Low Carbon Industrial Manufacturing Parks

New Operational & Organisational Structures

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More information
Public LOCIMAP reports will be available through its website at www.locimap.eu

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1. Summary

This is the fourth of a series of white papers produced within the LOCIMAP project, setting out what needs to be done from a managerial perspective so that European industrial parks become the future of low carbon manufacturing. The benefits of industrial symbiosis are well known, but the potential in Europe has not been well explored and therefore exploited.

This paper initially establishes the argument why new operational and organisational structures are needed by presenting the main barriers of Industrial Symbiosis (IS). Then, a three-step systematic approach for the development of IS projects and a respective business model route tree is given.

2. Introduction

In 2010 a group of 14 European companies and organisations responded to the European Commission's call to examine the future for low carbon manufacture at integrated industrial complexes (Parks). The LOCIMAP - Low Carbon Industrial Manufacturing Parks - project is the result and has been looking critically at the way European Industrial complexes might develop strategies and technologies to meet the challenges of legislative pressures, public policy and economic competitiveness.

The energy & resource intensive sectors which lie behind the development of the parks we have in Europe – are very significant part of the economy. Nearly 7m jobs and over 450,000 companies are involved[1]. The project team comes from these sectors and represents 4 industrial parks and a number of sectors all with intrinsically high energy demands. The commitment of the members to novel and sustainable approaches is absolute. These parks and others across Europe have already made great progress in improving the internal operating efficiencies. But more is needed.

The LOCIMAP project aims to provide fresh insights into the technical and organisational changes needed to secure the future for them and others like them across Europe.

3. Why do we need new Operational & Organisational Structures?

European industrial parks usually provide infrastructure, utilities and services[2], in order to maintain competitiveness and attract manufacturers, but are rarely the place where large carbon emitters from different sectors co-locate.

For historical reasons plants from different sectors are located where basic cost elements were originally minimised e.g Steel plants in Europe traditionally followed the rule "iron moves to coal" locating close to basic raw material in order to minimise transportation costs[3]. This hasn't changed much in the recent years, as most new primary Steel plants in the globe prefer to establish in Asia[4].

The concept is similar in other industrial sectors, e.g bricks and tiles sector.

[1] Spire Roadmap 2012. Found online at http://www.spire2030.eu/
[2] Observed among LOCIMAP partner sites. Also see services offered by Currenta: http://www.currenta.com/chempark-services.html and Ifraserv: http://www.infraserv.com/en/standortbetrieb/standortbetreiber_ish/index.jsp
[3] Janaki, V. A. (1985). Economic Geography: Factors Influencing the Location of Economic Activity. Concept Publishing Company.
[4] Source: Steel Statistical Yearbook 2013.

One could describe this situation as a spatial polarized state between different sectors. Mapping the German industrial manufacturing sector, the largest in Europe, shows that large plants from different sectors may be in proximity, but almost never within the same industrial park, confirming that spatial polarization is dominant.

