

Waste management policies for industrial symbiosis development: case studies in European countries

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ABSTRACT

Industrial symbiosis (IS) emerged as a self-organizing business strategy among firms that are willing to cooperate to improve their economic and environmental performance. The adoption of such cooperative strategies relates to increasing costs of waste management, most of which are driven by policy and legislative requirements.

Development of IS depends on an enabling context of social, informational, technological, economical and political factors. The power to influence this context varies among the agents involved such as the government, businesses or coordinating entities. Governmental intervention, as manifested through policies, could influence a wider range of factors; and we believe this is an area which is under-researched.

This paper aims to critically appraise the waste policy interventions from supra-national to sub-national levels of government. A case study methodology has been applied to four European countries i.e. Denmark, the UK, Portugal and Switzerland, in which IS emerged or is being fostered.

The findings suggest that there are commonalities in policy instruments that may have led to an IS enabling context. The paper concludes with lessons learnt and recommendations on shaping the policy context for IS development.

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1. Introduction

Human development has been coupled with the evolution of the extraction, use and disposal of natural resources. The altering pattern of human growth improved life style conditions in regions such as Europe, but not without compromising resource availability. This context led to a change in development strategies, towards a vision of sustainability. Stakeholders are called to act responsibly in the equitable sharing of ecological resources, satisfying the needs and aspirations of today and tomorrow's generations (Ehrenfeld, 2000).

As discussed by Ehrenfeld (2000), ecosystems provide the best available example of sustainability: energy and materials are extracted, metabolized and transferred by organisms and across their communities, in a cyclical manner. If anthropogenic systems are driven in a way to emulate ecosystems, it may be possible to learn lessons to progress towards sustainability. This forms the reasoning of Industrial Ecology (IE) (Frosch and Gallopoulos, 1989; Graedel, 1996; Ehrenfeld, 2007; Erkman, 1997), in which industrial systems are described, analyzed and configured as if they were natural, sustainable and mature end of succession (eco)systems.

One important measure relates to the systematic reuse of waste and by-products, which minimizes the need to extract natural resources and the depletion of environmental services (Erkman, 1997). Industrial Symbiosis (IS) can contribute to this objective, since it represents an engagement of traditionally separate industries in a collective approach to competitive advantage, involving the physical exchange of materials, energy, water and/or by-products (Chertow, 2000).

A consistent body of IS research suggests how these synergies emerge and can be fostered (e.g. Chertow, 2000; Lowe, 1997; Chertow, 2007; Desrochers, 2004; Jacobsen and Anderberg, 2004; Mirata and Emtairah, 2005; Gibbs and Deutz, 2007; Hewes and Lyons, 2008; Mirata, 2005). Overall, as Mirata (2005) observed, IS emerges primarily from the private sector as a self-organizing business strategy, driven by economic advantages offered by market dynamics and/or policy requirements. In this context, the authors agree with Boons and Baas (2006) that "IS activities are shaped by the context in which they occur, described in terms of cognitive, structural, cultural, political, spatial and temporal embeddedness".

Although self-organisation is considered a more feasible strategy, some form of coordination can assist further IS development (Chertow, 2007; Gibbs and Deutz, 2007; Schwarz and

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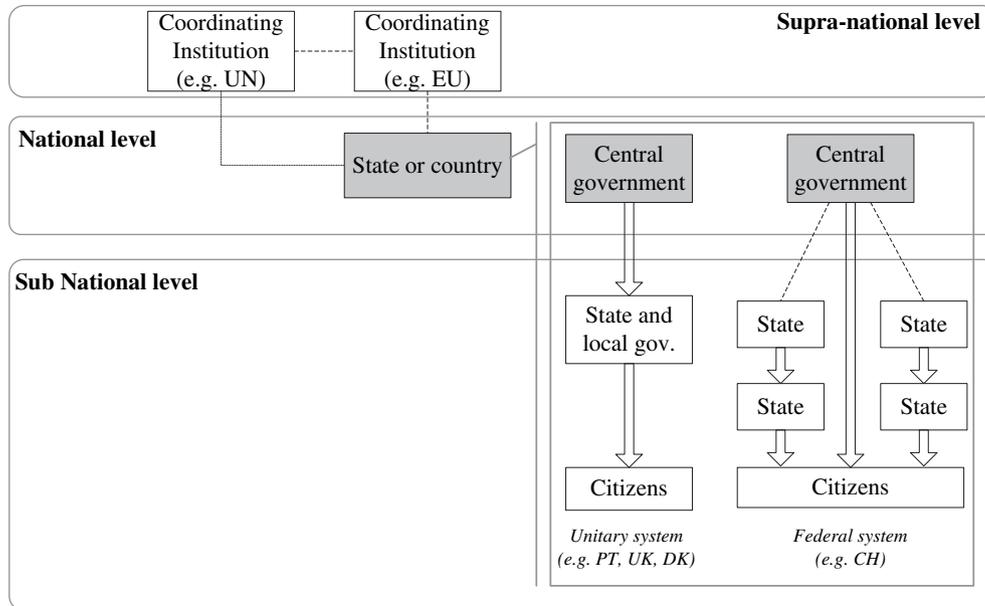


