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Sustainable practices of the energy transition – Evidence from the biogas and building industries in Luxembourg

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1. Introduction

Mechanisms, policies and trajectories leading to more sustainable ways of energy production and utilization have been increasingly studied under the notion of socio-technical transitions or transition studies (TS; for a comprehensive overview see Geels, 2010). Long-lasting processes of change in regulatory frameworks, institutional settings and technological evolutions have been in the center of such co-evolutionary analyses. This focus on socio-technical systems particularly highlights the interplay of and relationship between institutional structures, changing user practices, the environment, society at large, and technologies (Furlong, 2010; Markard, Raven, & Truffer, 2012).

A main topic of TS analyses is the shift to sustainable energy deployment and utilization, the so-called energy transition (Verbong & Geels, 2010; Dewald & Fromhold-Eisebith, 2015). This long-term structural change of energy systems becomes visible technologically in increasing energy efficiency and in replacing conventional energy sources (mostly oil, coal, natural gas and nuclear) with decentralized renewables (wind, hydropower, solar power, geothermal, and ocean power). TS highlight that these technological changes can only be understood by incorporating their social dimensions, making it socio-technical transitions (Markard et al., 2012).

The geographical enquiry of TS highlights the importance of a spatial understanding of the energy transition. Researchers focus on the uneven spatial spread of transitions (Affolderbach & Schulz, 2016; Bulkeley & Castan Broto, 2013; Hodson & Marvin, 2009), the importance of local contexts for transition processes (Bridge, Bouzarovski, Bradshaw & Eyre, 2013; Coenen & Truffer, 2012; Faller, 2016a; Fastenrath & Braun, 2016; Murphy, 2015; Nadaï & van der Horst, 2010), the spatial dimensions of networks from local to global (Binz et al., 2014; Gibbs & O'Neill, 2015; Wirth, Markard, Truffer & Rohracher, 2013), or the governance of transitions at and across different scales (Coenen, Benneworth & Truffer, 2012). Nonetheless, in a recent meta-analysis of the geographical TS literature Hansen and Coenen note that "there is still little generalizable knowledge about how place-specificity matters for transitions" (Hansen & Coenen, 2015, p. 92).

In order to account for the place-specificity of socio-technical transitions the seminal work of Shove and Walker (2007, 2010) as well as Barr's (2014), Faller's (2016a) and McMeekin and Southerton's (2012) contributions argue for a practice turn in TS. They illustrate that transformation processes are rooted in changing practices that relate to and create contextual factors. In a similar vein, James (2007), Jones and Murphy (2010), Jones (2008, 2013), and Radwan and Kinder (2013), all economic geographers, show that the emergence and change of routines in market processes or network-building activities – which are fundamental for the current geographical enquiry of TS – crucially depend on agents' practices. Consequently, focusing on practices bears the potential to further deepen our understanding of sustainability transitions and their place-specificity. This is what we address with the paper in hand: How can we conceptualize and methodologically examine sustainable practices in order to develop a deeper understanding of the energy transition and its contextual factors?

For developing a solid understanding of sustainable practices of the energy transition, the paper will, first, discuss transitions as changing practices. This will start with a summarization of theories of practice as conceptual foundation for understanding transitions as practice phenomena. It includes a brief discussion on distinguishing concepts focusing on atomistic, individual behaviors vis-à-vis collective or social practices of so-called Communities of Practice (CoP). Thereafter, we discuss the role of actors, or agents, for transitions, as all practices are ultimately carried out by them. Finally, contextual factors for transition practices are subject of our

Abbreviations: CHP, Combined heat and power biogas production; CoP, Community of Practice; LAPRE, Luxembourg Action Plan for Renewable Energies 2010; TS, transition studies.

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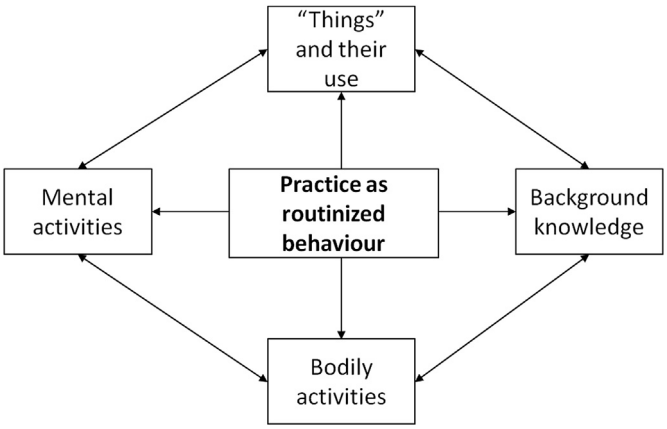

Fig. 1. Elements of practices, own illustration based on Reckwitz, 2002.

concept, because actors and their practices are embedded in a multitude of contexts (e.g. regulatory frameworks, institutional settings).

