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Voluntary urban climate governance: Whether and how should city governments be involved?

Author

Jeroen van der Heijden

Australian National University & University of Wageningen

j.j.vanderheijden@anu.edu.au

Abstract

Voluntary urban climate governance has been posed to overcome shortfalls with mandatory, top-down, state-led government interventions to address climate change risks. It seeks a commitment from households and firms to improve their environmental sustainability, but without the force of law. City governments are highly active in voluntary urban climate governance, and particularly in the development and implementation of voluntary programs for urban climate action. There is little evidence, however, on whether their involvement positively affects voluntary program performance, or not. This article presents qualitative comparative analysis (QCA) of 26 voluntary programs from Australia, the Netherlands and the U.S. seeking to understand whether, and if so how, city governments affect the performance of voluntary urban climate programs. Results will help to inform the roles city governments may take in voluntary urban climate governance.

Key words

Urban climate governance, voluntary programs, comparative qualitative analysis, climate action, built environment

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Voluntary urban climate programmes: Should city governments be involved and, if so, how?

Abstract

It has been proposed that voluntary urban climate programmes overcome shortfalls in mandatory, top-down, state-led government interventions to address climate change risks. Such programmes seek commitments from households and firms to improve their environmental sustainability, but do not have the force of law. City governments are actively developing and implementing such programmes, seeking improved and accelerated urban climate action. There is little evidence, however, of whether their involvement positively affects voluntary programme performance. This article presents qualitative comparative analysis (QCA) of 26 voluntary programmes from Australia, the Netherlands and the US, seeking to understand whether, and if so how, city governments affect the performance of voluntary urban climate programmes. The results will help to inform city governments about the roles they may play in urban climate governance.

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Introduction

Seeking to accelerate the transition to environmentally sustainable and climate resilient cities, governments, firms and civil society actors have turned to trialling governance instruments that complement traditional mandatory interventions such as planning legislation and building codes (Bulkeley and Castan Broto 2013; Van der Heijden 2016b). Many of these instruments have been introduced to incentivise households and firms to reduce the negative environmental impacts of their behaviour, but they do not have the force of law. This trend in voluntary programmes in urban climate governance has been documented at local, regional, national and international level (Bai, Roberts, and Chen 2010; Bulkeley, Castan Broto, and Edwards 2015; Hoffmann 2011; Moloney, Horne, and Fien 2010). There are high hopes of this approach to urban climate governance, but its performance is not well understood (Johnson, Toly, and Schroeder 2015; Van der Heijden 2017).

Voluntary approaches are not unique in the government of the negative environmental impacts and climate resilience of cities. Such approaches have a long history in, for example, environmentally sustainable forests and marine stewardship, organic food production, apparel manufacturing that does not use child labour, and ethical diamond mining (Auld 2014; Potoski and Prakash 2009). The increasing popularity of voluntary governance as an approach to achieving socially desirable outcomes, and voluntary programmes as the instruments of voluntary governance, has been closely followed in international scholarship. The literature points to various factors that improve the performance of this approach to governance (Coglianese and Nash 2009, 2014; Prakash and Potoski 2012; Van der Heijden 2012): the likelihood of individuals and organisations being exposed to voluntary programmes, the requirements they should meet, the rewards that come to them, and the actors involved in developing and monitoring the programmes.

For voluntary urban climate governance to be effective – that is, to attract participants and change their behaviour – the role of city governments in the development and implementation of voluntary programmes may be particularly critical (Jayne and Ward 2017; Parnell 2016). City governments may be most aware of the (local) problems that can be addressed with voluntary urban climate programmes, provided that local actors are willing to commit to the voluntary programmes, and they may be considered by those subject to voluntary programmes to be the most legitimate actors to develop and implement them (Hughes 2012; Peterman, Kourula, and Levitt 2012). In addition, there is anecdotal evidence that city governments do indeed play important roles in the development and implementation of voluntary urban climate programmes (C40 Research Team and Arup 2014; ICLEI 2012).

