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Promises and Techno-Politics: Renewable Energy and Malmö’s Vision of a Climate-Smart City

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ABSTRACT
Malmö aims to become Sweden’s most climate-smart city and Hyllie, its newest city district, is to lead the way. This ambition is front and centre in the 2011 Climate Contract that envisioned Hyllie as a climate-neutral city district. Malmö signed the Climate Contract with Eon, a multinational energy company. But five years after signing the Climate Contract, Malmö and Eon gave up their goal of making Hyllie climate-neutral by 2020. The Climate Contract resembles other smart city initiatives that many researchers have criticised for promoting technology-centric, corporation-controlled visions of cities. Assemblage urbanism and the sociology of expectations help to analyse the techno-political dynamics between organisations, visions and urban infrastructure. The realisation of a vision is a techno-political process that requires the coordination of multiple groups around multiple promises. At first, it was the Climate Contract that helped Eon and the city administration to coordinate their activities. Subsequently, Eon made a promise to build wind turbines, and that promise then took precedence in the coordination of their activities. But controversies arose with two publics that emerged in opposition to Eon’s promise: neighbours to the site of the proposed wind turbine and the city’s Property Department. Unable to resolve these controversies, Eon and Malmö acknowledged that they lacked the resources need to make Hyllie climate-neutral. They adapted their original promise to the current state of socio-material assemblages, and Hyllie was demoted from a role model for the climate-smart city to a source of lessons learned.

KEYWORDS
Smart cities; visions; assemblage urbanism; sociology of expectations; renewable energy

Introduction
The Malmö city government has ambitions when it comes to sustainable urban planning. City leaders sought to make Malmö into Sweden’s most climate-smart city and this goal was front and centre in the vision for a new city district called Hyllie. The city government signed a vision called the Climate Contract in 2011,
which envisioned that Hyllie would be climate-neutral by 2020. Thanks to the participation of Eon, a multinational energy company that operates Malmö’s energy grids, the Climate Contract also envisioned Hyllie as a demonstration site for urban smart grids. Hyllie would lead the way for Malmö as a climate-smart city.

Five years after signing the Climate Contract, the city government and Eon were forced to change their ambitions. Though the demonstration of urban smart grids had been successful, Eon and the city government no longer expected to provide enough renewable energy to meet their 2020 goal of a climate-neutral Hyllie. Construction of urban wind turbines had been stymied for years. It seemed that the vision and collaboration benefited Eon while the city government got the short end of the stick. Still, both organisations continued to be concerned about the Climate Contract’s credibility and used it to justify their work in Hyllie. What use was the Climate Contract to the city government, if the vision did not to help the city government realise its ambition of a climate-neutral city district?

The Climate Contract resembles other smart city initiatives that many researchers have criticised for promoting techno-centric, corporation-controlled visions of cities (Kitchin, 2014; Söderström et al., 2014; Vanolo, 2014). While the Climate Contract lacks explicit reference to the hallmark technologies of smart city discourses – e.g. sensors, big data or panoptic control rooms – its central solution is the smart grid, which typically involves the integration of information and communication technology (ICT) into energy infrastructure (e.g. Swedish Coordination Council for Smart Grids, 2014). The Climate Contract offers the notion of a climate-smart city and presents the urban smart grid as a technology that will help make Hyllie climate-neutral, which it defines as powered by ‘100% renewable or recycled energy’ by 2020 (City of Malmö et al., 2011, p. 2). Yet without studying what role visions have in practice, it is not clear whether smart city visions can deliver on their promises, nor whether they will bring about the dystopia for which they have been criticised (Kitchin, 2015; Luque-Ayala and Marvin, 2015). Any analysis of a vision’s content must be complemented by analysis of the context in which it emerges and what influence it has in practice.

Research on urban governance and socio-technical change explains some of the challenges that accompany the realisation of visions. In the context of urban energy and climate transitions, visions are ‘symbolic representations of future relationships between city and energy systems’ often produced by city governments that face pressure to transform their energy systems (Hodson et al., 2013, p. 1407). The creation of a vision is an example of governance through enabling, in which a city government engages in collaboration and persuasion to exert influence in matters where it lacks regulatory authority (Bulkeley and Kern, 2006). In an ideal situation, actors negotiate a guiding vision and adhere to it in their collective action (Dierkes et al., 1996). However, visions
emerge through interaction with diverse socio-material actors with a multitude of priorities, interests and resources that can introduce conflicts and prevent collective action (Berkhout, 2006; Hodson and Marvin, 2010; Späth and Rohracher, 2010; Hauber and Ruppert-Winkel, 2012). The dependence of city governments on visions and collaboration suggests that smart city visions might provide energy companies with opportunities to push their own agendas. However, renewable energy initiatives introduce the potential for conflict between publics with varying interests, depending on the socio-technical configurations in which these technologies are introduced and how proponents imagine these publics (Walker and Cass, 2007; Walker et al., 2010).