Fig. 1. General schematics of policy and legislative systems. (Source: Authors generated, based on Howe, 1996).

Steininger, 1997; Mirata, 2004). For example, Gibbs and Deutz (2007) mention the catalytic role of the Centre for Alternative Technology in Wales in enabling relationships between businesses, leading to potential eco-industrial developments. However, coordinating bodies are only able to influence some factors within the context, namely informational, organisational and human related, in a fairly localized manner. As Baas (2008) stated, “actors are not equally able to influence each other’s actions and system outcomes, which needs to be taken into account much more fully within IS development”.

Governmental policies are also regarded as being able to influence a wider range of factors (Gibbs and Deutz, 2007; Mirata, 2005; Baas, 2008). For example, in the Rotterdam region, after a period of strong environmental regulations, the national and sub-national governments facilitated programmes to strengthen economic and environmental performance in industry, including the partial funding of IS projects (Baas, 2008; Baas and Boons, 2004). However, policies can also pose barriers to IS (e.g. (Chertow, 2007; Desrochers, 2004; Desrochers, 2000)). For example, Desrochers (2000) mentioned if Danish regulation were to be similar to U.S. regulation IS development at Kalundborg “would be a very difficult if not impossible task”. In the Rotterdam case, Baas (2008) observed that although the regulator engaged with the companies to adjust rules, the policy environment still perceived synergies as handling waste rather than reusing resources.

Since “the role of power is hardly discussed systematically in the IS field” (Baas, 2008), our contribution to this discussion resides on the analysis of governmental influences in the IS development contexts of four European-based case studies. Using a common set of descriptors, cases are analyzed and contrasted in order to identify characteristics of particular governmental jurisdictions that are conducive to IS.

The paper is structured as follows. This section establishes the theoretical reasoning of the paper. Section 2 outlines the structures that support policy development for the European context, and Section 3 introduces the research framework. The case studies are presented in Section 4, followed by the discussion of the results (Section 5). The paper ends with the conclusions, in Section 6.

2. Policy and legislation in Europe

Policy is the course of action of a governmental body, which translates into strategies, tools, or other public decision (Helfand and Loomis, 2001). It commonly involves: 1) setting goals, objectives, and 2) developing instruments of regulatory (e.g. hazardous chemical bans), economic (e.g. landfill taxes) and informational/voluntary (e.g. eco labels) nature.

This paper analyses policy development at three levels: 1) *Supra-national* policies, based on conventions, protocols or programmes, (e.g. the Basel Convention), laying down a conjunct response to transnational challenges; 2) *National* policies, which translate national government objectives, according to its social, economic and environmental context. They can incorporate objectives defined by supra-national policies, or even present more ambitious goals; 3) *Sub-national* policies which are developed at the level of the region, state or municipality. In general, sub-national policies are kept aligned with national objectives; however, they can also be implemented differently in order to address local context factors.

Policy objectives and instruments commonly reflect or are enabled by legislation. Likewise, there may be different levels of legislative authority. In federal and decentralized unitary governments, regions and/or localities may possess some legislative autonomy whereas in unitary systems, this autonomy usually remains with central government (see Fig. 1).

Within the European context, the European Union (EU), as a supra-national institution, has been able to affect policies within the majority of its member countries. In the field of waste management, *The Thematic Strategy on the Prevention and Recycling of Waste* includes the main policies, general objectives and action principles. These principles include firstly the obligation to handle waste without posing a negative impact on the environment or human health and secondly the hierarchy of the best overall environmental options in waste management, from prevention to disposal (EC-European Commission, 2008; 1999).

In terms of legislation, the EU influences member countries through *regulations* (laws applied in full throughout the Community), *directives* (binds members to achieve objectives; however,

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