It thus makes logical sense to expect that the involvement of city governments in voluntary programmes and the performance of these programmes are positively associated. This article seeks to assess whether and how city governments affect the performance of voluntary urban climate programmes. It does so through an empirical study of 26 programmes from Australia, the Netherlands and the United States. In what follows, the extant literature on voluntary programmes is examined in the context of urban climate governance. The research methodology underlying the empirical study is then presented. A qualitative comparative analysis (QCA) is conducted to examine, empirically, the influence of city governments on the performance of voluntary urban climate programmes. The article concludes with implications for the roles of city governments in voluntary urban climate programmes.

Voluntary programmes – a brief review of the literature

Cities are a key source of resource consumption and waste production, and, within cities, the built environment takes up the largest share (Dodman 2009; IPCC 2014). With mature technology and with non-intrusive behavioural and lifestyle changes, cost-effective energy consumption and carbon emission reductions ranging from 30 to 80 per cent can be achieved in the built environment (UNEP 2009, 2016). This makes cities key in global responses to climate change, and key in global climate governance. Unfortunately, traditional mandatory governance interventions, such as planning legislation and building codes, have not yet been able to accelerate the transition to a resource-efficient and low carbon built environment – leaving untapped the vast potential of cities to reduce resource consumption and waste production (Bulkeley et al. 2014; Castan Broto 2017; Van der Heijden 2017).

Whilst a range of problems have been pointed out as regards mandatory and often state-led governance interventions in this area (Otto-Zimmermann 2010; Van der Heijden 2014a), a few problems particularly stand out. The first is the long time that is taken to develop and implement planning regulations, building codes and other city development policies, as well as the time it takes to see their effects (Rosenzweig et al. 2010). Second, mandatory interventions predominantly regulate objects and not behaviour, and yet the way humans behave in cities, and particularly how they use buildings, is one of the major sources of city energy consumption and carbon emissions (Moloney, Horne, and Fien 2010; Solanki, Malella, and Zhou 2013). Third, mandatory interventions normally focus on future developments, and make existing parts of cities – buildings and infrastructure – exempt from compliance (Cihat Onat, Egilmez, and Tatari 2014). Whilst understandable from a property rights point of view (Nash and Revesz 2007), this tradition is problematic because today's cities already contribute substantially to global carbon emissions.

Voluntary programmes appear ideally suited to address these specific urban governance issues. They provide a vehicle for taking action in situations in which it is too costly or difficult to implement direct regulatory interventions, for instance because of political unwillingness (Darnall and Carmin 2005). They also provide an opportunity for showcasing and marketing desired 'beyond compliance' behaviour, or a means of rewarding leading firms (Saurwein 2011). Further, voluntary programmes open up opportunities to collaborate closely with the regulated sector, without forcing the latter to be involved in such collaborations (Hofman and De Bruijn 2010). It is for these reasons that high hopes have been expressed about the potential for voluntary programmes to address complex societal problems including climate action (Darnall and Sides 2008; Hoffmann 2011). Since the 1990s, voluntary programmes have become conventional instruments in urban climate governance (Bulkeley, Castan Broto, and Edwards 2015; Van der Heijden 2014a). Examples include the voluntary labelling of the environmental performance of buildings (Van der Heijden 2015a), forms of eco-financing (Van der Heijden 2016a), and action networks in which governments, firms and citizens collaborate to take local climate action (Van der Heijden 2016b).

Voluntary programmes can be developed and implemented with or without government involvement, and both 'purely private' programmes and programmes with government involvement have been reported (Hoffmann 2011; Van der Heijden 2014a). It has been documented that involving governments – be they local, regional or national – comes with advantages that are missing with 'purely' private voluntary programmes. Government involvement may provide legitimacy to voluntary programmes in the eyes of the wider public (Solomon 2008), and governments may be considered neutral actors by non-governmental participants, making the latter more willing to become involved (Kickbusch, Hein, and Silberschmidt 2010). Governments may pay (part of) the costs of developing and implementing the voluntary programme, may reduce information asymmetries between the participants and other stakeholders, and may disseminate the programme results to a wide audience (Delmas and Terlaak 2001; Lobel 2004). All this may contribute to the voluntary programme performing as desired.