The aim of this article is to better understand how visions influence urban change. More specifically, what role do visions have in the coordination of city governments, energy companies, and other organisations in pursuit of infrastructural change? What strategies do these organisations use to address controversies that arise as they attempt to fulfil visions? Even when a vision has the support of central organisations in urban infrastructural governance, there are many other publics who might contest or resist the vision. As time passes, other changes might make it untenable for even the proponents to support their own vision.

This article finds that the realisation of a vision is a techno-political process that requires the coordination of multiple groups around multiple promises. A vision is the first and vaguest in a series of interdependent promises that helps organisations coordinate their action. At first it was the Climate Contract that helped Eon and the city administration coordinate their activities. Subsequently, Eon made a promise to build wind turbines, and that promise then took precedence in the coordination of their activities. When controversies arise, the proponents of a vision must consider not only their techno-political ambitions but also the current state of socio-material assemblages. Controversies about Eon’s promise to build wind turbines took away the resources needed to make Hyllie 100% climate-neutral, so Eon and the city administration were forced to adapt their original promise to this lack of resources. Hyllie was demoted from a role model for the climate-smart city to a source of lessons learned.

The next section presents an analytical perspective based on assemblage urbanism and the sociology of expectations. The third section describes the research methods, while the fourth section provides additional background material and introduces the empirical analysis. The following three sections constitute the empirical analysis. Finally, the conclusion discusses what the concepts of promise and assemblage contribute to the study of visions and urban techno-politics.

**Analytical Perspectives**

To analyse the influence of visions on urban change, rather than simply studying the content of visions, is to study the techno-politics of urban visions. Technopolitics refers to how politics influence technoscientific practice and how
technologies are used in political processes (Hecht, 2009). While previous research on smart cities has had no problem pointing out the political implications of smart city technologies, the concept of techno-politics emphasises that ‘these technologies cannot be reduced to politics’ (Hecht, 2009, p. 15, emphasis original). The political implications of visions depend on the technoscientific practices of creating visions and attempting to realise them through urban infrastructural change. A starting point for an analytical perspective informed by techno-politics is that a vision of a climate-smart city does not necessarily lead to the introduction of smart city technologies or urban smart grids in urban infrastructure. Rather, the concept of techno-politics is consistent with other perspectives from science and technology studies (STS) that emphasise ‘the deeply contingent nature of the process of “socialization” or appropriation of new technologies’ (Coutard and Guy, 2007, p. 718).

Several analytical perspectives within STS have been used to interrogate urban techno-politics. The tradition of large technical systems has long studied the socio-technical construction of infrastructure networks, though rarely with focus on cities (Hommels, 2005). Aibar and Bijker’s early (1997) study of Barcelona shows how competing visions of urban futures influence urban planning practice. However, their analytical focus on social groups misses the agency of technologies and the material world. In contrast, analyses that draw upon actor-network theory (ANT) take more interest in how existing socio-technical networks influence urban change (Hommels, 2005). By studying the construction of socio-technical networks, ANT helps to explain how both human and nonhuman actors gain and lose agency.

A recent strand of research referred to as assemblage urbanism applies ANT and post-ANT perspectives to the study of urban techno-politics. In the tradition of ANT, ‘assemblage urbanism conceives of cities as ensembles of heterogeneous actors, giving analytical priority to the active dynamics of arranging or fitting together socio-material elements’ (Blok, 2013, p. 8). But unlike early ANT analyses that studied the construction of single socio-technical networks, an assemblage perspective involves ‘understanding the city as a multiple object’ which calls for ‘identifying, describing and analysing these multiple enactments of the city’ (Farías, 2010, p. 14). And in contrast with the tendency in some ANT studies to focus on strong actors and the stabilisation of networks, assemblage perspectives emphasise the fluidity of objects and the need to constantly reaffirm relationships (de Laet and Mol, 2000; Gad and Bruun Jensen, 2010; Ureta, 2014). For assemblage urbanism, inquiry into urban techno-politics involves a focus on the description of the practices in which cities are enacted as multiple objects (Farías, 2011).

However, assemblage urbanism research has not studied the topic of collaborations through visions, as many studies take controversies as their point of departure (e.g. Blok, 2013; Ureta, 2014; Baron and Petersen, 2015). These studies use the concept of an assemblage explore how several overlapping
Socio-material worlds may conflict with one another over certain meanings or resources. In contrast, the study of visions requires the analysis of assemblages that emerge in the absence of overt political controversies, and rather coalesce in consensus-oriented processes where differences are not explicitly acknowledged. Processes of creating visions and establishing collaborations around them are rather political in the sense of ‘all those institutions [that] appear on the surface to be absolutely apolitical, and yet in their silent, ordinary, fully routinized ways ... are perversely the most important aspects of what we mean by living together’ (Latour, 2007, p. 817). The criteria that differentiates between assemblages are their ‘different dynamics of knowledge and politics’ (Blok, 2013, p. 7). While controversies are one form in which assemblages interfere with one another, visions are examples of techno-political interactions in which assemblages overlap, collaborate or depend on each other in various ways (cf. Mol, 1999; Farias, 2010).

