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Discourses of carbon neutrality and imaginaries of urban futures

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ABSTRACT

By analyzing the discourses in carbon governance texts, this paper identifies visions for the built environment in carbon neutral urban futures and the storylines driving those urban imaginaries. Local authorities have begun aiming for 'carbon neutral' transformations, but it is not clear what kind of city will result. Different imaginaries about the futurity of energy will send cities down divergent sociotechnical paths. Using discourse analysis, this paper identifies the storylines underlying sociotechnical imaginaries of urban carbon neutrality among the 17 founding members of the Carbon Neutral Cities Alliance, which is a network of local governments mainly from Europe and North America pioneering deep decarbonization. This paper elaborates on five storylines in urban carbon governance texts: 1. The diverse meanings of carbon neutrality 2. The new economy of carbon control 3. The city as a laboratory 4. Technological fixes and the modern city and 5. Reframing what it means to be a 'good' urban citizen. The developing sociotechnical imaginary of urban carbon neutrality is structuring shifts in policy and practice. Trends include a focus on technological fixes and innovation as solutions where private capital is a fundamental partner, as well as reflexivity about the experimental nature of achieving carbon neutrality.

1. Introduction

We do not yet know what a completely carbon neutral city looks like. Nevertheless, imaginaries have begun to shape these urban futures through policy documents around the world. Local authorities have begun aiming for 'carbon neutral' transformations [1]. These transformations will not culminate in one kind of city; different imaginaries about the futurity of energy will send cities down divergent sociotechnical paths. It is not yet clear what these paths will look like and whether they all might lead to significant greenhouse gas emission reductions.

Imaginaries about a place influence policy outcomes through their repeated performance [2,3]. Rather than 'just talk' then, the discourses underlying imaginaries do political work and become a lens through which we see the world and make decisions [2,4]. The power of these visions for the future, or 'sociotechnical imaginaries' [5], is reinforced and amplified as they are embedded into material networks and societal norms. In this way, sociotechnical imaginaries define what kind of future is both desirable and possible. The processes of imagining and producing energy futures are understudied despite the importance of these dynamics in ordering society [6]. Here we undertake an analysis of sociotechnical imaginaries, which is a type of analysis that is "a form of intensely political narration, reminding both observers and observed that the seen reality is not the only one about which we can dream" [2].

The aim of this paper is to examine the meaning of 'carbon neutral' in policy discourses to illuminate the sociotechnical paths to low carbon futures that are imagined by urban decarbonization pioneers. In order to unpack carbon neutrality, we analyze the discourses represented in urban carbon governance texts of the 17 founding members of the Carbon Neutral Cities Alliance, which is a network of local authorities mainly from Europe and North America that are pioneering deep decarbonization. We identify the storylines underlying urban imaginaries of carbon neutrality among these pioneers. By unpacking the storylines driving urban imaginaries, this paper provides insight into hegemony among ideas about urban carbon neutrality. Before tackling this aim, we first provide a discussion of the literature on sociotechnical imaginaries and storyline analysis of policy discourses, which inform this study.

2. Imaginaries of urban futures

Ideas about what the future can be powerful drivers of action in the present since these visions are embedded into decisions affecting the social and technical fabric of our society. Our understanding of who we are and where the future is headed are created and maintained through socio-technical networks spanning across society [5]. These ideas about the future, or "sociotechnical imaginaries" [5], do not just describe desirable futures, but also delimit attainable ones. Sociotechnical

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imaginaries are defined as "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology" [2]. This concept considers how visions of social order are coproduced with science and technology. Sociotechnical imaginaries are performed through exercises of power like target and policy setting, which shape infrastructures, objects and institutions. It is this performative dimension that links sociotechnical imaginaries to policy as well as politics [2]. Particular visions of the future gain traction through acts of power, ongoing coalition building and the fostering of innovation [2,7]. Using this concept, scholars have explored where transformative ideas come from as well as how imaginations become solidified in practice through the adoption of social norms and the performance of objects [2].

While Jasanoff and Kim [2,5] orient sociotechnical imaginaries particularly to the national level and tackle topics like nuclear power in the US and South Korea, they suggest there is no reason to limit the concept to this scale. In this paper, we consider a transnational sociotechnical imaginary. Other researchers have applied the concept to a variety of scales as well as multi-scalar interactions [7–10]. Indeed, national sociotechnical imaginaries may be contested locally [8] or new imaginaries may emerge from local, everyday experience [10]. However, it can be difficult to actually attain the future described in one group's sociotechnical imaginary if there is contention or a lack of power to change material infrastructures [8,10]. In this volume, Schelhas et al. highlight local counter-narratives in the development of sociotechnical imaginaries of biofuel in the US [11] and Delina uses the concept of sociotechnical imaginaries to examine contestation among powerful and powerless actors seeking to shape the desired future of energy in Thailand [12]. Urban carbon neutrality is a sociotechnical imaginary that is under development, but we can examine nascent imaginaries to consider what the implications will be as these visions are embedded into society. In the case of developing visions for low carbon housing in the UK, for example, experts have two competing visions for possible futures: Passivhaus and Smart Homes [13]. Passivhaus uses mainly passive and low-tech design to make homes so efficient there is no need for traditional heating and cooling systems. Smart Homes, in contrast, are high-tech buildings that make extensive use of information and communication technologies to automate control of the domestic environment [13]. As this example demonstrates, choices exist about potential sociotechnical pathways when sociotechnical imaginaries are under development, but one or more may be shut down as one imaginary gains traction.

