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Scaling-up energy conservation initiatives: Barriers and local strategies

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ABSTRACT

Energy conservation in residential and commercial buildings is considered a key challenge and opportunity for low-carbon urban development. In cities worldwide, energy conservation initiatives have been realized that demonstrate the social, financial, and environmental benefits that energy conservation can generate. However, in order to accomplish international goals pertaining to climate mitigation, these initiatives need to go to scale and reach a greater and broader audience. To accelerate the scaling-up of such initiatives, an in-depth understanding of barriers hampering this process and local strategies that can be applied to address these barriers is required. While scholars and practitioners underline the importance of local solutions to the global problem of climate change, little is known about strategies that can be applied at the local level to overcome barriers. This paper has three general findings that can make a valuable contribution to theory and practice on urban climate governance. First, it sketches the context-specificity of barriers to scaling-up energy conservation initiatives and reflects on similarities and differences in barriers to energy conservation in residential and commercial building stocks in two European cities: Utrecht and Valencia. Second, this paper presents several local strategies that can be applied to overcome barriers, thereby improving our understanding of the relation between barriers and solutions. Finally, the findings of the paper suggest that while many barriers have national or international origins, the local environment appears to be a promising scale to address barriers.

1. Introduction

The retrofitting of residential and commercial buildings is considered a key challenge and opportunity for low-carbon urban development (Immendoerfer, Winkelmann, & Stelzer, 2014; Levine et al., 2007). In Europe, the building stock is the greatest contributor to carbon emissions and contributes to approximately 40% of final energy consumption (Pérez-Lombard, Ortiz, & Pout, 2008; UNEP, 2009). Energy conservation is seen as the fastest and most cost-effective way to mitigate climate change and reduce global greenhouse gas emissions (GHG) (Levine et al., 2007). Energy conservation initiatives (henceforth 'EIs' or 'initiatives') in the existing building stock – focused on the implementation of technological or behavioural energy conservation measures to reduce energy consumption and abate GHG emissions – are regarded effective means to accelerate the transition to low-carbon cities. In addition to their climate mitigation impacts, EIs are associated with various co-benefits, including job creation, business opportunities, and increased comfort, health, and quality of life of citizens (Boardman, 2010; Immendoerfer et al., 2014; Levine et al., 2007; UNEP, 2009).

In European cities, EIs have been realized that demonstrate the financial, social, and environmental benefits of energy conservation. Previous studies have reflected on success factors to the realization of such initiatives and indicate that successful initiatives are often initiated by actors who are intrinsically motivated to engage in the process due to their levels of environmental concern and willingness to pioneer (Chmutina, Wiersma, Goodier, & Devine-Wright, 2014; Klein Woolthuis, Hooimeijer, Bossink, Mulder &

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Brouwer, 2013; Seyfang, 2010; van Doren, Driessen, Runhaar, & Giezen, 2016). However, what are barriers to the increase in uptake, spatial growth, and replication – i.e., the scaling-up (van Doren et al., 2016; World Bank, 2003) – of such EIs? And what strategies can initiators of EIs and other actors with an interest in the scaling-up of EIs apply in order to address these barriers? In order to develop effective urban governance arrangements for accelerating the low-carbon transition, we need to develop an integrative understanding of barriers to scaling-up and local strategies that can address these barriers. First, an accurate diagnosis of the diversity of barriers hampering the scaling-up of EIs is required. Studies often emphasize different barriers, and there is a need to combine these various perspectives in order to obtain an integrative overview of the full spectrum of barriers that need to be addressed. Moreover, while studies suggest that barriers to energy conservation are context-specific and interconnected, there is a need to further enhance our understanding of these issues (Fleiter, Schleich, & Ravivanpong, 2012; Kranzl et al., 2014; Stieß and Dunkelberg, 2013; Trianni and Cagno, 2012). Second, local strategies need to be identified that can address the different barriers. A focus on the local level is deemed justified because cities, municipalities, and urban regions worldwide have expressed their interest in promoting low-carbon urban development, demonstrating that the local context is an appropriate scale at which strategies to address barriers will be put into action (Betsill and Bulkeley, 2006; Burch, 2010; Schreurs, 2008; Selman, 1998). However, due to the relatively immaturity and lack of institutionalization of the field of urban climate governance (Anguelovski and Carmin, 2011), there is still limited knowledge on strategies that public and private actors can apply to further the low-carbon transition. Previous studies have focused primarily on strategies that can be applied at the international and national level by state actors (Baek and Park, 2012; Kranzl et al., 2014; Tuominen, Klobut, Tolman, Adjei, & de Best-Waldhober, 2012) and scholars stress the need for a greater understanding of how local strategies can contribute to mitigating the global problem of climate change (Anguelovski and Carmin, 2011; Burch, 2010; Rutherford & Jaglin, 2015).

