus reducing CO₂ emissions to the environment.

### Non-technological

<table>
<thead>
<tr>
<th>Understanding system settings</th>
<th>Identifying wishes, needs, duties engaging change makers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpreting system trends</td>
<td>defining LESTS cluster pentagons &amp; companies SWOT analyses</td>
</tr>
<tr>
<td>Steering towards sustainability</td>
<td>facilitating industrial symbiosis (IS) expanding IS boundaries</td>
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</tbody>
</table>

### Technological

<table>
<thead>
<tr>
<th>Legal</th>
<th>Economic</th>
<th>Spatial</th>
<th>Technical</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>policy context</td>
<td>economic instruments</td>
<td>regional planning</td>
<td>equipment &amp; infrastructure</td>
<td>societal challenges</td>
</tr>
<tr>
<td>framing cluster agreements</td>
<td>sponsoring cluster management</td>
<td>designing</td>
<td>supporting cluster activities</td>
<td>answering cluster stakeholders</td>
</tr>
<tr>
<td>no legal ground nor contracts in place</td>
<td>no wins recognised, gains internalised</td>
<td>no proximity nor connection options</td>
<td>no technical feasibility</td>
<td>no awareness nor acceptance</td>
</tr>
<tr>
<td>contractual multi-party clustering</td>
<td>entity in place driving symbiosis</td>
<td>integrated in regional planning</td>
<td>circular economy principles met</td>
<td>proactivity towards any social actor</td>
</tr>
</tbody>
</table>

A system’s perspective is applied for:
- initiating industrial symbiosis
- cultivating cross-sector clustering by using the LESTS framework

### Results

- Identified IS opportunities in Hull (UK)

#### LESTS pentagons for EPOS clusters

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Reference

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