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From leaders to majority: a frontrunner paradox in built-environment climate governance experimentation

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This paper seeks to better understand the possible paradox of frontrunners in experimental climate governance. This paradox refers to the situation where frontrunners are required to push boundaries in terms of developing governance innovations and to experiment with these, but where, at the same time, a too strong focus on frontrunners may result in a situation where lessons from these experiments and the innovations developed do not resonate with the majority. In such a situation, an innovation may not be capable of being scaled up or of being transferred to another context. This paper draws lessons from a series of nine experimental and innovative governance instruments for low-carbon building development and transformation in Australia. It points out that for these instruments the frontrunners paradox provides a partial explanation as to why they have not yet been able to scale up from a small group of industry leaders to the large majority.

Keywords: climate change mitigation; governance innovations; urban governance; Australia; low-carbon transitions

1. Introduction

Over recent years, scholars have pointed to an emerging trend of experimentalist climate governance around the globe (Ansell and Bartenberger 2016; Laakso, Berg, and Annala 2017; McFadgen and Huitema 2017). They are specifically concerned with the development of innovative climate governance instruments through iterative processes of implementation, learning, and adaptation – sometimes framed as 'governance by experiment' (Bulkeley and Castan Broto 2013; Caprotti and Cowley 2016; Hoffmann 2011). This experimental climate governance appears to be particularly popular for low-carbon built-environment development and use (Bulkeley, Castan Broto, and Edwards 2015; Evans, Karvonen, and Raven 2016; Johnson, Toly, and Schroeder 2015; Smedby 2016).

The literature is not univocally positive about the capacity of these experiments to effectively address climate change challenges in general and to accelerate the transition to low-carbon built environments in particular (Harman, Taylor, and Lane 2015; Scott 2015; van der Heijden 2017). Indeed, the literature is becoming increasingly critical of the transferability of innovative governance instruments from one context to another as well as the scalability of lessons learnt from experimental to formal settings (Evans and Karvonen 2014; Kivimaa *et al.* 2015; Vreugdenhil, Taljaard, and Slinger 2012).

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Seeking to better understand what may hamper transferability and scalability, this paper explores an intuitive paradox in experimental and innovative climate governance – the necessity and constraints of involving frontrunners in such experiments. On the one hand, frontrunners are required to push the boundaries in terms of innovation and to have actors willing to accept the risks of experimentation (Andresen and Agrawala 2002; Gunningham and Sinclair 2002). On the other hand, a too strong focus on frontrunners may result in a situation where the lessons drawn from experiments and the innovative instruments developed do not resonate with the majority in an industry or sector (Moore 2002; Rogers *et al.* 2005).

In what follows, the discussion first briefly reviews the literature on climate governance experimentation, with a focus on the built environment, seeking to understand what may be expected of such experimentation. This review also further explores the possibility of a frontrunner paradox in climate governance experimentation and innovation and its possible consequences. From here on, the paper studies a series of nine instruments for low-carbon built environments in Australia that are characterised by experimentation and innovation (the research design is explained in what follows) and assesses their performance. From this research, it becomes clear that industry frontrunners are indeed a key characteristic of governance experiments and that the strong focus on involving them in experiments comes with constraints on how the innovative instruments perform and how they can be transferred and scaled. In other words, the frontrunner paradox is a considerable challenge for those involved in governance experimentation and innovation. The paper concludes by identifying the main lessons learnt and discusses their relevance to experimental and innovative climate governance.

2. Experimentation and innovation: the balancing act of virtue and mechanism

The field of 'governance by experiment' is rapidly gaining traction. In what follows, a brief review of the literature is provided to introduce core aspects of experimental governance relevant for understanding the empirical study that follows; readers interested in the origins, conceptual underpinnings, and breadth of experimental governance are referred to the excellent meta-reviews available elsewhere (Ansell and Bartenberger 2016; Bai, Roberts, and Chen 2010; Bulkeley and Castan Broto 2013; Laakso, Berg, and Annala 2017).

There is no single definition of what climate governance experimentation with innovative instruments entails, but some 'ideal type' characteristics recur in the literature. Of these, the first and foremost is a shift away from technocratic processes of instrument development towards iterative ones, involving the trialling of governance instruments within a bounded jurisdiction or population and with the ambition of scaling up these instruments once lessons have been drawn (Bulkeley and Castan Broto 2013; Kivimaa *et al.* 2015). The second is a shift away from government as the sole authority to govern climate problems and a move towards the involvement of public and private sector stakeholders or even the development of climate governance instruments without any government involvement at all. Through collaborative and consensus-oriented approaches (i.e. experimenting), the tacit knowledge of those governed can be included in the development and implementation of governance instruments, which may further their (local) effectiveness (Ansell and Bartenberger 2016; Hoffmann 2011). The third is a shift towards governance instruments that encourage self-organisation, market solutions, or both as substitutes for or complements to mandatory command-and-control style

instruments, often combined with a shift towards instruments that reward voluntary compliance as opposed to enforcing mandated behaviour (Bos and Brown 2012; Evans, Karvonen, and Raven 2016).

At building and city level, governance experimentation is considered particularly promising because of scaling possibilities: if an experimental governance instrument works in a specific (part of a) city, then it, or the lessons learnt from it, might easily be scaled up to other parts of the city or even to other cities (Sassen 2015). Yet, moving from experimental governance as a virtue to experimental governance as a mechanism appears to come with constraints, and concerns have been expressed. Some scholars argue that while experiments may achieve promising results in one context it will be difficult to replicate these in other contexts. Small differences between contexts in, for example, legal requirements, may have considerable impact on an experiment's performance (McFadgen and Huitema 2017; Rocle and Salles 2017). Others warn that the original participants in an experiment have specific incentives to ensure its success. Such motivations may, however, not be shared by the broader population, implying that once an initiative is formalised in public policy it will not yield the same results as during its experimental phase (Laakso, Berg, and Annala 2017; Sidiki *et al.* 2015). Then, while experimental governance is not limited to a specific size, studies find that the scale of experiments is often too small to have a meaningful impact (Bai, Roberts, and Chen 2010; van der Heijden 2017).

But what can be considered a successful experiment? This is a question that haunts, particularly, the evaluative literature (Ansell and Bartenberger 2016; Laakso, Berg, and Annala 2017). If drawing lessons is considered a main goal, then an experiment with a climate governance instrument that fails to achieve carbon emissions can, paradoxically, be considered a great success – at least now we know not to use that instrument (van der Heijden 2017). Yet, if being able to scale up and scale out is the main goal of an experiment, then this hypothetical example would be considered a major failure (Sassen 2015). It is particularly between the evaluative categories of 'drawing lessons' from a governance experiment and 'capacity for scaling up' that governance experiment that a specific potential paradox sits, which could explain why an experiment can be considered at the same time a success and a failure.