This paper aims to contribute to theory and practice on urban climate governance by diagnosing the nature of, and relations between, barriers to scaling-up EIs and by exploring local strategies that can address these barriers. While EIs are realized in different types of buildings, the focus of analysis will lie on scaling-up initiatives in residential and commercial buildings, because these two building stocks are jointly accountable for the major share of energy consumption (UNEP, 2009). A comparative analysis is conducted of two European cities, Utrecht and Valencia, in which the local governments aim to accelerate low-carbon urban development and various EIs have already been realized (Municipality of Valencia, 2014; Municipality of Utrecht, 2011). The variation in terms of socio-cultural, market, policy, and built and geographical context allows us to explore the context-specificity of barriers and general conditions required for scaling-up.

The paper will proceed with an introduction to our analytical framework. Section 3 will elaborate on the method applied. Subsequently, section 4 will present the results of our analysis, followed by a comparative analysis and reflection on the findings in section 5.

2. Analytical framework

2.1. Barriers to scaling-up energy conservation initiatives in the existing building stock

Energy conservation initiatives refer to initiatives where energy conservation measures (ECMs) are applied. Examples include the retrofitting of streets or neighbourhoods, housing blocks, or business districts. There is an extensive array of technological and behavioural ECMs that can be applied to reduce energy consumption and abate GHG emissions in existing buildings. Measures to save energy can relate to, amongst others, the building's thermal envelope, heating system, HVAC, energy management, lightning, water management, appliances and electronics, and occupant behaviour (Abdellatif & Al-Shamma'a, 2015; Levine et al., 2007). In addition to climate mitigation, EIs can also generate co-benefits such as improvement in health, productivity, comfort, and local employment (Boardman, 2010; Immendoerfer et al., 2014; Levine et al., 2007; UNEP, 2009). While the retrofitting of existing buildings – through EIs – has the potential to reduce Europe's building sector's emissions with 30–36% by 2030, there is a need to accelerate the scaling-up of EIs in order to reach this potential and accomplish international and European climate mitigation goals (Energy Efficiency Financial Institutions Group (EEFIG), 2014; International Energy Agency (IEA), 2013; Levine et al., 2007; UNEP, 2009).

While the concept of scaling-up can encompass various meanings, we interpret it as a process where there is an increase in uptake, growth, or replication of EIs ('horizontal pathways to upscaling', see World Bank, 2003; van Doren et al., 2016). At present, EIs are primarily realized by actors who are driven by environmental concern and a willingness to demonstrate that 'it can be done' (Chmutina et al., 2014; Klein Woolthuis et al., 2013; Seyfang, 2010; van Doren et al., 2016). However, to accomplish the low-carbon transition, such initiatives need to be scaled-up beyond green-minded actors and reach a wider public. Yet, the widespread scaling-up of EIs remains a challenge due to various barriers to energy conservation that the wider public, such as households and enterprises, are confronted with. An adequate assessment of barriers experienced by this group is required to deepen the knowledge base on conditions that need to be addressed to accelerate the scaling-up of EIs. We define barriers to scaling-up EIs as any condition or factor that impedes households, enterprises, or other demand-side actors from initiating, engaging in, or replicating EIs, thereby limiting their upscaling. Table 1 presents a summary of factors found in empirical peer-reviewed papers and scientific reports, from different scientific disciplines, reporting on factors that can positively or negatively influence energy conservation, thereby appearing as driver or barrier. Building on the categorization of van Doren et al. (2016), the factors identified in literature were classified into four general categories of the contextual environment of EIs. The socio-cultural context refers to a collection of factors related to the characteristics of the demand-side actors, including their level of awareness, values, attitudes, and capacity. Factors regarding the market context relate to the characteristics of ECMs, skills and experience of supply-side actors, and the conditions that enable demand-side actors to invest in the ECMs, such as information and credit availability. The policy context concerns the policy framework, such as legislation and policy leadership, which influence the ability and attractiveness to invest in ECMs. The built and geographical context, such as building characteristics and the climate, determine the potential for energy conservation. We expect that barriers to scaling-up might be diverse and depend on the type of building stock and urban context. This corresponds to the notion that while some barriers are always mentioned in studies, others are reported incidentally.

2.2. Local strategies to address barriers

The identification of barriers leads to knowledge on the conditions that need to be addressed in order to support the scaling-up of EIs. It is assumed that by removing a broad variety of barriers and creating facilitative conditions, the scaling-up of EIs can be accelerated. In this paper we explicitly look for local strategies that can