The sociology of expectations provides a conceptual understanding of the role that visions play in the interactions between assemblages. As city governments turn to governing through enabling, they initiate visions as a way of coordinating the assemblages they belong to with other assemblages that in turn bring order to the city through different dynamics of knowledge and politics. This body of research contributes an understanding of ‘the mechanisms and dynamics by which expectations and promises help to create an agenda and to interlock activities’ (van Lente, 1993, p. 193). Visions are examples of what the sociology of expectations refers to as expectations or promises, and I use the concept of promises, rather than expectations, to stress that these statements about the future are not only ‘real-time representations of future technological situations and capabilities’ but also ‘wishful statements of a desired future’ (Borup et al., 2006, p. 286). One benefit of the concept of promises is that it is general enough to apply not only to visions, but also to more specific statements about the future that actors make in relation to visions. This article uses the concept of vision as a synonym for particular type of promise: a vague promise that provides a symbolic representation of future relationships concerning urban infrastructure.

Promises are not only outcomes but also elements that constitute an assemblage and affect how it changes. This relation between promises and assemblages applies whether the promise is an overarching vision or a more specific statement about the future. Promises become performative when actors accept them as shared agendas or as interpretations of how they expect other actors to act (Borup et al., 2006; Konrad, 2006). The performativity of a promise is a relational achievement that depends on how actors relate to past promises (Brown and Michael, 2003; Bakker et al., 2012). It also depends on the interdependence of generic and specific promises (van Lente and Bakker, 2010). As with other elements, promises have the capacity to shape an assemblage, but this capacity is a product of relations within the assemblage and may diminish as the assemblage changes.
The interactions between assemblages around promises occur in what I call *techno-promissory moments*, to emphasise that both the creation of promises and the work of realising them is techno-political in character. The political implications of promises arise through the dynamics that motivate actors to take actions that they would have not taken without the existence of the promise. The work of realising promises can take place through technoscientific practice, and has political implications even if the resulting changes to assemblages do not match what was promised. The notion of a moment emphasises that a promise’s influence on the coordination of actors is an achievement that can also be undone. A techno-promissory moment includes both the process of creating a promise and the subsequent activities in which actors act in relation to the promise. The moment ends when actors no longer use the promise to coordinate their interactions within the assemblage of which the promise is part. The end of the moment can result from actors giving up on the promise, or from the creation of a new promise that actors give precedence in the coordination of their actions.

**Research Methods**

I performed participant-observation of meetings about the Climate Contract between September 2015 and May 2016. The realisation of the Climate Contract was organised with a hierarchy of three inter-organisational groups, each of which had members from Eon, several departments within the city administration, and VA Syd, a municipally owned water and waste company that operated incineration and biogas facilities and was the third signatory to the Climate Contract. The city administration was represented by the Environmental Department, the City Planning Office, the Property Department and the Transportation Department. I attended monthly meetings of the project group, which was the lowest group in the hierarchy, and whose members had the responsibility for their departments’ work in the Climate Contract. I attended most steering group meetings, which occurred approximately four times per year and provided direction to the project group. The commissioning group had the final say questions of how to interpret the Climate Contract, and it met once or twice a year, but I did not attend those meetings.

During May 2015 and March 2016, I interviewed most current members of the project group, as well as other employees who had previously worked with the Climate Contract. I use pseudonyms for the three people who I quote explicitly: Erik, who was previously the project manager for Hyllie at the Environmental Department; Olivia, a project manager at Eon who worked with Hyllie for several years; and Martina, a project manager at the City Planning Office.

While VA Syd was a signatory to the Climate Contract, its role in the Climate Contract had mostly to do with its facilities for incineration and biogas production – two examples of recycled energy. Because of its focus on recycled
energy, it played little role in the discussions about wind turbines and renewable energy. Therefore, I have left it out of the empirical analysis. Its representatives were often present in these meetings of the three groups, but as an organisation it had little influence.

I complemented my field notes from participant-observation and interviews with documents related to the Climate Contract, in particular meeting minutes and presentations from the three groups. The meeting minutes and presentations that I obtained covered most meetings of the three groups since the beginning of 2015, as well as some meetings from 2011 to 2014. However, meeting minutes from prior to my participant-observation were of varying detail and it was not possible to trace all decisions without the help of interviews.

**Hyllie**

Hyllie is a new city district located in the south of Malmö (see Figure 1). The vision of a climate-smart city district, as described in Climate Contract, was created while the first phase of Hyllie was already under construction. Until the mid-2000s, Hyllie was a section of agricultural land located in the south of Malmö. The district’s future changed when a railway tunnel was built under the city. Hyllie then became home to the first railway station on the Swedish side of the Öresund Bridge that connects southern Sweden to the Danish capital city of Copenhagen. Copenhagen, Malmö, and the surrounding regions have become increasingly integrated since the bridge connecting them opened in 2000, and they are collectively referred to as the Öresund Region (see Figure 2).