2.1 The possibility of a frontrunner paradox

At first glance, experimentation, innovation, and frontrunners are logical allies (Bos and Brown 2012; Hoffmann 2011; Termeer and Nooteboom 2014). Experiments look for actors who want to be actively involved in solving a problem, who do not mind deviating from routines, and who are willing to take risks. Innovations look for actors who think outside of the box, who do not take routines for granted, and who see opportunities where others do not. We naturally assign such traits to frontrunners (Teisman, van Buuren, and Gerrits 2009). It is from these actors and their involvement in experiments with innovative governance instruments that we may draw valuable lessons about those instruments.

Indeed, the empirical literature on climate governance experimentation often points to the role played by frontrunners in government, civil society, and particularly in industry as being crucial for getting experiments off the ground, for developing innovative instruments, and for trialling them (Andresen and Agrawala 2002; Borck, Coglianese, and Nash 2008; Gunningham and Sinclair 2002). This relates directly to the diffusion of innovations literature that argues that any innovation needs to be committed to and taken

up by a group of leaders before it can scale up to the majority (Rogers 1995; Rogers *et al.* 2005). In short, these frontrunners trial the experiment and demonstrate its advantages to the majority, who will then, so goes the argument, be convinced and will also commit to the innovation and mainstream it (Moore 2002; Rogers 1995).

The literature on the diffusion of innovations does, however, point to a critical moment in this scaling process. If the majority are not convinced by the insights and experiences shared by the frontrunners, they may reject an innovation (Moore 2002). In non-homogenous areas – those characterised by a wide variety of actors, products, and services – this risk is substantial because the majority may not consider frontrunners as their peers or equals (Clarysse *et al.* 2014; Jahanmir and Lages 2016). In other words, the lessons drawn by the frontrunners may not resonate with the majority market to which the experiment aims to scale. Since many climate governance experiments and innovative climate governance instruments seek to address complex problems in non-homogenous areas, this 'frontrunner paradox' may be particularly challenging. This holds particularly for the built-environment with its large numbers of building types and contexts, professions, forms of ownership, and so on. The paradox has, however, received limited attention in the empirical literature on climate governance experimentation. In what follows, this frontrunner paradox is explored by studying a series of experimental and innovative urban climate governance instruments for reducing carbon emissions from the built environment in Australia.

3. Towards urban climate governance experimentation and innovation in Australia

As in many other countries, the Australian building stock is a key source of the nation's carbon emissions (Rauland and Newman 2015). The construction, maintenance, and use of buildings account for approximately 25 per cent of Australia's annual carbon emissions – approximately four metric tonnes per capita annually.[1] The dominant governance instruments in place to address building-related carbon emissions in Australia reflect those in force in other countries (IEA 2013; van der Heijden 2014). The Building Code of Australia is key. It pursues improved sustainability in buildings primarily through building energy efficiency codes. These were introduced in 1997 and their stringency has since been increased. Over the years, considerable critique has been expressed towards them. The Building Code of Australia applies only to the development of new buildings and major retrofits of existing ones. New and amended regulatory requirements normally exempt the existing stock from compliance. Because most of the existing Australian stock predates the 1980s, well before any energy efficiency requirements were in force, its energy efficiency is poor and its related carbon emissions high (Bond 2011). Yet, even the younger stock shows poor performance (Maller and Horne 2011). Building energy efficiency codes were introduced relatively late in Australia and are lenient when compared to the United States and Europe (IEA 2013). This problem is amplified by the fact that mandatory requirements for low-carbon building development (such as energy efficiency requirements) are found to face poor regulatory enforcement, increasing the likelihood of non-compliance (Healthy Environs 2015).

These critiques relate to broader critiques of mandatory, top-down, government-led instruments for low-carbon buildings. Although, in theory, these instruments hold great potential to accelerate the transition to low-carbon buildings (IEA 2013; UNEP 2009), they face a political and instrumental reality that is not in their favour (van der Heijden 2014). Acknowledging these complications, government, industry, and civil society have

begun to experiment with innovative governance instruments of the kind discussed before, seeking to reduce the carbon emissions of the Australian building stock beyond what is required by mandatory instruments (McGuirk, Bulkeley, and Dowling 2014; McGuirk *et al.* 2015).

4. Research design

Between 2010 and 2015, nine innovative governance instruments for low-carbon building development and transformation were studied in Australia to gain a better understanding of how they perform and how their performance can be explained. In addition, a series of 26 related instruments from other countries were also studied, including the United States and the Netherlands (van der Heijden, 2017). However, due to space limitations, these related instruments are not discussed in this paper.

The nine instruments that form the basis of this paper were chosen from the larger pool to represent the variety of designs and contexts, but without resulting in too much repetition of instruments in the pool of Australian cases. They fit three broad types of innovative urban climate governance instruments: certification instruments that make visible the resource performance of a building via a label, action networks that bring together actors to explore how to achieve the transition to low-carbon buildings, and novel forms of financing that seek to financially support property owners and developers (these broad types relate to those identified in the literature on experimental and innovative climate governance; cf. Evans, Karvonen, and Raven 2016; van der Heijden 2016; Wurzel, Zito, and Jordan 2013). Although the nine instruments are indicative of the full pool of cases studied in the larger research project (in terms of design and performance),[2] by no means does this paper claim that they are representative of all possible designs and contexts of innovative governance instruments for low-carbon building development and transformation around the globe. Table 1 provides a brief overview of the instruments studied for this paper and Appendix A (online supplemental data) gives a more extensive description of each instrument.

As the research project sought to gain an in-depth understanding of the performance of these instruments, a qualitative comparative research design was chosen (Newell, Pattberg, and Schroeder 2012). Cases (experimental and innovative governance instruments) were identified through internet searches and desk research. While all cases discussed in this paper are illustrative of a trend of innovative climate governance instruments, not all cases studied were in a similar stage of experimentation. Some were terminated during the research project (including the Sustainable Development Grant and the Building Innovation Fund), others were started just at the same time this project began and experimented with during the whole period of research (including the Better Buildings Partnership and CitySwitch Green Office), and yet others had moved beyond their initial experimental stages and were only modified incrementally following conventional policy change processes during the research project (including NABERS and Green Star).