It is not only the presence of governments in voluntary programmes that is expected to affect their performance. Another critical condition is their design. Earlier studies point to a positive association between programme rewards and programme performance – thus, the higher the rewards, the more likely it is that a programme will achieve its desired performance (Moon and Ko 2013; Potoski and Prakash 2013b). The literature makes us aware that different types of rewards may achieve different outcomes, with better outcomes expected if there are financial rewards and leadership rewards (the opportunity to showcase industry leadership). However, rewards are not the only design factor that matters. The requirements that participants must meet (the 'rules') and the monitoring and disciplining of compliance with these rules ('enforcement') are relevant too (Potoski and Prakash 2009; Prakash and Potoski 2012). The relationship between a programme's rules and its performance, as well as that between the enforcement of the rules and the performance of the programme, is found to be complex (Potoski and Prakash 2005, 2013a). That is, whilst stringent rules may require meaningful behavioural change by participants, rules that are too stringent may discourage them from participating in the first place. Likewise, whilst stringent enforcement may ensure that participants comply with programme rules, if the enforcement is too stringent then this may be too costly for programme administrators and participants alike, and it may detract from the experienced voluntariness of the programme and discourage potential participants from participating.

Another critical factor that is expected to affect the performance of a voluntary programme is the type and density of the market it targets (Rogers et al. 2005; Van der Heijden 2017). That is, the more homogeneous and close-knit the market of prospective participants, the more likely it is that participants will commit to the programme under competitive and peer pressure. This is because they target the same client base, or they are inspired by each other to participate, or both. Likewise, the more heterogeneous and scattered the prospective pool of participants, the less likely they are to feel pressurised into committing themselves to a voluntary programme.

In sum, when overviewing the voluntary programme literature, three core conditions stand out as affecting their performance: (1) government involvement in programme design and implementation; (2) programme rewards that come to participants, and programme rules and the enforcement of these rules; and (3) the density of the market of prospective participants. The literature also provides another critical insight. Earlier empirical studies have found that voluntary programmes with similar designs such as, for instance, programmes for fees-per-plastic-bag (Ackerman 1997), organic food labelling (Thøgersen 2010), building assessment certification and classification (Fowler and Rauch 2006) and revolving-loan funds (Boyd 2013), elicit different outcomes depending on whether or not governments are involved in their development and implementation, and whether or not they target a dense market of prospective participants. This all indicates that the outcomes of voluntary programmes are likely to be caused by different interacting conditions (that is, conjunctural causation), and that different configurations of interacting conditions may cause a similar outcome (that is, equifinality). In other words, there does not seem to be one single condition that matters most when it comes to desired programme performance, but some specific combinations of conditions appear more promising than others. It remains unclear, however, how the abovementioned conditions combine in affecting voluntary programme performance.

Research design, case selection, and data collection and analysis

City governments are found to be especially active in voluntary programmes that seek to reduce resource consumption and waste production (Hoffmann 2011; Moloney, Horne, and Fien 2010; Van der Heijden 2014a). They have been shown to play a range of roles, including providing financial and administrative support in the development and implementation of programmes, monitoring and enforcing voluntary programme performance, marketing and disseminating the results of programmes to a broad audience, acting as launching customer by requiring their suppliers to participate in voluntary programmes, and putting together voluntary programmes in larger urban climate governance regimes (van der Heijden 2015b, 2015c). Whilst it makes sense to assume that the involvement of government yields the desired programme performance – as discussed earlier – there is little empirical evidence that supports (or disputes) this assumption.

Research design

Assessing the performance of voluntary programmes comes with some challenges. The first is the issue of what to count as performance. The literature suggests that both direct outcomes and indirect outcomes are relevant. Direct outcomes are the number of participants a programme attracts, the extent to which the participants change their performance in accordance with programme rules, and the overall impact of the programme on the problem it seeks to address (de Vries, Nentjes, and Odam 2012; Gunningham 2009). Indirect outcomes include policy lessons learnt, spill-over effects to non-participants, and longer-term outcomes such as the normalisation of a

product or practice (Auld 2014; Darnall and Sides 2008). While acknowledging the relevance of indirect outcomes, the empirical study that follows is primarily concerned with direct outcomes.