Plans for Hyllie Station (constructed 2005–2010) were followed by an arena (completed in 2008), shopping mall and conference centre (both 2012). The Climate Contract was signed in 2011, as the area around the train station was already taking its material form. These buildings around the station later proved to complicate the goal of a climate-neutral city district. To put it simply, large buildings have large energy needs.

This analysis considers two assemblages. These assemblages enact climate-smart urban planning in two bureaucratic, seemingly apolitical manners, but each with its own dynamics of knowledge and politics. First, the environmental planning assemblage is driven by knowledge about climate change and energy use, the climate ambitions of the city government, as well planning procedures within city departments. Second, the urban smart grid assemblage has dynamics driven by Eon’s knowledge about new energy technologies and its ambitions for corporate transformation, combined with a reshaping of roles in the governance and operation of urban energy infrastructure. Using assemblage as an analytical construct provides an understanding of the dynamics that influence diverse socio-material actors to contribute resources to the collaborative enactment of the climate-smart city vision. The two assemblages are distinct (though
undeniably interdependent) and their respective dynamics influence the creation and re-interpretation of promises during three techno-promissory moments.

The analysis is structured around three techno-promissory moments, each of which concerns a different promise about Hyllie. The first techno-promissory moment introduces the two assemblages and analyses how they established the Climate Contract. The second techno-promissory moment explores how the promise to build wind turbines for Hyllie played out. The third techno-promissory moment traces the city administration and Eon’s responses to the failure of the wind turbine promise and how the two assemblages dealt with the threat to the Climate Contract.

**Making the Promise of a Climate-Smart City District**

The sustainability ambitions for Hyllie arose from an environmental planning assemblage that originated in the early 2000s. During this time, the city
redeveloped an abandoned, centrally located shipyard into a city district called the Western Harbour. City departments experimented with new planning procedures where they worked with property developers to set environmental goals for new neighbourhoods in the Western Harbour. These experiments resulted in an assemblage of planning programmes, environmental policies, city departments and the property development companies active in Malmö. Within this assemblage, Hyllie was an opportunity to further improve the environmental performance of the city’s built environment. The Environmental Department first tried to secure European Union funding that would have allowed them to create an environmental programme for Hyllie. While two attempts to secure funding were ultimately unsuccessful, the department continued its efforts to create an environmental programme.

**The Climate-Smart City Meets the Smart Grid**

Planners had struggled to establish an environmental programme for Hyllie, but the environmental planning assemblage received a boost when the city government approved the 2009 Malmö Environmental Programme (MEP). It was the MEP that first introduced the city government’s goal of making Malmö...
‘Sweden’s most climate-smart city’ (City of Malmö, 2009, p. 7). Furthermore, the MEP stated that ‘the city administration will be climate-neutral in 2020 and all of Malmö will be powered by renewable energy by 2030’ (City of Malmö, 2009, p. 7). The second half of this statement concerned all energy use in the city, not just energy consumed in city government operations. This ambitious goal called for collaboration with other stakeholders. And around the time that the city government approved the MEP, several departments in the city administration began to meet with Eon in what was the beginning of the first techno-promisey moment.

Discussions between city departments and Eon came at a time when an urban smart grid assemblage began to form within the company. Smart grid technology gained importance within the company in preparation for a corporate transition that occurred formally at the beginning of 2016. Eon would then create and sell off a separate company called Uniper, which focused on traditional power generation and energy commodities. Eon would be left to focus on renewable energy, distribution networks, energy efficiency and digital solutions. For the urban smart grid assemblage, Malmö was a location where the company could use existing energy infrastructure to demonstrate new technologies and test new business models. The urban smart grid assemblage began as a collection of technologies and competences within Eon, which had special importance given the upcoming corporate transition. The assemblage would gradually extend to include the Climate Contract, other parts of the company, and a demonstration project in Malmö whose results would help Eon extend its role in the governance of energy infrastructure.

The Environmental Department, City Planning Office and the Property Department engaged Eon to help develop a vision for Hyllie. Olivia, the project manager from Eon, explained that the company pushed for certain ideas in its discussions with city departments:

There were a few aspects that we pushed for. One was to see the solutions in Hyllie from a holistic perspective. Not one solution for heating, one for electricity, and another for natural gas. We see the energy system as a whole. And we want to demonstrate how this energy system as a whole can be designed in the best way possible. With a link to other infrastructure too: waste, wastewater, transport, etc. That was very important to us. (Eon Employee, 2015)

Eon’s perspective influenced the vision of a climate-smart city district in two ways. First, the Climate Contract included ambitions for an urban smart grid that would use ICT to balance energy production and consumption. Second, Eon insisted on a holistic perspective that considered existing infrastructure. Whereas the MEP defined the climate-smart city as a city whose energy came from renewable energy, the Climate Contract referred to renewable or recycled energy – taking into account the existing incineration of garbage and production of biogas from organic waste.
The negotiation between Eon and departments in the city administration shows how the techno-politics visions began to play out in practice. The Climate Contract maintained the language of the MEP when it promised that Hyllie would become ‘the Öresund Region’s most climate-smart city district’ (City of Malmö et al., 2011, p. 2). However, two more specific goals reflected Eon’s influence: the goal that the entire city district should be powered by ‘100% renewable or recycled energy by 2020’ and that ‘energy flows in Hyllie rely on smart infrastructure (“smart grid”)’ (City of Malmö et al., 2011, p. 2). While the environmental planning assemblage continued to set the overarching ambitions for Hyllie, the urban smart grid assemblage contributed Eon’s perspective on energy systems.