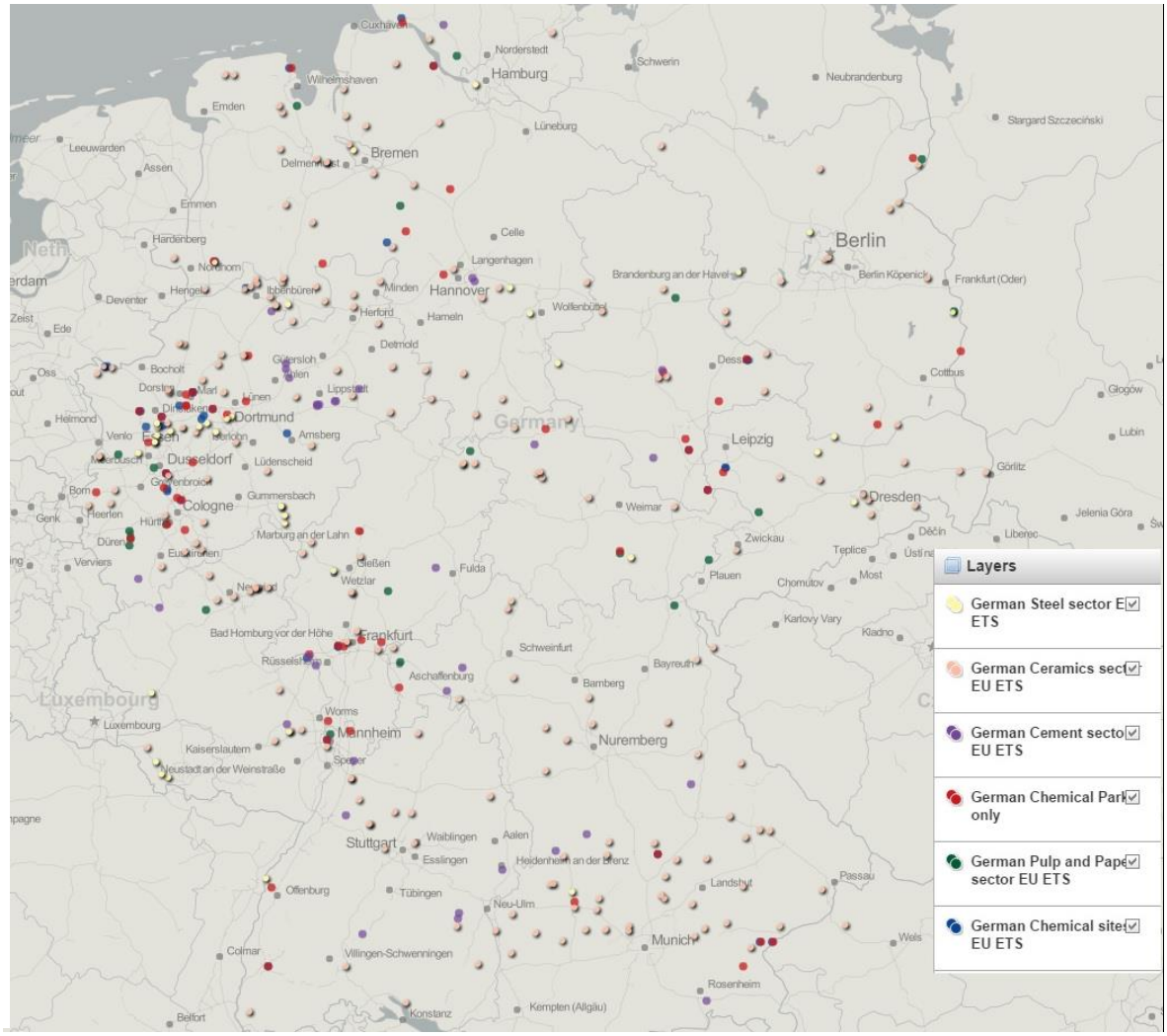

Figure 1. Spatial distribution of various German Industrial sectors that

Industrial Symbiosis (IS) cases from state-funded Industrial Symbiosis projects in Australia, Korea and Turkey show that there is unexploited technical potential of synergistic projects[5]. Sectorial diversity is an important element for industrial symbiosis. Multi-sector industrial parks have great potential for improving their energy and material efficiency that lead to economic and carbon emission benefits for the participants (Fig. 2).

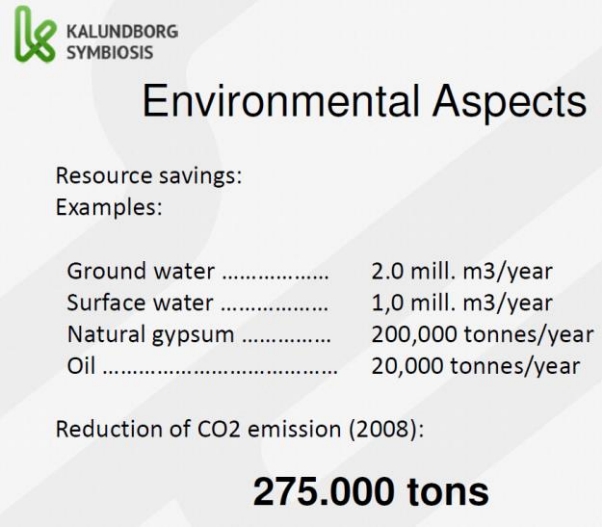

Figure 2. Resource savings in the Kalundborg Symbiosis Network

Practice has shown that market forces may not be enough to initiate IS projects[6]. The work done within the LOCIMAP project confirms that issues such as long payback periods, transaction costs, lack of trust and the risk of losing focus on core business make firms reluctant to participate in synergistic projects. In order to overcome these barriers, new business models both for firm managers and park operators are necessary.