The NABERS building certification instrument provides a good illustration here. It was implemented by the state of New South Wales as a voluntary programme in 1998 to gain insight into the resource consumption of the existing building stock and to influence the office market. It was expected that insight into building energy and water performance would drive demand for energy- and water-efficient office space, resulting in an upgrading of offices. Between 1999 and 2004, other state governments in Australia adopted it, and in 2005 the Australian Commonwealth Government adopted NABERS as a nationwide voluntary instrument. In 2010, the Commonwealth Government went

Table 1. Summary of instruments studied.

Name	Brief description	Participants relative to pool of prospective participants	Average reductions by participants	Relative effectiveness
1200 Buildings (since 2010)	Financing instrument that bridges the City of Melbourne government, finance providers, and commercial property owners (participants). It aims to retrofit 1200 buildings in the Melbourne central business district (CBD).	4 per cent.	Unknown (too few buildings retrofitted yet).	Minimal† when considering Melbourne's 2011 commercial building energy consumption.
Better Buildings Partnership (since 2011)	Action network for reduced commercial property-related carbon emissions in Sydney's CBD. It aims for a 70 per cent reduction of 2006 emissions by 2030.	100 per cent (all 14 initially targeted participants).	35 per cent, and on track to reach 70 per cent by 2020.	Approximately 18 per cent when considering Sydney's 2006 commercial building energy consumption in the CBD.
Building Innovation Fund (2008–2012)	Competitive financing instrument that funded only the most promising building retrofit proposals from a pool of proposed retrofits of commercial buildings in the City of Adelaide.	Less than 2 per cent (fewer than 10 projects were supported over the lifetime of the instrument).	Over 20 per cent, but not on track to achieve 50 per cent reductions by 2030.	Minimal when considering Adelaide's 2008 commercial building energy consumption.
CitySwitch Green Office (since 2010)	Action network for reduced resource consumption office users (participants). Challenges participants in Australia to reduce their resource consumption and achieve a specified classification (4 stars) under NABERS (see below).	6 per cent.	13–16 per cent, but not on track to achieve 50 per cent reductions by 2030.	Less than 1 per cent of Australia's 2010 office building energy consumption.
EnviroDevelopment (since 2006)	Certification instrument for resource efficient buildings. It allows property developers and owners (participants) to communicate the resource consumption of their property.	6 per cent (of new residential buildings).	Over 20 per cent, but not on track to achieve 50 per cent reductions by 2030.	Approximately 1 per cent of Australia's 2006 residential building energy consumption.

(*continued*)

Table 1. (*Continued*)

Name	Brief description	Participants relative to pool of prospective participants	Average reductions by participants	Relative effectiveness
Environmental Upgrade Agreements (since 2011)	Financing instrument that bridges the City of Sydney government, finance providers, and commercial property owners. Comparable to 1200 Buildings (above) but without a pre-specified emission target.	Less than 1 per cent.	Unknown (too few buildings retrofitted yet).	Minimal when considering Sydney's 2011 commercial building energy consumption.
Green Star (since 2003)	Certification instrument for resource efficient buildings. It allows property developers and owners (participants) to communicate the environmental credentials of their property.	18 per cent of new office buildings.	Over 20 per cent (but paper performance*) but not on track to achieve 50 per cent reductions by 2030.	Approximately 4 per cent of Australia's 2003 office building energy consumption (but paper performance*).
NABERS (nationwide since 2010)	Certification instrument for resource efficient buildings. It allows property developers and owners (participants) to communicate the energy and water consumption of their property.	77 per cent.	Over 20 per cent but not on track to achieve 50 per cent reductions by 2030.	Approximately 15 per cent of Australia's 2010 office building energy consumption.
Sustainable Development Grant (2007–2011)	Competitive financing instrument that funded only the most promising building retrofit proposals from a pool of proposed retrofits for commercial buildings in Brisbane.	Less than 2 per cent (fewer than 15 projects were supported over the lifetime of the instrument).	Around 20 per cent (but paper performance*) but not on track to achieve 50 per cent reductions by 2030.	Minimal when considering Brisbane's 2007 commercial building energy consumption.

† The qualitative descriptor 'minimal' indicates a maximum of 0.5 per cent.
* The term 'paper performance' indicates that these are expected reductions, not observed reductions; most certificates have been issued for the design of a building and not the performance of a building in operation.

further by introducing the Building Energy Efficiency Disclosure Act of 2010. The Act applies to office buildings with a net lettable area greater than 2,000 square metres and requires the owner or tenant to disclose the energy efficiency rating when such a building comes onto the market for sale or lease or when an existing lease is renewed. The Act requires that a NABERS energy certificate be made available but does not stipulate that a specific level of certification for a building has to be met. Finally, in 2015, NABERS was exported to New Zealand, where it is implemented as a voluntary instrument.[3]

A comparison of older versions of NABERS with newer ones indicates that over the years the rules underlying the instrument have been increased in stringency, the scope of the instrument has been increased to include more types of buildings, the star rating on which it builds has been expanded to make visible exceptional performance, and so on. This was all done based on lessons learnt during its implementation. The instrument was developed in close collaboration with industry stakeholders, builds on market solutions, and rewards voluntary beyond-compliance performance.

4.1 Data collection and analysis

The relevant data for analysing the instruments were obtained from websites, reports, and other sources. New data were obtained through a series of interviews. Interviews sought to fill gaps in the data from other sources, to resolve conflicts in data from other sources, and to gain additional insight into the instruments under scrutiny. Interviewees were recruited through Internet searches and social-network websites, particularly LinkedIn. A total of 55 interviewees from various backgrounds, including policymakers, bureaucrats, property developers, architects, engineers, and property owners, were interviewed for insights into the nine instruments studied here. The interviewees were often aware of, and involved in, more than one instrument. It is expected that this (partially) helped to overcome the sampling bias of administrators (and participants) who were overly enthusiastic about their 'own' instruments. Table 2 provides a brief overview of the interviewees.

Data were processed following conventional practice for this type of research (Brady and Collier 2004; Goertz and Mahony 2012; Silverman 2001). That is, the interviews were recorded and, based on the recording and notes taken during the interviews, a summary report was drafted that was returned to the interviewees for validation. Interviews lasted for approximately one hour and were generally conducted at the interviewees' work locations. The interview data and additional data were coded using a systematic coding scheme (Appendix B [online supplemental data] provides an overview

Table 2. Overview of interviewees.