A second challenge in assessing the performance of voluntary programmes comes from instances of conjunctural causation (the outcomes of voluntary programmes are likely to be caused by different interacting conditions) and equifinality (different configurations of interacting conditions may cause a similar outcome). In this article this challenge is addressed through a configurative comparative research design, building on qualitative comparative analysis (QCA) logic and tools. The method may be unfamiliar to some of the readers of this journal, and a brief introduction is warranted here.

QCA was introduced by the social scientist Charles Ragin in the mid-1980s as a middle path between quantitative and qualitative social research (Ragin 1987). QCA is grounded in set theory, a branch of mathematical logic that allows researchers to study in detail how causal conditions (here the 'independent variables': city government involvement in a voluntary programme, programme design, and the density of the participant market) contribute to a particular outcome (here the 'dependent variables': the number of participants attracted, and their changed behaviour). Since the mid-1990s QCA has rapidly developed into an accepted research method for the type of study presented in this article, and has been applied in hundreds of studies, especially in the policy sciences (Rihoux et al. 2013; Rihoux and Marx 2013); see also www.compasss.org.

QCA differs from other data analysis methods in its configurational focus. 'The key issue [for QCA] is not which variable is the strongest (i.e., has the biggest net effect) but how different conditions [i.e., the involvement of governments in voluntary programmes, the size of the rewards given to participants, etc.] combine and whether there is only one combination or several different combinations of conditions (causal recipes) of generating the same outcome' (Ragin 2008, 114). QCA also helps to address the recurrent criticism of comparative qualitative studies – that they lack a systematic and transparent treatment of data, which brings into question the validity of inferences drawn from them (Lijphart 1971; Van der Heijden 2014b). QCA builds on the assumption that conditions combine in how they affect outcomes (conjunctural causation) and on the assumption that multiple combinations of conditions may affect an outcome (equifinality).

In short, QCA provides (1) a logic for comparative analysis, building on Boolean algebra and assuming the possibility of conjunctural causation and equifinality; (2) tools for comparatively analysing a medium-sized set of cases that is, normally, too small to allow regression analyses to be performed but too large to treat without an algorithm; and (3) an accepted reporting structure that increases the transparency and internal validity of the study and the inferences drawn. The fundamentals and background of QCA are well explained and documented in a series of authoritative textbooks (Goertz and Mahoney 2012; Ragin 2008; Rihoux and Ragin 2009; Schneider and Wagemann 2012). Online Appendix A provides a step by step discussion of the various analyses carried out.¹

QCA can also be applied to assess the explanatory reach of heuristic frameworks (Rihoux and Ragin 2009; Van der Heijden 2017). That is, it can allow one to explore different combinations of the conditions to gain an understanding of which condition or configuration of conditions best explains the outcome of interest (Mahoney, Kimball, and Koivu 2009). In sum, the research design allows

¹ The number and length of the Online Appendixes may be unexpected for scholars unfamiliar with QCA. Standard QCA practice requires the underlying data, as well as the research steps taken and the choices made, to be made transparent (Ragin 2008; Rihoux and Ragin 2009).

empirical insight to be gained into whether city government involvement is important (necessary, sufficient, or both) in achieving desired programme outcomes, as well as into how important it is in combination with other conditions.

Operationalisation of conditions and outcomes

The outcomes of interest in this study are:

- O1. The number of participants a programme attracts, as a percentage of the complete pool of prospective participants it targets. Following the diffusion of innovations literature, a programme is considered to be successful in attracting participants if it has attracted 15 per cent or more of the pool of participants it targets over a five-year period, or is on track to do so (Rogers 1995).
- O2. The average improvement in the behaviour of the participants since joining the programme, measured in reduced energy consumption or carbon emissions. Following the urban transition literature, a programme is considered to be successful in changing participant behaviour if the participants show, on average, an improvement of at least 20 per cent in their behaviour since joining the programme (Van der Heijden 2017).