4. Which Operational and Organisational Structures?

In order to facilitate overcoming potential organisational and economic barriers and accelerate this way the development of IS within an industrial park, a systematic approach should be adopted (Fig.3).

Real-world examples of Industrial Symbiosis such have shown that it usually takes years or even decades to develop synergies across different sectors or operators. The spontaneous evolvement of Kalundborg started more than 40 years ago, whereas a case of brownfield designed IS, the ULSAN eco-industrial park project in Korea is expected to have its final form within 15 years from its inauguration.

Although symbiosis can be market driven, the signals from current energy prices carbon taxation and regulation in Europe are insufficient to drive change to IS rapidly. In each step there is a need for a person or institution with a clear role as facilitator to accelerate the process and ensure success. Potential facilitators could be academic institutions, local governments, firm associations, industrial park operators, industrial clusters etc. but in any case someone knowledgeable and committed to the project.

[5] See LOCIMAP D6.3 for more details.
[6] Jacobsen, N. B. (2006). "Industrial symbiosis in Kalundborg, Denmark: a quantitative assessment of economic and environmental aspects." *Journal of Industrial Ecology*, *10*(1-2), 239-255
Park, H. S. (2010). "Eco-efficient and sustainable urban infrastructure development in Asia and Latin America, case study: Eco-industrial park in Ulsan, Republic of Korea." United Nations: 35 pp.

SEVENTH FRAMEWORK PROGRAMME

Cases of planned eco-industrial parks in Netherlands and the US suggest that such projects should be driven by firms and regional governments should only have supportive role[7]. This could include funding of the first and second step of the three step process (Fig. 3) or assumption of facilitator's role. In any case, reassuring long-term stable business climate for investors is very important.

In the present economic climate low carbon investments by industry require patient external funds which tends to require public sector support (The Green Investment Bank in the UK is an attempt to overcome this hurdle). However the difficulties with initiating for example Carbon Capture and Storage programmes in the EU are a further example of where market signals are limited and where public sector support needs to be carefully considered.