Interviewee background	Government	Non-government
Policymaker	4	
Administrator	22	12
Architect, engineer, advisor		7
Contractor, developer		3
Property owner		4
Other		3
Total	**26**	**29**

of codes used) and then processed using data analysis software (Atlas.ti). Using this approach, the data were systematically explored and insight was gained into the 'repetitiveness' and 'rarity' of the experiences shared by the interviewees and the insights provided by additional sources.

5. Findings

To better understand whether there is indeed such as thing as the frontrunner paradox and, if so, what its implications are, this empirical section is structured into four topics that follow from the literature discussed to further tease out the tension between drawing lessons and scaling up in urban climate governance experiments: (1) the role of industry frontrunners in the innovative governance instruments studied, (2) the lessons learnt from experimenting with the instruments, (3) the performance achieved relative to the problem the instruments seek to address, and (4) the potential to scale up the instruments or to replicate them in other settings.

5.1 The role of industry frontrunners

All instruments were developed through collaborations between government and industry. Interviewees involved in their development and implementation were particularly vocal about the need to involve industry frontrunners in these processes – where interviewees used the terms 'leader' and 'frontrunner' interchangeably. "You need leaders in the market place showing a better way of doing things, and you need the market place to be inspired and driven by those leaders", explained a representative of a sustainable construction peak body (int. 33).[4] Interviewees argued that governments have a limited understanding of what is possible in terms of low-carbon buildings and that by bringing in industry frontrunners in these instruments, their knowledge can be used. "From [our] point of view," explained a policymaker in Sydney (int. 42), "we need their expertise and experiences to show us and challenge us to get the best solutions". A policymaker in Melbourne (int. 26) added, "You can say all these things should be in regulation, but then it forces leadership into something traditional. You won't help businesses to build something that is leading. Something that is on the edge". Thus, this interviewee argued that only by involving industry frontrunners in the development of these instruments is it possible to move beyond traditional solutions.

Not only were industry frontrunners deeply involved in the development and implementation of the instruments, but also the instruments themselves focused strongly on rewarding industry frontrunners. An illustrative example is Green Star, a building certification instrument that makes visible the environmentally sustainable credentials of a building through the use of a label. As a senior board member of the Australian Green Building Council (int. 22) – the organisation that administers Green Star – explained, "When developing Green Star, we faced this question: Do you aim for the top 5 per cent of the market and neglect the other 95 per cent?" He continued, "Aiming [for] the top 25 per cent appeared a way to address the leaders in the market, without losing engagement". To indicate its emphasis on rewarding only the top quartile, Green Star awards three labels, the minimum of which is a 4 Star rating (referred to as 'Best Practice'), followed by 5 Star ('Australian Excellence'), and 6 Star ('World Leadership').

The same senior board member concluded that "If you address the leaders, you will push the followers" (int. 22). Interviewees repeatedly mentioned this expectation of a spill over effect from frontrunners in the industry to the majority. As a policymaker in

Brisbane (int. 27) noted, "The developer looks down the road, sees a Green Star building and thinks, 'I've got to compete with that'. You get to a tipping point where it becomes the norm". According to the interviewees, another advantage of acknowledging frontrunners is that it rewards, and therefore stimulates, innovation: "For me it really shows what the market is capable of", observed a policymaker in Adelaide (int. 51). "You often see ambition [in government] to lift the minimal standards, but then the interest groups squeal and say 'That cannot be done'. But with [these instruments] you see that it can be done, that it makes them think to go further, to push the boundaries".

The focus on industry frontrunners is dominant, even in the way the instruments are marketed. For example, the website of the Green Building Council of Australia, the organisation that administers Green Star, mentions the word 'leadership' no less than 6,500 times on its pages.[5] Yet, the instruments are also marketed using subtler wording to attract frontrunners in the industry. The instrument 1200 Buildings, which helps property owners secure funds for retrofits, claims on its website that participation helps in "improving corporate image", helps to "lower environmental footprint", and helps in "making the building more attractive to investors".[6] The Mayor of Melbourne is also vocal in the media about the 'leadership role' that participants have taken in committing to this instrument.[7] That having been said, participants were less vocal about a need to involve frontrunners in these instruments. For them, there is no need to distinguish between the frontrunners and the majority in these instruments. Their aim is to gain the rewards of the instrument and not, or at least less so, to make the instrument a success, which is a key goal for instrument administrators (cf., Rogers 1995).

5.2 Lessons learnt and knowledge created

Again, particularly instrument administrators and those involved in the process of experimenting with it were very positive about the various lessons learnt and the knowledge created from the experiments. When discussing the value of experiments with innovative climate governance instruments in Sydney, a city policymaker argued (int. 42) that "[these experiments are] a good way of demonstrating what actually can be done. It is a good way of showing facts about the efficiencies [that can be achieved] in energy and water [consumption]". Likewise, the representative of a sustainable building peak body argued (int. 33) that "[these experiments] are necessary in setting the vision [of] what the right thing is. Because if we don't show what the right thing is, [the construction and property industries] are doing the wrong thing".

Indeed, all instruments studied have (or had) sections on their websites dedicated to best practices and lessons learnt (see also Appendix B [online supplemental data]). These range from very brief descriptions of exemplary buildings constructed or retrofitted in some instruments to extensive case studies in others that spell out opportunities, challenges, costs, and participant and administrator experiences. A challenge in communicating best practices and knowledge, explained programme administrators, is moving from very project- or participant-specific insights to knowledge that is transferable across different (types of) projects and participants. Another challenge is data collection. Often the notion of drawing lessons from trialling or experimenting with an instrument came only after the very first phases of developing or implementing it. Often in the initial stages of an experiment, no formal structure of drawing and storing lessons was in place. As an administrator of one of the instruments studied explained after its first year of experimentation (int. 18), "[We do not] collect lessons systematically, but still some mutual learning is achieved. We are seeing things better

now. Where are the opportunities [in building-energy reduction]? Where is most energy used? Where can we make savings? But systematic collection of data will be the next step".

While participants were also positive about the ability to draw lessons from these experiments, there was little mention of using the best practices and case studies developed and provided by instrument administrators. Reflecting on Green Star, a manager of one of Australia's largest development firms stated (int. 45), "It is like when Green Star started. Back then a four-star Green Star building was very [exceptional]. Now a four-star Green Star building is just the minimum [in Australia's major central business districts]". To this he added, "It has taken some time to build up the knowledge on the returns that are generated through certain solutions, how much energy can be saved, and so on. But the engineers now are very knowledgeable about this and very experienced with it". This latter part reflects well how other participants discussed the knowledge generated through the innovative climate governance instruments too: they often discussed how they themselves or how their advisors or suppliers had come to understand the instrument. Yet, they did not touch on the value of the best practices available on the various instrument websites.