Second, studying the examples of combined heat and power biogas production (CHP) in the agricultural sector as well as the green building sector in the Grand Duchy of Luxembourg, we focus on changing practices and the evolution of diverting actor constellations. We are particularly interested in changes of CoPs and how they are constructed by agents in the respective sectors. Since the inquiry into these CoPs necessitates a reflection on appropriate research methods, we discuss the use of innovative, interactive research methods and of new ways of handling qualitative interview data. Both help to provide better understandings of ongoing changes in each CoP. Since the methodological approaches for both case examples are distinct we introduce them in the respective case sections.

Third, our findings allow drawing some conceptual and methodological conclusions as well as giving policy recommendations. Finally, we provide a summarization of main findings and an outlook on further research needs.

2. Transitions as changing practices

Theories of practice focus on social practices and routines,[1] rather than on agents and their actions. In a comprehensive discussion of practice approaches – such as Bourdieu's, Gidden's, Shove's or Schatzki's theories of social practice - Reckwitz (2002) defines a practice as "a routinized type of behavior which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge" (Reckwitz, 2002, p. 249; Fig. 1). Building a house, for example, comprises various elements, such as a person designing the house and someone actually building it up (bodily activities), the land on which the house is build or the raw materials for bricks and windows (things), the fundamental understanding of and desiring of a house (mental activity), as well as the know-how for actually combining all the elements (background knowledge). "A practice […] forms so to speak a 'block' whose existence necessarily depends on the existence and specific interconnectedness of these elements, and which cannot be reduced to any one of these single elements" (Reckwitz, 2002, pp. 249 f.). Therefore, a practice is more than solely behavior – as widely used in energy research for understanding change in mostly consumption patterns relating to "personal norms concerning energy efficiency and curtailment and various specific beliefs" (Stern, 2014, pp. 41–48) – but incorporates behavior as one dimension of social practices. Furthermore, behavior studies follow rational choice models focusing individuals (Moezzi & Janda, 2014, p. 32), while practice approaches point at the constitutive and collective significance of human interaction for social change.

As Hargreaves (2011) shows in the case of pro-environmental behavior change, theories of practices offer a "broader and more holistic conceptualization" (Hargreaves, 2011, p. 80) of behavior change than behavior studies themselves. It is obvious, though, that individuals are the performers of a practice, but the way of performing a specific practice appears in collective uniformity. Consequently, a practice is more than a single action or an individual's activity. It requires collectivity and co-existence of people as well as recognizable and repeated patterns of interdependent elements. This leads to the insight that, for example, the practice 'building a house' is recognizable as a distinct social practice independent from the actual people building it and the type of the physical building, whether sky scraper, one-family house, or dog kennel. The complexity of elements involved might be different, but the elements themselves as analytical categories help us to understand the social practice.

Jones and Murphy (2010, p. 372) illustrate that a practice-focused approach is also helpful to understand how practices "constitute, reproduce, or transform structural forms (e.g., production systems, institutions, communities, livelihood patterns, networks, markets, power structures)". This builds on the insight that practices are dynamic. They can be stable as well as change. Analyzing practice elements helps us to understand "how various sustainable practices come into existence, how they disappear and how interventions of various forms may be implicated in these dynamics" (Shove & Walker, 2010, p. 476). This transformation of structural forms in sustainability transitions is our main interest. Reckwitz (2002, p. 255) notes that "the 'breaking' and 'shifting' of structures must take place in everyday crises of routines, in constellations of interpretative interdeterminacy and of the inadequacy of knowledge with which the agent, carrying out a practice, is confronted in the face of a 'situation'". This highlights, first, that a structure is a temporal feature of practices. Second, it points at the role of human constellations and the role of agents.

2.1. The people of transitions

Agents are the starting point for practice research. They are the ones "who ‚carry' and, carry out' social practices. […] As carriers of a practice, they are neither autonomous nor the judgmental dopes who conform to norms: They understand the world and themselves, and use know-how and motivational knowledge, according to the particular practice" (Reckwitz, 2002, p. 256). They are "those people who act and interact in firms and other organizations to produce economic value" (Jones, 2013, p. 2). Consequently, from a philosophically rigid point of view, agents are individuals, subjects, who represent the intersection of various stocks of knowledge and behaviors related to a particular practice (Reckwitz, 2003, p. 296). As carriers of practice they inter-subjectively exchange and disperse all sorts of knowledge, knowing in practice, and thereby practices themselves. This inter-subjective situation points at the requisite of multiple people for a practice.

Agents performing the same practice are part of one Community of Practice (Wenger, 1998). CoPs are social situations, in which routines are produced, transformed and exchanged (Gertler, 2001)

[1] Since routines are generally defined as „repetitive, recognizable patterns of interdependent actions, carried out by multiple actors" (Feldman & Pentland, 2003: 95), we are using the terms practice and routine synchronously in this article.

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