**Promising Boundaries**

The city departments and Eon had more decisions to make about the Climate Contract. Alongside the goal of 100% renewable or recycled energy for Hyllie, there was the question of what counted as Hyllie. The more expansive this definition of Hyllie, the more renewable and recycled energy the signatories would need to produce.

There were two aspects to this decision. One was of a practical character – what can be counted? The other linked the renewable energy goal to Eon’s smart grid ambitions. How could the Climate Contract help to attract funding for a smart grid demonstration project? Erik from the Environmental Department explained the debate in this way:

> The question was which projects in Hyllie should be included since construction was already underway. The railway tunnel was opened in 2010. So the station was already built. The arena was built. The shopping mall was under construction. The conference centre was under construction. Quite a few large-scale projects had already been approved or were built or were almost done. The question was whether we should only include buildings that were approved after the signing of the Climate Contract. Or buildings that were completed after the signing. Or whether we should include everything regardless of when it was initiated. (Employee at the Malmö Environmental Department, 2015)

If the boundaries of the Climate Contract were drawn to count all these buildings, their energy consumption would have to be matched by more renewable or recycled energy production (see the solid black line in Figure 1). It would be more difficult to fulfil the promise of a climate-neutral city district.

The decision about boundaries was based on the role that the Climate Contract was to play in the two assemblages. Erik from the Environmental Department explained how Eon suggested to resolve the debate:

> There were different opinions. … And when I think about it, it was important that Eon was involved in the discussions at this point. For this decision. Because they had a very
practical perspective on things. For one thing, it would be difficult to communicate any exceptions to the energy agency. For another, it would be unmanageable to keep track of energy flows. (Employee at the Malmö Environmental Department, 2015)

For both assemblages, a complicated boundary would require extra resources to keep track of how much energy consumption was needed (see the dashed white line in Figure 1). For the urban smart grid assemblage, a simple – yet ambitious – boundary would be easier to communicate to other stakeholders. Exceptions based upon when buildings were planned or constructed could weaken the contract’s credibility. The contract’s signatories reasoned that if the Swedish Energy Agency believed that the Climate Contract was interesting for national energy system development, the agency would be more likely to provide funding for an urban smart grid demonstration project. And later that year, Eon and the city administration received funding from the Swedish Energy Agency for a large urban smart grid demonstration project.

The Climate Contract was signed in 2011. The three signatories were a city councillor and directors from Eon and the municipally owned water and waste company. This promise stated that Hyllie would become climate-smart city district with 100% renewable or recycled energy by 2020. The Climate Contract became the shared agenda that the signatories used to coordinate their collaboration. The two assemblages started to interact in new ways: through the work of the project group, the steering group and the commissioning group. It was in these groups that planners had to determine what the climate-neutrality goal would mean in practice, which led to the second techno-promissory moment.

**The Promise of Urban Wind Turbines**

Energy production in Hyllie shall be composed of 100% renewable or recycled energy by no later than 2020. […] A significant share of [Hyllie’s] energy needs shall be provided by locally produced renewable energy, for example solar and wind energy. (City of Malmö et al., 2011, p. 3)

These two goals from the Climate Contract only hint at the role that wind turbines would play in the project group. The project group first needed to find its bearings with respect to these goals. There were two sides to the climate-neutrality goal: energy consumption and energy production. The project group had to predict Hyllie’s energy consumption in 2020, then calculate how much additional renewable or recycled energy production would be required to compensate for that consumption. The result of these calculations was called Hyllie’s energy balance.

Eon made a new promise that became the focus of the second techno-promissory moment. The energy balance showed that Hyllie would need additional renewable energy in the forms of district heating and electricity. Eon offered
to take care of renewable district heating by converting one of its plants to use biomass (Eon Employee, 2015). When it came to electricity, Olivia, the project manager from Eon, explained that the company proposed a division of roles:

When it came to wind we stated our intention that we were prepared to build wind turbines. But we didn’t own any land on which to build those turbines. There was a– I think it was the city’s comprehensive plan. Where they had located a bunch of potential locations for wind turbines within the city limits. (Eon Employee, 2015)

This promise extended the urban smart grid assemblage within the company to include the wind power division. Since the wind power division became instrumental to fulfilling the Climate Contract, this division became part of the environmental planning assemblage as well. In accepting Eon’s promise, the Environmental Department and the City Planning Office also attempted to extend the overlapping assemblages in two other ways: to include the city’s Property Department, which would need to sell land to Eon, and to include specific plots of land that were suitable for wind turbines.