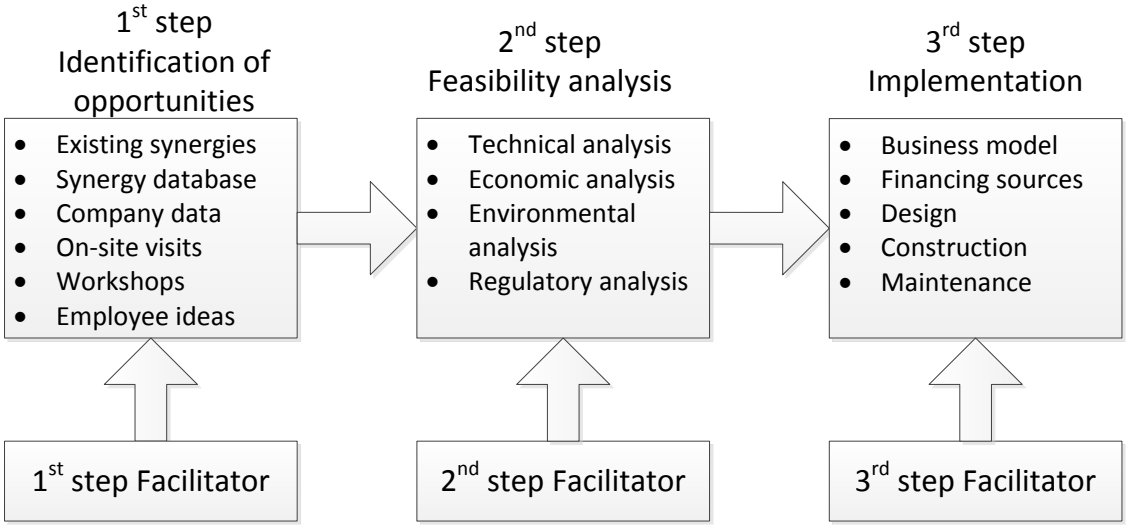

Figure 3. A systematic approach for the development of IS projects

The business model to be followed when running a synergistic project is crucial for the success of the project (Fig.4) since it determines all attributes of this relationship. Firms in the Kalundborg Symbiosis network built their synergistic projects based on profit sharing agreements, whereas Lafarge Tarmac and Scottish Power started a joint venture, Scotash[8]; all of them used own resources, and succeeded mainly because firms committed to the project.

[7] Heeres, R. R., Vermeulen, W. J., & De Walle, F. B. (2004). Eco-industrial park initiatives in the USA and the Netherlands: first lessons. *Journal of Cleaner Production, 12*(8), 985-995.
[8] www.scotash.com

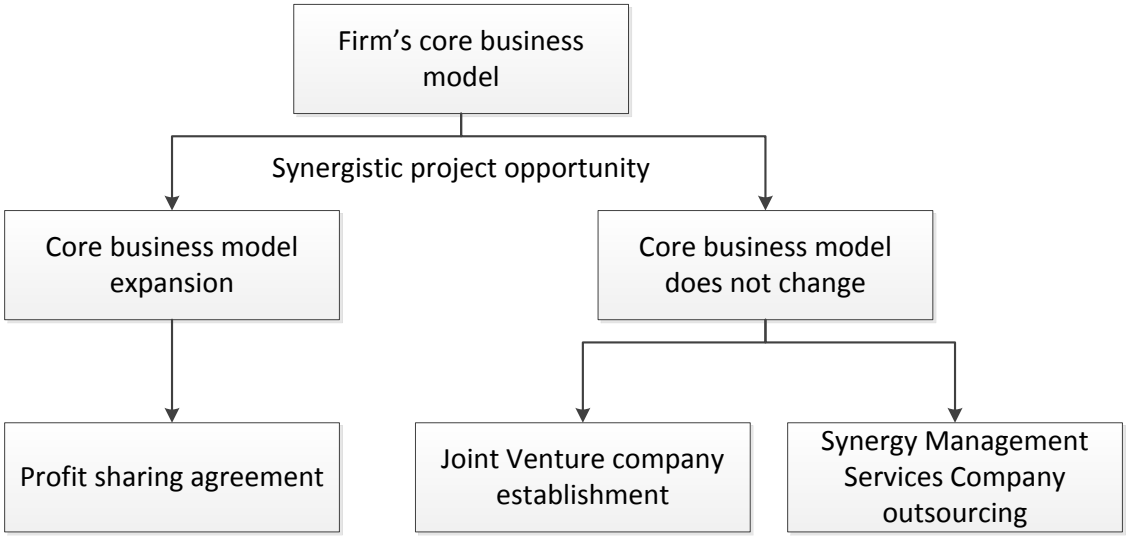

Figure 4. Business model routes for synergistic projects

Even when firms are committed to participate in a project and have overcome all other barriers, the financial barrier remains hard to break. IS projects could be financed, built and run by a third-party. An appropriate business model is the Synergy Management Services (SMS) company.

An SMS company operates similarly to Energy Service Companies (ESCOs), relieving the two parties from allocating resources. The European Park operators can have a central role in the whole systematic approach of IS development within their parks, by adapting their business model accordingly to operate as SMS companies.

5. Conclusions

As the European industrial sector seeks for ways to reduce costs, accommodate regulation on emissions and simultaneously improve competitiveness, the case of developing Industrial Symbiosis within industrial parks becomes more compelling.

There are significant barriers to this which require public policy actions to overcome alongside a more collaborative approach by companies. The experience of success and failure worldwide shows that a focus on symbiosis can work and reduce emissions/ improve sustainability.

A systematic approach for the development of IS within European industrial parks via service organisations would be a major step forward in reducing waste and eliminating CO_2 emissions.