In sum, as with the focus on involving leaders in these experiments, there appears to be a difference between how instrument developers and administrators view the value of best practices and knowledge generated and how participants view it. Again, the knowledge and best practices serve different interests. For participants, it is relevant to know how exactly an instrument will serve them, which requires very detailed knowledge that can, likely, only be generated by using the instrument. For administrators, such knowledge is also relevant, but too detailed, too case-specific information will likely not appeal to a broad community of potential participants. That is, knowledge and best practices provided on instrument websites also serve a signalling function to attract participants. This in itself may result *in situ*ations where being able to present an attractive 'best practice' overrides the ambition to present meaningful knowledge. CitySwitch Green Office provides an example here. "[The] key of the [instrument] is learning," a local administrator explained, "and we can best be understood as a facilitator in this learning process through the meetings and lectures we organise" (int. 35). Yet, a national administrator stated that not all data underlying the lessons learnt and the best practices presented on the CitySwitch website are sound because of the quality of insights provided by participants. "This distorts the data we have. Based on the current data only very flawed predictions of [best practices] can be made", she observed (int. 41). The reported lessons learnt and best practices presented are likely to constitute theoretical best-case scenarios, with real performance being substantially lower than recorded numbers.

5.3 Performance: participants attracted and reductions achieved

An accepted approach in climate governance studies was followed to assess the performance of the instruments (Borck and Coglianese 2009; de Vries, Nentjes, and Odam 2012). First, the number of participants an instrument has attracted was considered as a percentage of the full pool of prospective participants to which it reaches out. This was done to gain an insight into the uptake of the instrument. Second, average reductions in energy or carbon emissions achieved per participant were contrasted with reductions that are claimed to be achievable in Australia at net cost–benefit by using available and well-trialled technology and insights on low-impact behavioural change – in other words, 50 per cent reductions by 2030 (ASBEC 2016; Beyond Zero Emissions 2013; Greensense

2013). Third, the overall reductions claimed by instrument administrators in 2015 were contrasted with the total energy consumption or carbon emissions for the specific area addressed by the instrument in the year of its implementation to gain an insight into the relative performance of the instruments.[8]

Table 1 shows that, with the exception of the Better Buildings Partnership and NABERS, none of the programmes studied have attracted a large percentage of the full pool of the targeted participants.[9] Most programmes have achieved an uptake of 1–6 per cent – well below the 15–25 per cent that is conventionally considered to be required to make a transition from frontrunners to majority (Rogers and Weber 2010; Rogers 1995). Green Star performs better, but the 18 per cent market uptake only reflects its penetration in the office market in Australia. The programme is marginally applied in the other areas it seeks to serve, such as retail, residential, and educational buildings. In addition, the instrument saw a rapid increase in the number of participants in its first years, but its growth has since levelled out (GBCA 2015). The contrastingly high participation of NABERS office energy labelling, 77 per cent, is explained by the mandatory requirements set by the Building Energy Efficiency Disclosure Act of 2010 (see above). That being said, the voluntary NABERS office water labelling is applied in 46 per cent of the office market in Australia. Finally, the participation of all originally targeted participants under the Better Buildings Partnership can be explained by the simple fact that they constituted only 14 major property owners.

Table 1 also shows that, with the exception of the Better Buildings Partnership, none of the instruments are on track to achieve an average per participant reduction of 50 per cent of energy consumption or carbon emissions by 2030 compared with the year the instrument was launched. More worrying, again with the exceptions of the Better Buildings Partnership and NABERS, all instruments have thus far had, at best, marginal impacts (here considered as less than 5 per cent) on reducing the overall energy consumption or carbon emissions in the specific areas they target. Before looking at the outlier, the Better Buildings Partnership, this poor performance is further unpacked.

What explains the poor uptake of the instruments by prospective participants? Part of the answer to that question appears to be the dominant focus on rewarding frontrunners and industry leadership. For example, when closely scrutinising the participant base of CitySwitch, an instrument that supports office tenants in reducing their resource consumption, it was learned that it attracts participants who already show building energy consumption below average market levels when they commit to the instrument (CitySwitch 2013, 2014, 2015). In other words, this instrument attracts tenants who are already leading and not the majority of average and/or poor performers. The rewards that come with the instrument may explain this. A yearly award ceremony is held to highlight the best-performing participants and considerable media attention is given to these frontrunners. “CitySwitch helps leaders to feel good about what it is they are doing, and we very much aim to market [their performance] to the best of our ability”, a national CitySwitch administrator (int. 41) explained, “but do they win business with it? Probably not”. This led interviewees involved in CitySwitch at local level to be highly critical. “What we found is that the first thing people in [City X] ask is: What’s in it for me?” said a local CitySwitch administrator (int. 50). “And [after we explain the advantages of participating] they say: I can do that anyway. What is it that the council is going to pay for?” He was particularly concerned that the strong focus on frontrunners makes the instrument attractive to only a small segment of office tenants – ironically those that are already performing well.

What explains the poor average participant performance? In developing innovative governance instruments, administrators have to make a difficult decision: introduce a highly ambitious instrument with high participation criteria – but run the risk of a low uptake because not many can actually comply with these criteria – or introduce a moderately ambitious one with moderate requirements that are attractive to, and achievable by, a large group of prospective participants (Potoski and Prakash 2009). When considering the Australian instruments – and also those studied from other countries (van der Heijden 2017) – it appears that administrators prefer the latter design over the former. For example, to achieve the lowest level of labelling, Green Star requires participants to outperform the energy performance requirements set by the Australian Building Code by 10 per cent (GBCA 2014). This is a fairly unambitious requirement in the light of possible reductions but is still considered 'Best Practice'. In contrast, the certification instrument EnviroDevelopment sets more ambitious criteria and requires that buildings outperform mandatory requirements by at least 20 per cent. However, this ambition seems to have backfired: only 6 per cent of all new residential property built in Australia has been EnviroDevelopment certified, representing less than 1 per cent of Australia's housing stock.[10]

Low levels of participation, moderately ambitious criteria, or both, logically result in a situation where the overall performance of these instruments is marginal. But what explains the promising performance of the Better Building Partnership? The answer is straightforward. The Partnership covers the relatively small area of Sydney's central business district and only applies to some 100 high-profile office buildings. It is an absolute elite group of property sector leaders managing a total of AU$105 billion worth of property, which indicates that they have the financial means to carry out retrofits. It is much easier for an instrument administrator to reach out to such a close-knit pool of prospective participants than to any of the pools of prospective participants in the other instruments (Olson 1965). In addition, the reported performance should be considered in the light of the fact that some improvements had been made (or planned) by participants well before the Partnership was implemented in 2011. The participants' energy consumption in 2006 is used as a benchmark, which considerably skews the reported performance.