If Eon acquired these plots of land, it would be able to build enough wind turbines to cover the renewable electricity needs as calculated in the energy balance. The members of the project group considered this promise to be credible and accepted it as the group’s plan for Hyllie’s renewable electricity. However, acceptance within the project group did not mean that all city departments accepted the roles that Eon proposed for them. Decisions about selling city land did not fall under the authority of the project group. They took place in the city’s Property Department, whose mandate forced it to consider how wind turbines might influence property values and thus impact the city’s future potential earnings from land sales.

Erik from the Environmental Department explained how the idea of wind turbines was considered within the Property Department:

We discussed where in the city there could be wind turbines. One suggestion was along the outer ring road. […] One area that we looked at was by the shopping centre and industrial area in the south of the city. […] South of there is countryside, land that the city owns. But the Property Department absolutely doesn’t want to build wind turbines there. Because they think the land could be sold for development some day. And according to the prevailing logic at the Property Department, wind turbines are a threat to development. They decrease the value of neighbouring land. And since city council has given them the responsibility to earn as much as possible when they sell land, they don’t want wind turbines there. (Employee at the Malmö Environmental Department, 2015)

The Property Department was ostensibly supportive of the Climate Contract, since the contract was signed by a city councillor, but Eon’s promise clashed with another of the department’s responsibilities – maximising revenue from the sale of city-owned land. Because of the conflicting mandates, the Property Department resisted the role that Eon’s promise proposed. Despite the
combined resources of the two assemblages, Eon could only acquire land sufficient for one turbine (denoted by a triangle in Figures 1 and 2). This plot was not enough to produce the renewable electricity that Hyllie needed.

The challenges for urban wind turbines did not only come from within the city administration. Once Eon received its one plot of land, it needed to successfully establish a new set of relations between wind turbines, city departments, building permits, and neighbours. Legal complaints from neighbours interfered with the project’s building permits. Interviewed in September 2015, four and a half years after the Climate Contract was signed, Olivia from Eon explained that ‘the only location we have for wind now is by [a highway interchange called] Petersborg. We’re preparing to build there. Right now the construction has been appealed by neighbours’ (Eon Employee, 2015). At a steering group meeting in May 2016, another Eon representative explained that the delays meant that this turbine would never be profitable. The company continued to push for its construction rather as a matter of principle.

Eon’s struggle through the appeals process only emphasised the problem for the Climate Contract. In 2015, after four years of trying, the project group acknowledged that Eon’s promise for urban wind turbines was no longer credible. The two assemblages were not able to resolve the conflicting political positions of promoting renewable electricity and maximising revenue from the sale of city-owned land. Their abandonment of the promise marked the end of the second techno-promissory moment. However, the energy balance still showed a need for renewable electricity. The credibility of the Climate Contract, which had depended on the promise of urban wind turbines, was at risk.

Saving – or Sacrificing? – the Climate Contract

By the time that the project group abandoned Eon’s wind turbine promise, four years after the promised was proposed, much had happened in Hyllie. Other initiatives had progressed and the Climate Contract remained important for them. Within the environmental planning assemblage, the Climate Contract justified a new planning programme that the City Planning Office introduced in late 2015. Within the urban smart grid assemblage, the smart grid demonstration project was soon to finish, and the Climate Contract remained a resource for acquiring further funding from the Swedish Energy Agency. For these reasons, the project group needed to re-engage with the techno-politics of Hyllie’s renewable energy goal. Saving the credibility of the Climate Contract became the focus of the third techno-promissory moment.

The Continued Importance of the Climate Contract

Hyllie and the Climate Contract continued to be important to the urban smart grid assemblage. Already in November 2015, the commissioning group
discussed that failure to meet the Climate Contract’s energy goal could reduce the Swedish Energy Agency’s confidence in the city administration and Eon, which could hinder them from procuring funding in the future (meeting minutes, commissioning group, November 2015). Ahead of the completion of the smart grid demonstration project, whose funding from the Swedish Energy Agency expired in 2016, Eon began preparing a funding application for a follow-up project. The new project focused on real-time data and a wider scope ‘to address climate change, urbanisation, digitisation and energy transition, but where Sweden’s and the EU’s energy goals for 2020 continue to be the starting point’ (City of Malmö and Eon, 2016, p. 2). This project would allow the urban smart grid assemblage to expand to smart city technologies beyond the energy system. However, since the Swedish Energy Agency was the source of their desired funding, Eon and the city administration needed to maintain both a focus on energy issues and confidence in the eyes of the agency.

