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# Building capacity for sustainable regional industrial systems: an event sequence analysis of developments in the Sloe Area and Canal Zone

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ABSTRACT

For more than a decade, firms, governmental organizations, knowledge institutes and other relevant actors in the Sloe Area and Canal Zone have been engaged in multiple initiatives dedicated to the sustainable industrial development of their region. In this article, a reconstruction is made of these developments, using Event Sequence Analysis (ESA), to study how actors built and maintained the collaborations that drive these initiatives, and to study the extent to which these initiatives mutually influence each other. The analysis reveals that there are no direct mutual influences between the developments, but that there are indirect influences based on partially overlapping sources of institutional capacity (i.e. the capacity for collective action). Based on the results, several additions are made to existing models of industrial symbiosis that describe the stages through which industrial symbiosis develops. The first addition is the idea that industrial symbiosis can be understood to build on stable intermediate components that develop autonomously from each other. The second addition is that the development of industrial symbiosis itself can be understood as a stable intermediate for more comprehensive developments at a higher system level. The third addition is that the development of industrial symbiosis can be understood to be embedded in a larger social context that influences the opportunities that actors see for collective action towards industrial symbiosis.



## 1. Introduction

Over the past decade a small collection of by-product exchanges and utility synergies has emerged in the Sloe Area and Canal Zone, an industrial port area in the province of Zeeland in the Netherlands (see Fig. 1 for a map of the region). These symbiotic exchanges are the outcomes of a long-term development in which firms, governmental organizations, knowledge institutes and other relevant actors interacted to develop a bio based industrial cluster in the Canal Zone (Biopark Terneuzen). A detailed description of Biopark Terneuzen is offered in an earlier publication (Spekkink, 2013). Biopark Terneuzen is not the only initiative in the region that is dedicated to sustainable development. Another development concerns a joint venture by the port authority Zeeland Seaports and Dow Benelux, that is dedicated to clustering firms that specialize in the production and distribution of chemical products (Valuepark Terneuzen). A third development concerns the activities of a project group that, among other things, organizes master classes on sustainable entrepreneurship for firms in the region (Vital Sloe Area and Canal Zone). In this article the focus of analysis shifts to the Sloe Area and Canal Zone as a whole in order to investigate the relationships between the three developments and the implications of these relationships for the sustainable development of the region as a whole. To that end, a reconstruction is made of each development, focusing on the interactions through which the involved actors built and maintained the collaborations that drove the developments. Then an analysis is offered of the extent to which the three developments mutually influenced each other.

The conceptual basis for the reconstructions is a framework that builds on Healey's concept of institutional capacity building (Healey, 1998; Healey et al., 2003). Boons et al. (2011) and Boons and Spekkink (2012) introduced the concept of institutional capacity building to the literature on industrial symbiosis to investigate how actors build the capacity for collective action towards the development of industrial symbiosis. Collective action is understood here as a more or less coordinated sequence of interactions through which actors work to achieve common goals. Based on the conceptual framework, the focus of the reconstructions offered in this paper will be on activities undertaken by actors in the Sloe Area and Canal Zone to build and mobilize capacity for collective action.

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**Fig. 1.** The southernmost area is the part of the Canal Zone where Biopark Terneuzen is located. The area in the middle is where the complex of Dow (the right part of the area) and Valuepark Terneuzen (the left part of the area) are located. The uppermost region is the Sloe Area (source: Google Maps).

The developments under investigation in this article took a long time to unfold and therefore a longitudinal approach to their investigation is fitting. The approach adopted in this investigation is Event Sequence Analysis (ESA) (Spekkink, 2013; Boons et al., 2014). ESA builds on other process-oriented research approaches (Abell, 1987; Abbott, 2001; Langley, 1999; Poole et al., 2000) and is developed by researchers of the research cluster 'Governance of Energy and Material Flows'[1] at the Erasmus University of Rotterdam as an approach for the systematic longitudinal investigation of governance processes.

The conceptual basis for the research is introduced in more detail in Section 2. In Section 3, ESA is introduced and the approach taken to the collection, organization and analysis of data is elaborated. In Section 4 the results of the analysis are presented and in Section 5 the conclusions of the research are presented.

## 2. Conceptual framework

### 2.1. Institutional capacity

The central concept of the conceptual framework (see Fig. 2) is that of institutional capacity building (Healey, 1998; Healey et al., 1999, 2003). Institutional capacity is defined as the capacity of a community of actors to engage in collective action to deal with issues of common concern (Healey et al., 1999). A community can be defined as "[ … ] a group of people who interact directly, frequently and in multi-faceted ways" (Bowles and Gintis, 2002, p. 420). The stance taken in this research is that communities emerge from frequent interactions, which means that the existence (and development) of a community presupposes interactions, instead of the other way around. Following Healey et al. (1999), institutional capacity can be broken down into three dimensions:

- Relational capacity: capacity for collective action based on the quality of the relationships of actors, such as the number and range of actors involved in the community as well as the level of trust between them.
- Knowledge capacity: capacity for collective action based on the quality of the knowledge and experience of the members of the community as well as the alignment of definitions of problems and solutions.
- Mobilization capacity: capacity for collective action based on the existence of a shared strategic vision and the presence of actors within the community that are willing and able to take the lead.

Institutional capacity is closely linked to the opportunities that individual actors in a community see for engaging in collective action. First, the number and diversity of actors in a community will shape the opportunities that its members see for engaging in

[1] The research cluster 'Governance of Energy and Material Flows' is part of the research group 'Governance of Complex Systems' in the Public Administration department of the Erasmus University Rotterdam.