5.4 Potential to scale or replicate

Interviewees were particularly vocal about the limitations on scaling or replicating the instruments studied. Policymakers and administrators in cities other than Sydney, for example, pointed to the Better Buildings Partnership as being impossible in their jurisdictions: "We host the back offices of the big companies. It is in the interest of these big companies to have the city in which they have their headquarters – the city from where they want to be the springboard to the world – to have these cities hum and look fantastic", said an administrator from another city (int. 50). "It is not necessarily of interest to them to have their back offices be a high-cost work environment, with [higher levels of built-environment] sustainability, higher rental costs and all that", he continued. The Better Building Partnership turned out to be such a success, he further explained, because it only involves a small jurisdiction, a relatively small number of buildings, and Australia's most ambitious and wealthy property owners.

Criticisms expressed about the other instruments resonate with this insight. For example, Green Star is predominantly applied in the absolute top end of the new commercial property market: high-end and flagship offices in the central business districts of Australia's major cities. It is here that Green Star has a market coverage of 18 per cent.

Governmental agencies and large corporations occupy these offices, and occupying low-carbon office space is in line with their policies of social corporate responsibility. Green Star is, however, less sought after by small and medium-sized businesses, homeowners, and those interested in retrofitting existing buildings. In these parts of the construction and property sectors, the uptake of Green Star is marginal.[11]. Moreover, the higher levels of labelling under certification instruments were not considered to see much scaling: "It simply is not viable to develop a Green Star six-star rated multi-unit residential project," a sustainability manager at a major property developer in Australia (int. 44) explained. He continued, "unless, of course, you want it to be a flagship development of your portfolio and you know you're going to make a loss on it".

In particular, interviewees who represented participants indicated that the frontrunner awards that come with participating – having the opportunity to market this frontrunner position through a label, being recognised by government as an industry leader, and so on – are of no interest to a large segment of prospective participants. "Look, we are talking about the top end of town [that seeks Green Star certification]. Think government, blue-chip companies, financial institutions, lawyers and accounting firms. But there is another level where the consumer does not currently see the benefit of sustainable buildings," explained a senior manager at a major Australian development firm (int. 47). He continued, "and even if they do see the benefit, they probably are not willing to pay a premium for it". Further, a senior consultant at one of Australia's major environmental consultancy firms (int. 23) said, "The [high-end] commercial market is hit. There it's seen as creating value. But this does not relate to the residential market. It is not proven [homeowners] want to pay for it". The interviewees argued that other incentives were more important to the majority of the market: "[For them] cost reduction is one of the biggest drivers to participate. The bigger companies [may be] very keen to market themselves as leaders in this area but the biggest driver is cost", concluded a senior programme officer from NABERS (int. 40).

A further complication appears to be the marketing of leadership on which many programmes rely. 1200 Buildings provides an example. The majority of commercial property in Melbourne's central business district, the area targeted by 1200 Buildings, is owned privately (small and medium-sized firms and individuals) rather than by large professional corporations (City of Melbourne 2013). "Private owners often do not have the corporate structures and resources to research, facilitate and track building performance", the team leader of 1200 Buildings explained (quoted in Aliento 2014). Private owners are often unaware of the energy performance of the building or buildings they own and take a passive stance toward building energy performance. More than large firms, they consider building energy retrofits a sunk cost rather than an investment that might generate a cash flow in the form of energy-cost savings (Perinotto 2014). Still, the instrument is marketed in terminology that resonates more with large (and front-running) property owners than it does with smaller ones, as discussed earlier: "improving corporate image", "lower environmental footprint", and "making the building more attractive to investors". The administrators do little to market the instrument as an attractive opportunity for small and medium-sized firms and individual commercial property owners.

6. Discussion and conclusion: is it time to focus on what lies beyond frontrunners?

This paper has studied nine governance instruments for low-carbon buildings in Australia that share many characteristics of experimental and innovative climate governance. It

was particularly interested in exploring the paradox of frontrunners in climate governance experiments and innovations, that is, the conflict of having to rely on frontrunners to work towards innovations and to be able to experiment but at the risk of relying too much on them and thus losing touch with the majority. Without convincing the majority to commit to an innovation it will be very hard, if not impossible, to see it scale up.

Before drawing conclusions, particularly on the frontrunner paradox, it is of relevance to note that the chosen research approach limits the generalisability of the presented findings. Other studies, in other countries and other areas, may find related patterns and processes, but it is unlikely that they will be exactly the same – what follows can be considered "*moderatum* generalisations" (Payne and Williams 2005). Furthermore, although the poor performance of the instruments studied can, in part, be assigned to the frontrunner paradox, other explanations are possible, and two stand out. First, apart from the (partly) mandatory instrument NABERS, all instruments ask for voluntary participation. The broader literature on voluntary programmes indicates poor performance in terms of participation along the lines observed here (Prakash and Potoski 2012). Second, except for the Better Buildings Partnership, which is characterised by a relatively small and highly homogenous pool of participants, all instruments seek to attract a large and relatively heterogeneous pool of participants. The broader literature on groups and collective action indicates the complexities of attracting participants along the lines observed here (Olson 1965). Finally, while this study does not indicate that the frontrunner paradox plays out differently for the type of instrument experimented with, its context, or the actors involved, future research may seek to explore whether this holds more broadly or whether it results from the sample of nine cases studied.

That said, the bottom-line finding is that most instruments studied fall short of attracting meaningful numbers of participants or achieving a meaningful improvement in participants' behaviour, or both. Still, they have provided a wealth of knowledge about and best practices in low-carbon building development, retrofitting, and use in Australia. Some building developers, owners and users have, often supported by instrument administrators, introduced innovative building designs and use practices that have resulted in resource efficiencies and waste reductions that reach well beyond mandatory requirements in Australia. It remains a question for future research, however, whether they have done so seeking to achieve instrument rewards or whether they would have been frontrunners also without the instruments in place. Another question for future research is how well the knowledge created by them, as well as their best practices, resonate with the majority market.