In the environmental planning assemblage, the Climate Contract remained a resource to engage other actors. In late 2015, the City Planning Office released a voluntary planning programme called the Hyllie Environmental Programme (HEP). This programme aimed to encourage more property developers to contribute to the goals of the Climate Contract. Martina, the HEP’s project manager, explained how the HEP was intended to address criticisms of the Climate Contract:

Part of the problem so far is that Climate-Smart Hyllie has been dependent on many different processes. And many different documents. It’s been very difficult to get an overview both as a city employee and for private property developers. It’s been difficult to know how a specific project can be part of Climate-Smart Hyllie. It’s the intention of the HEP to be able to answer that question. (Employee of the City Planning Office, 2015)

In the HEP, the goals of the Climate Contract were translated into specific measures for property developers. The City Planning Office assumed that property developers would contribute to the vision of Climate-Smart Hyllie if these goals were translated into more specific measures that were relevant for building design. Without the Climate Contract, the HEP would lack its main justification.

**The Energy Balancing Act**

The continued importance of the Climate Contract within both assemblages pushed the project group into a discussion about the goal of 100% renewable and recycled energy. In addition to discussions about how to facilitate wind turbine construction, the project group returned to the text of the Climate Contract and debated how it should be interpreted. The debate touched on the geographical and temporal boundaries of energy production and, to a lesser extent, Hyllie’s energy consumption.
One matter of discussion was contracts for wind power that predated the Climate Contract. The city administration and one private company in Hyllie already purchased wind power, but the energy balance excluded these contracts because the wind turbines were located in northern Sweden. The Climate Contract stipulated that renewable energy should come from the Öresund Region. The project group calculated not only how these turbines could influence the energy balance, but also the additional influence if other private companies could be persuaded to acquire their own contracts for wind turbines (observation notes, project group meeting, October 2015). One month later, the project group’s meeting minutes asked ‘Is it reasonable that energy production should be limited to the Öresund Region or should the boundaries be expanded? If so on which grounds?’ (meeting minutes, project group, November 2015).

Another matter was a proposal from Eon. The company proposed including two sets of wind turbines that it owned on land outside of the city (denoted by squares in Figure 2). Eon hadn’t built these turbines for Hyllie, but the company reasoned that the turbines fit the requirements of the Climate Contract: they were located within the Öresund Region and built after the contract was signed in 2011 (observation notes, project group, October 2015). Including these turbines brought up questions about potential double-counting, but these questions seemed minor enough for the project group to consider counting these turbines in Hyllie’s energy balance.

Energy consumption – the other side of the energy balance – played a less prominent role in these discussions. The project group did not revisit the Climate Contract’s boundaries for Hyllie, which were easy to communicate at the expense of being ambitious. At one point, the steering group suggested looking into how to decrease energy consumption: ‘Take up the issue of energy use in the project group. Can behaviour change decrease energy consumption and therefore simplify the fulfilment of the energy balance?’ (meeting minutes, steering group, September 2015). However, the project group did not devote any time to this suggestion in the months that followed, and instead maintained its focus on the production side of the energy balance.

The two assemblages help to explain the focus on energy production. In the environmental planning assemblage, city planners tried to influence property developers. The planners could only influence the behaviour of residents by proxy. Similarly, the urban smart grid assemblage depended on property developers to adopt Eon’s technological solutions. While some property developers adopted Eon’s building-level demand management technology, only one property developer in Hyllie provided Eon’s energy use displays to its tenants. Beyond that, these assemblages provided little opportunity to influence the energy consumption behaviour of Hyllie’s current and future residents. The techno-political work to balance the energy balance continued to focus on energy production.
Accepting the Imbalance

The third techno-promissory moment led to a new promise in November 2015. After discussions in the project group and steering group, the commissioning group accepted that the energy balance include Eon’s rural wind turbines in the Öresund Region, even though the turbines were not originally built with the Climate Contract in mind. But it decided to maintain the geographical principles of the Climate Contract, which excluded wind power from northern Sweden. With this compromise, it would be unlikely that Hyllie would be climate-neutral by 2020 (observation notes, project group, December 2015).

In accepting that the Climate Contract’s goal would not be achieved, the city administration and Eon made a new promise that modified the Climate Contract. The commissioning group accepted the premise that the Climate Contract was ‘a test balloon for the City of Malmö’s 2030 energy goals’ (presentation to commissioning group, November 2015). This decision emphasised that the experiences in Hyllie would provide important lessons for the city government, even if Hyllie’s goals were not fulfilled (observation notes, project group, December 2015). Instead of the promise to realise the Climate Contract, the signatories promised to learn from the process.

With this new promise instantiated, the city administration and Eon could claim that the Climate Contract remained in effect and it could continue to play a role in both assemblages. Within the environmental planning assemblage, this change depended on emphasising how the Climate Contract was part of a larger planning context. In relation to the Malmö Environmental Programme, with its city-wide goals for 2030, the Climate Contract could be seen as an attempt to provide lessons to help the city reach its long-term goal. The City Planning Office could still refer to the Climate Contract as it encouraged property developers to use the HEP. Similarly, Eon continued to reference the Climate Contract as it tried to extend the urban smart grid assemblage with more funding from the Swedish Energy Agency.

