

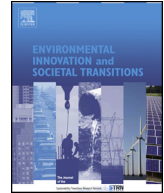


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Contents lists available at ScienceDirect

Environmental Innovation and Societal Transitions

journal homepage: www.elsevier.com/locate/eist



Broadening the national focus in technological innovation system analysis: The case of offshore wind

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ARTICLE INFO

Article history:

Received 25 November 2012

Received in revised form 2 September 2014

Accepted 3 September 2014

Keywords:

Offshore wind

Systemic policy

Systemic problems

Technological innovation system

Territorial embeddedness

Transnational linkages

ABSTRACT

This paper empirically explores if and how the spatial dimensions of Technological Innovation System matter using the case of offshore wind in North-Western Europe. In particular, it demonstrates the territory-specific institutional embeddedness and transnational linkages effects between four national offshore wind innovation systems. The paper discusses the consequences of taking these spatial dimensions into account in the analysis of the domestic TIS performance. It argues that the acknowledgement of these dimensions contributes to better understanding of the systems' dynamics and leads to policy advice that is in sync with recent internationalisation developments in the diffusion of the offshore wind industry.

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<http://dx.doi.org/10.1016/j.eist.2014.09.001>

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1. Introduction

The Technological Innovation System (TIS) perspective has become a popular analytical tool to explain the success and failure of the development and diffusion of renewable technologies and their contribution to sustainability transitions. The core of the TIS perspective comprises the analysis of the emergent structural configuration of the innovation system (actors, networks, technology, institutions) and major processes (also labelled as system functions) that support the formation and development of radically new technological fields (Hekkert et al., 2007; Bergek et al., 2008). Analyses based on the TIS perspective create insight in the weaknesses of the innovation system and suggest ways in which the development and diffusion of technology can successfully be improved (Wieczorek and Hekkert, 2012). The specific focus on analysing emergent technological fields distinguishes TIS from related frameworks (Coenen and Diaz-Lopez, 2010) like the sectoral (Malerba, 2002) and regional innovation systems (Cooke, 2001).

Technological Innovation Systems are essentially global systems. Initial conceptualizations of TIS have emphasised that technology development and diffusion are processes that cut across spatial boundaries (Carlsson and Stankiewicz, 1991; Carlsson, 1997). Hence, the most appropriate way to understand the emergence of new technology would be to study the TIS as a global system (Binz et al., 2014). However, many empirical TIS studies delineate their analysis to a single country, see e.g. Jacobsson and Lauber (2006), Negro and Hekkert (2008), Hekkert et al. (2007), Negro et al. (2007), Bergek et al. (2008) or Hillman et al. (2008). The choice for a *national* focus is often justified by the importance of national institutions for technology development and diffusion and by the aim to inform domestic technology and innovation policy. The international aspects that influence such nationally delineated technological fields are predominantly discussed under a broad term of *exogenous forces* without a clear explanation of their impact on the analysed TIS (Coenen and Truffer, 2012; Markard et al., 2012). By treating these influences as merely exogenous or contextual, there is a risk of overlooking the TIS' interconnectedness with other innovation systems, on national, regional or sectoral levels as pointed out in a recent reflection paper on TIS by Jacobsson and Bergek (2011). This weakness is further substantiated by recent observations made in sustainability transition literature concerning the spatial distribution and variation of structural configurations of the systems (Berkhout et al., 2011; Dewald and Truffer, 2011; Späth and Rohracher, 2012; Coenen et al., 2010, 2012; Truffer and Coenen, 2012; Binz et al., 2012; Raven et al., 2012). Without spatial sensitivity, it is argued, TIS studies overlook how national policies and resources may be conditioned by broader international networks, markets and institutional configurations and thus influence the impact of these policies and resources in considerable ways. A narrowly defined national focus may, for example, underestimate the importance of other countries in technology development and therefore overestimate the role of a national government in R&D stimulation. To avoid containerized TIS studies (Binz and Truffer, 2012) more attention to the spatial dimensions of TIS is therefore called for (Coenen et al., 2012).

In this paper, we concentrate on empirically exploring if and how the spatial dimensions of TIS matter using the case of offshore wind in North-Western Europe. Offshore wind is an emerging renewable energy technology with considerable potential and for this technology Europe is the leading continent in terms of installed capacity, key industrial players and profitability potentials (Makridis, 2013). Using insights from an earlier TIS analysis of offshore wind in Germany, the Netherlands, the UK and Denmark respectively (Wieczorek et al., 2013), we aim to demonstrate the implications of moving beyond a national TIS focus by highlighting the territory-specific institutional embeddedness and transnational linkages effects between the four national offshore wind innovation systems. In particular, we discuss the consequences of taking these spatial dimensions into account in the analysis of systemic problems. Due to our focus on four countries we acknowledge that we do not create a full picture of the global TIS for offshore wind and its implications for national development. However, the chosen scope does make it possible to analytically show what a spatially sensitive view adds to an (implicitly) nationally focused TIS analysis.

For our analysis we draw on the TIS framework complemented by insights from economic geography on territory-specific institutional embeddedness and transnational linkages, explained in Section 2. In Section 3 we describe the methodology. In Section 4 having presented basic facts about offshore wind in Europe we discuss structural configuration and functional performance of four nationally

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