When taking a step back and looking at the instruments from some distance, a similarity that helps to explain their poor performance comes to the fore. All instruments adopt a fairly homogenous marketing narrative around frontrunners and the leadership benefits that come from committing to these instruments. The markets targeted by these instruments are, however, not homogenous and are not only made up of (prospective) frontrunners. With the exception of the Better Buildings Partnership, all instruments seek to attract a variety of market sectors, including professional and non-professional property owners, large and small firms, single family dwellings and full-scale residential development projects, international developers and local contractors, and so on. The frontrunner narrative and the marketed leadership benefits might resonate well with specific segments of these markets but not with all of them. In particular, for smaller firms and non-professional property owners, this narrative may not be sufficiently attractive or convincing. The knowledge created by frontrunners and their best practices may also not resonate well with other segments of the markets. In addition, and perhaps

of interest to explore in future scholarship, the data indicated a difference between how developers and administrators of instruments view the need to involve frontrunners and the value of the knowledge created through experiments and how participants of the instruments do.

The development and property industry lacks aspects that are essential for the diffusion from frontrunners to majority to occur naturally (Moore 2002). First, because of the heterogeneity of the industry, the frontrunners are not always considered to be inspirational peers by the majority. Second, because of high fragmentation of the industry, power laws (such as the 80/20 rule) do not hold: targeting a small number of organisations with much influence is normally not possible in the development and property industry. The instruments' dominant focus on involving, stimulating, and rewarding frontrunners fails to interpret the heterogeneity and fragmentation of the industry. Thus, the time seems ripe for instrument administrators to move away from (solely) targeting frontrunners and marketing the leadership benefits of these instruments and to begin to target specific market sectors with more tailored narratives and more tailored instruments. For example, 1200 Buildings could be split into an instrument for large property owners and one for medium and small property owners. These groups have different needs, will probably respond to different rewards, and will require different narratives to get them on board with an innovative governance instrument.

In conclusion, frontrunners are important in climate governance experiments and innovations. There is, however, a risk of a frontrunner paradox when instrument developers and administrators too easily assume that the majority will follow leading practice and use knowledge created in experiments. This risk particularly boils down to the following: lessons and best practices that result from experiments have little value when seeking to scale up the innovative climate governance instruments experimented with when there is a mismatch between the groups that have created these best practices and knowledge and those that are sought for scaling up (i.e. frontrunners vs. majority). Instrument developers and administrators need to understand the configuration of the pool of prospective participants they target – Is it homogenous? Is it heterogeneous? Do power laws hold? Is substantial peer pressure present? Whether the frontrunner paradox holds similarly in other complex areas of climate governance remains to be seen. This paper has, however, pointed out that there are good reasons to assume it might.

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Supplemental data

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Notes

1. Data from www.environment.gov.au/climate-change/greenhouse-gas-measurement/tracking-emissions (20 July 2016).
2. The larger pool includes 16 certification instruments, eight action networks, and 11 innovative forms of financing (van der Heijden, 2017). The set studied here includes three, two, and four, respectively.
3. www.nabersnz.govt.nz (18 August 2016).
4. Interviewees were promised anonymity in research publications. Interviewees are numbered consistently throughout all publications resulting from the larger project.
5. www.new.gbca.org.au (18 August 2016).
6. www.melbourne.vic.gov.au/1200buildings/Pages/GoodForBusiness.aspx (10 August 2016).
7. www.greenlifestylemag.com.au/news/1894/melbournes-big-green-overhaul (18 August 2016).
8. These second and third approaches to evaluation may be critiqued because factors other than participating in the instrument may also have caused reductions and because the data used, which were provided by instrument administrators, may present an overly positive narrative (Borck and Coglianese, 2009). For this article, this is not a major concern because it points to a pattern of generally poor performance of the instruments – even whilst the data underlying that pattern may have been too positive in the first place.
9. Performance data is reported to a great extent elsewhere (van der Heijden 2017).
10. www.envirodevelopment.com.au, www.hia.com.au, and www.abs.com.au (6 July 2015).
11. www.new.gbca.org.au (18 August 2016).

References

Aliento, W. 2014. *Retrofits: How Melbourne Can Encourage Private Interests to Engage With Public Ones*. http://www.thefifthestate.com.au/property/commercial/retrofits-how-melbourne-can-encourage-private-interests-to-engage-with-public-ones/58407

Andresen, S., and S. Agrawala. 2002. "Leaders, Pushers and Laggards in the Making of the Climate Regime." *Global Environmental Change* 12 (1): 45–51.

Ansell, C., and M. Bartenberger. 2016. "Varieties of Experimentalism." *Ecological Economics* 130 (October): 64–73.

ASBEC. 2016. *Low Carbon, High Performance*. Sydney: Australian Sustainable Built Environment Council.

Bai, X., B. Roberts, and J. Chen. 2010. "Urban Sustainability Experiments in Asia." *Environmental Science and Policy* 13 (4): 312–325.

Beyond Zero Emissions. 2013. *Zero Carbon Australia: Buildings Plan*. Melbourne: University of Melbourne.

Bond, S. 2011. "Barriers and Drivers to Green Buildings in Australia and New Zealand." *Journal of Property Investment and Finance* 29 (4/5): 494–509.

Borck, J., and C. Coglianese. 2009. "Voluntary Environmental Programs." *Annual Review of Environmental Resources* 34: 305–324.

Borck, J., C. Coglianese, and J. Nash. 2008. "Environmental Leadership Programs." *Ecology Law Quarterly* 35 (4): 771–834.

Bos, J. J., and R. R. Brown. 2012. "Governance Experimentation and Factors of Success." *Technological Forecasting and Social Change* 79 (7): 1340–1353.

Brady, H. E., and D. Collier (Eds.). 2004. *Rethinking Social Inquiry*. Lanham, MD: Rowman and Littlefield Publishers.

Bulkeley, H., and V. Castan Broto. 2013. "Government by Experiment?" *Transactions of the Institute of British Geographers* 38 (3): 361–375.

Bulkeley, H., V. Castan Broto, and G. Edwards. 2015. *An Urban Politics of Climate Change*. Abingdon: Routledge.