Policy discourses are recommended as useful place to start for analyses of sociotechnical imaginaries [2]. In this paper, we unpack the discourses represented in carbon governance documents using discourse analysis and literature on storylines. Scholars have used discourse analysis to consider the role of storylines in policy making. Discourse analysis derives from an intellectual tradition concerned with power dynamics, which means that it is well suited to our examination of the production of meaning and power in the negotiation of carbon governance. Discourse analysis aims to explore the outcomes of discourse in actions or attitudes, to identify the frameworks within which discourses are produced and circulated, and to reveal the structures that reinforce particular statements as normal or 'true' [4,14,15]. Instead of seeing statements as just a method of expression, it examines discourses as practices within regulating structures and analyses the effects of texts [11]. Hajer [13] uses the concept of a discourse coalition to explain how people can develop shared terms, or 'storylines', that construct environmental problems and delimit potential responses. He sees a storyline as "a generative sort of narrative that allows actors to draw upon various discursive categories to give meaning to specific physical or social phenomena" [16]. However, members of the discourse coalition might interpret these storylines differently. In fact, he argues that this might be a key way that a coalition is formed and maintained.

In a useful application for this study, Lovell et al. [14] employed discourse analysis to examine what kinds of storylines are dominant in the climate and energy policy field in the UK. They identify four principal storylines: (1) climate change as a problem of energy supply, (2) climate change as a problem of energy demand, (3) climate change as a market efficiency problem, and (4) climate change as an international problem [17]. Applied similarly here, a storyline analysis approach allows us to examine what kinds of ideas about carbon neutrality are powerful among the Carbon Neutral Cities Alliance members. The Carbon Neutral Cities Alliance is a transnational climate governance network of local governments that have adopted a target of at least an 80% reduction of greenhouse gas emissions by 2050 [1]. A storylines approach is particularly helpful in adding structure to sociotechnical imaginaries analysis, in which researchers tend to use a wide range of methods and theoretical approaches. Here, we use a storylines approach as a way to analyze sociotechnical imaginaries about carbon neutral urban futures.

The focus on *carbon neutral* futures is particularly important. In some cities, there has been action for decades to try to address climate change [18–21]. Local governments have set greenhouse gas emission reduction targets and adopted climate change response plans [22]. Business, government and community sector actors have been using both social and technical means to intervene in urban systems in response to climate change [23]. Local governments have also banded together in transnational networks focused on municipal climate governance and have tried to use these new political spaces to facilitate low carbon transitions [24]. However, urban climate governance has faced many barriers that have proven difficult to overcome and have prompted mainly incremental rather than systemic changes to urban systems [18,19,25]. Despite these challenges, the founding members of the Carbon Neutral Cities Alliance are imagining urban futures that are carbon neutral, which implies the achievement of systemic transformations. However, the nature of these carbon neutral futures is not clear, especially given the barriers that have been encountered so far and the multiple possible pathways to decarbonization. It is in this context that this paper unpacks the meaning of 'carbon neutral' and illuminates the sociotechnical imaginaries of low carbon futures.

3. Methods

This paper focuses on the deep carbon reduction planning documents produced by the founding members of the Carbon Neutral Cities Alliance.[1] Through network activities, these local governments (listed in Table 1) share insights as they pursue "deep decarbonization" [1]. These pioneers have laid the groundwork for aggressive long-term carbon reduction goals.

We collected climate governance texts that have been produced on behalf of each of the 17 founding members of the Carbon Neutral Cities Alliance (CNCA) (see Table 1). The governance texts were municipal-led, but often included participation from local stakeholders and significantly referenced both flows and authorities well beyond the official scope of the local government. The climate governance texts in this sample were produced between 2009 and 2015 and range from short-term climate action plans to long term decarbonization 'roadmaps'. They were in English, which is the language used within the transnational CNCA network, and they were freely available to the public. Document analysis is an appropriate approach because deep decarbonization is largely in the planning stages, which means that policy discourses on carbon neutrality are primarily textual at this point. Furthermore, a document analysis approach allows for the inclusion of 17 urban areas in order to build a broad understanding of carbon neutral sociotechnical imaginaries. The limitations of this approach

[1] The Carbon Neutral Cities Alliance, founded in 2015, is administered by the Urban Sustainability Director's Network with the C40 Cities Climate Leadership Group and the Innovation Network for Communities (USDN, 2015).

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