Conclusion

Much research on smart city initiatives has criticised these initiatives for promoting techno-centric, corporation-controlled visions of cities. However, this research has often focused more on the content of these visions than the context in which they emerge and are realised. Visioning and governance through enabling are tools that city governments have turned to in response to pressure to transform urban infrastructure, a situation that leaves governments dependent on other urban actors. The realisation of visions for urban infrastructural change is a process notoriously full of compromises and trade-offs, as the various publics affected by renewable energy technologies do not necessarily share the same values. The aim of this article has been to better
understand the influence of visions on urban change. In Hyllie, the efforts to create a climate-neutral city district involved techno-political negotiations between different departments in the city government, the energy company, urban energy infrastructure and residents.

What role do visions have in the coordination of city governments, energy companies, and other organisations in pursuit of infrastructural change? The first and second techno-promissory moments of this case illustrate how the Climate Contract helped Eon and some departments within the city administration to coordinate their activities. In the first techno-promissory moment, interactions between the environmental planning assemblage and the urban smart grid assemblage allowed for the city government and the energy company to establish a vision for the city district. The vision borrowed the city government’s notion of a climate-smart city, which had previously been synonymous with climate mitigation, and complemented it with Eon’s ambitions to demonstrate urban smart grid technologies. The ambitions of the contract’s signatories led them to define boundaries for Hyllie that were easy to communicate but that made the goals of the Climate Contract quite ambitious. The Climate Contract was then put into practice through three inter-organisational groups that served to coordinate the two assemblages in a common direction.

The second techno-promissory moment shows that a single vision was not sufficient for the city administration and Eon to coordinate their activities. It was Eon’s subsequent promise to build wind turbines helped them to further coordinate their activities within the environmental planning assemblage and the urban smart grid assemblage. The influence of this promise suggests that the techno-politics of visions are not sufficiently explained by the notion that a vision is a singular ‘reference point around which networks can be built’ (Hodson et al., 2013, p. 1407). The realisation of a vision in a city is a technopolitical process that requires the coordination of multiple groups around multiple promises. While an initial, vague vision can help group of actors to begin coordinating their activities, realising this vision depends on the articulation and realisation of more specific promises (van Lente and Bakker, 2010). It is these more specific promises that provide enough detail about socio-technical configurations to clarify the implications for various publics (Walker and Cass, 2007). But as implications become clear, the potential for controversies increases.

What strategies do these organisations use to address controversies that arise as they attempt to fulfil visions? During the second techno-promissory moment, it became clear that the support of the two assemblages was not enough for Eon to realise its promise to build wind turbines. Controversies arose with two publics that emerged in opposition to the promise: neighbours to the site of the proposed wind turbine and the city’s Property Department. New publics that emerge in reaction to a specific promise can threaten a vision that in the
past seemed credible (Brown and Michael, 2003). While the neighbours were a new public that emerged in response to the second promise, the city’s Property Department emerged as a heterogeneous public that had previously appeared to be part of the environmental planning assemblage and thus appeared to support the Climate Contract. To address this controversy, the strategy adopted by Eon and the other city departments was to reconsider not only their original ambitions, but also the current state of the two assemblages. In line with ANT, analysis of the changing socio-technical composition of assemblages helps to explain how both organisations and promises gain and lose agency over time.

It was in the third techno-promissory moment that Eon and the city administration addressed these controversies. Their new promise redefined the Climate Contract to reflect changes within the environmental planning assemblage and the urban smart grid assemblage. The redefinition was most significant for the environmental planning assemblage, which was characterised by the city government’s ambition of making Malmö into Sweden’s most climate-smart city, powered by renewable energy. The Climate Contract was supposed to strengthen the environmental planning assemblage by making Hyllie into a role model for renewable energy throughout the city and across the nation, while the involvement of Eon introduced urban smart grids into the notion of a climate-smart city. But the previous controversies had robbed the environmental planning assemblage of the resources it needed to make Hyllie 100% renewable. Therefore, the strategy adopted in the third techno-promissory moment was to adapt the original promise to the lack of land available for wind turbines. Hyllie was demoted from a role model to a source of lessons learned for Malmö and other cities aspiring to realise climate-smart visions.

The concept of socio-material assemblages helps to explain the strategies used to address controversies during subsequent techno-promissory moments. An assemblage, in the context of urban techno-politics, is characterised by particular dynamics of knowledge and politics that reconfigure urban infrastructural relations in a particular way (Blok, 2013). The dynamics of an assemblage are characterised by the techno-political ambitions of organisations, particular knowledge about urban infrastructure, and the relations with other socio-material actors who are required to apply this knowledge and fulfil these ambitions. When organisations negotiate a vision, they must consider what support it will take to rearrange assemblages in accordance with their ambitions. Later, when controversies threaten the realisation of the vision, the proponents of the vision do not give up their techno-political ambitions, but rather reconfigure relations between the vision and other elements within relevant assemblages. In such techno-promissory moments, the vision is no longer translated into the socio-material relations of assemblages; instead, it is the state of socio-material assemblages that become translated into new promises.
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