Caprotti, F., and R. Cowley. 2016. "Interrogating Urban Experiments." *Urban Geography*. doi:10.1080/02723638.2016.1265870

City of Melbourne. 2013. *1200 Buildings Melbourne Retrofit Survey 2013*. Melbourne: City of Melbourne.
CitySwitch. 2013. *2012 Progress Report*. Sydney: CitySwitch.
CitySwitch. 2014. *2013 Progress Report*. Sydney: CitySwitch.
CitySwitch. 2015. *Progress Report 2014*. Sydney: CitySwitch.
Clarysse, B., M. Wright, J. Bruneel, and A. Mahajan. 2014. "Creating Value in Ecosystems." *Research Policy* 43 (7): 1164–1176.
de Vries, F., A. Nentjes, and N. Odam. 2012. "Voluntary Environmental Agreements." *International Review of Environmental and Resource Economics* 6 (2): 119–152.
Evans, J., and A. Karvonen. 2014. "Give Me a Laboratory and I will Lower Your Carbon Footprint!." *International Journal of Urban and Regional Research* 38 (2): 413–430.
Evans, J., A. Karvonen, and R. Raven (Eds.). 2016. *The Experimental City*. London: Routledge.
GBCA. 2014. *Green Star: Design & as Built*. Sydney: Green Building Council of Australia.
GBCA. 2015. *Introducing Green Star*. Sydney: Green Building Council of Australia.
Goertz, G., and J. Mahony. 2012. *A Tale of Two Cultures*. Princeton, NJ: Princeton University Press.
Greensense. 2013. *Out of Hours: The Easiest Way to Improve Your Building's Energy Efficiency*. Melbourne: Greensense.
Gunningham, N., and D. Sinclair. 2002. *Leaders and Laggards*. Sheffield: Greenleaf Publishing.
Harman, B., B. Taylor, and M. B. Lane. 2015. "Urban Partnerships and Climate Adaptation." *Current Opinion in Environmental Sustainability* 12 (1): 74–79.
Healthy Environs. 2015. *New Home Energy Efficiency Compliance Inspections*. Adelaide: State of South Australia.
Hoffmann, M. 2011. *Climate Governance at the Crossroads*. Oxford: Oxford University Press.
IEA. 2013. *Modernising Building Energy Codes*. Paris: UNDP.
Jahanmir, S., and L. F. Lages. 2016. "The Late-Adopter Scale." *Journal of Business Research* 69 (5): 1701–1706.
Johnson, C., N. Toly, and H. Schroeder (Eds.). 2015. *The Urban Climate Challenge*. Abingdon: Routledge.
Kivimaa, P., M. Hildén, D. Huitema, A. Jordan, and J. Newig. 2015. *Experiments in Climate Governance*. SPRU Working Paper Series, (SWPS 2015-35). Brighton: University of Sussex.
Laakso, S., A. Berg, and M. Annala. 2017. "Dynamics of Experimental Governance." *Journal of Cleaner Production*. doi:10.1016/j.jclepro.2017.04.140
Maller, C., and R. Horne. 2011. "Living Lightly, Urban Policy and Research." 29 (1), 59–72.
McFadgen, B., and D. Huitema. 2017. "Experimentation at the Interface of Science and Policy, Policy Science." doi:10.1007/s11077-017-9276-2.
McGuirk, P., H. Bulkeley, and R. Dowling. 2014. "Practices, Programs and Projects of Urban Carbon Governance." *Geoforum; Journal of Physical, Human, and Regional Geosciences* 52 (March): 137–147.
McGuirk, P., R. Dowling, C. Brennan, and H. Bulkeley. 2015. "Urban Carbon Governance Experiments." *Geographical Research* 53 (1): 39–52.
Moore, G. 2002. *Crossing the Chasm*. New York: HarperCollins Publishers.
Newell, P., P. Pattberg, and H. Schroeder. 2012. "Multiactor Governance and the Environment." *Annual Review of Environment and Resources* 37 (1): 365–387.
Olson, M. 1965. *The Logic of Collective Action*. Cambridge, MA: Harvard University Press.
Payne, G., and M. Williams. 2005. "Generalization in Qualitative Research." *Sociology* 39 (2): 295–314.
Perinotto, T. 2014. *Melbourne 1200 Building Programs on HVAC 101*. http://www.thefifthestate.com.au/innovation/energy/melbourne-1200-building-programs-on-hvac-101/62307
Potoski, M., and A. Prakash. 2009. *Voluntary Programs*. Cambridge, MA: MIT Press.
Prakash, A., and M. Potoski. 2012. "Voluntary Environmental Programs." *Journal of Policy Analysis and Management* 31 (1): 123–138.
Rauland, V., and P. Newman. 2015. *Decarbonising Cities*. Dordrecht: Springer.
Rocle, N., and D. Salles. 2017. "Pioneers But Not Guinea Pigs." *Policy Science* doi:10.1007/s11077-017-9279-z
Rogers, E., and E. Weber. 2010. "Thinking Harder About Outcomes for Collaborative Governance Arrangements." *The American Review of Public Administration* 40 (5): 546–567.
Rogers, E. M. 1995. *Diffusion of Innovations*. New York: Free Press.

Rogers, E. M., U. Medina, M. Rivera, and C. Wiley. 2005. "Complex Adaptive Systems and Diffusion of Innovations." *Innovation Journal* 10 (3): 1–26.

Sassen, S. 2015. "Bringing Cities into the Global Climate Framework." In *The Urban Climate Challenge,* edited by C. Johnson, N. Toly, and H. Schroeder. London: Routledge.

Scott, T. 2015. "Does Collaboration Make Any Difference?" *Journal of Policy Analysis and Management* 34 (3): 537–566.

Sidiki, S., J. Carboni, C. Koski, and A. Sadiq. 2015. "How Policy Rules Shape the Structure and Performance of Collaborative Governance Arrangements." *Public Administration Review* 74 (4): 536–547.

Silverman, D. 2001. *Interpreting Qualitative Data*. 2nd ed. London: Sage.

Smedby, N. 2016. *Local Environmental Governance*. Lund: Lund University Publications.

Teisman, G., A. van Buuren, and L. Gerrits. 2009. *Managing Complex Governance Systems*. London: Routledge.

Termeer, C., and S. Nooteboom. 2014. "Innovative Leadership Through Networks." In *Public Innovation Through Collaboration and Design*, edited by C. Ansell and J. Torfing, 170–187. Abingdon: Routledge.

UNEP. 2009. *Buildings and Climate Change*. Paris: United Nations Environment Programme.

van der Heijden, J. 2014. *Governance for Urban Sustainability and Resilience*. Cheltenham: Edward Elgar.

van der Heijden, J. 2016. "The New Governance for Low-Carbon Buildings." *Building Research and Information* 44 (5–6): 575–584.

van der Heijden, J. 2017. *Innovations in Urban Climate Governance*. Cambridge: Cambridge University Press.

Vreugdenhil, H., S. Taljaard, and J. Slinger. 2012. "Pilot Projects and Their Diffusion." *International Journal of Sustainable Development* 15 (1–2): 148–172.

Wurzel, R., A. Zito, and A. Jordan. 2013. *Environmental Governance in Europe*. Cheltenham: Edward Elgar.