The conditions of interest in this study are:

- CG. City government involvement in the development or implementation of the voluntary urban climate programme.
- PR. The stringency of the programme rules – that is, the requirements for participants. A programme is considered stringent if it requires at least a 20% voluntary improvement in participant behaviour.
- PE. The stringency of the enforcement of the programme rules. Enforcement is considered stringent if systematic monitoring is carried out by programme administrators or a third party and this monitoring is documented.
- R1. The guaranteed exclusive financial rewards that come to participants when joining the programme.
- R2. The guaranteed exclusive leadership rewards that come to participants when joining the programme.
- R3. The guaranteed exclusive other rewards, such as information and knowledge, that come to participants when joining the programme.
- DN. The density of the diffusion network (the pool of prospective participants) of the programme.

Case selection

To gain insight into whether city government involvement in voluntary urban climate programmes affects the outcomes of these programmes, a series of 26 programmes (cases) is studied from Australia, the Netherlands and the United States. These countries show considerable similarity in a number of contextual conditions that are considered in the voluntary programme literature to be related to the programme outcomes (e.g., Van der Heijden 2012). They show considerable similarity in their focus on the resource sustainability and energy consumption of their built environments (IEA 2013). They rank fairly comparably in terms of economic development and standard of living (UNDP 2013), and in terms of the environmental awareness of citizens and businesses (OECD 2013). Thus, by ‘keeping’ the contextual conditions of the voluntary urban climate programmes in the study relatively constant it is assumed that differences in programme outcomes are not caused by

differences in programme contexts, allowing for a targeted evaluation of the three conditions discussed above.

The 26 cases studied were identified based on an extensive internet search using key words such as ‘sustainable development AND [country]’, ‘sustainable building AND [country]’, ‘green building AND [country]’, ‘sustainable construction AND [country]’ and ‘green construction AND [country]’. Cases were selected when they met a number of criteria (i.e., a stratified sample), to allow a QCA analysis to be performed – that is, to give sufficient variety in the conditions that are considered to be causally relevant in relation to programme performance. First, they explicitly focused on increasing the environmental and resource sustainability of buildings through technical solutions or through the changed use of buildings. Second, they set requirements for property developers, property owners and building users to make changes to their buildings (or in the way they used these buildings) beyond the requirements of the building legislation and regulations. Third, only cases that had at least two years of actual implementation were selected – i.e., it was expected that some time is needed for the cases to achieve outcomes. Fourth, cases with significant city government involvement were selected, as well as cases with limited to no city government involvement. Fifth and finally, cases were selected so that a variety of approaches to achieving the goal of the voluntary urban climate programme were included – including the voluntary labelling of the environmental performance of buildings, eco-financing, and action networks in which governments, firms and citizens collaborated to take local climate action. Online Appendix B provides brief summaries of the cases studied.

Data collection and processing

The data collection and processing followed conventional practice for this type of research (Brady and Collier 2004; Goertz and Mahoney 2012; Silverman 2001). Most data relevant for the analysis presented in this article could be obtained from the voluntary urban climate programmes’ websites, existing reports and other sources. Additional data on the cases was obtained through a series of in-depth face-to-face interviews carried out in 2012 and 2013, with follow up interviews carried out in 2015. These interviews aimed to fill in gaps in the data obtained from other sources, to resolve conflicts in the data obtained from other sources, and to gain additional insight into the cases under scrutiny. Interviewees were traced through internet searches and through social network websites, particularly LinkedIn. This resulted in a pool of 101 interviewees from various backgrounds; Table 1 gives an overview.

Table 1 – Overview of interviewees and their backgrounds

Interviewee background	Government	Non-government
<i>Policy maker</i>	9 (4A/4N/2U)*	
<i>Administrator</i>	29 (22A/4N/3U)	27 (12A/3N/12U)
<i>Architect, engineer, advisor</i>		13 (7A/6N)
<i>Contractor, developer</i>		7 (3A/4N)
<i>Property owner</i>		7 (4A/3N)
<i>Other</i>		8 (3A/3N/2U)
Total	39 (26A/8N/5U)	62 (29A/19N/14U)

*Abbreviations: A=Australia; N=Netherlands; U=United States

The interviews were based on a semi-structured questionnaire that provided a structure of checks and balances to assess the validity of the findings. The interviews were recorded, and using the recording and notes taken during the interviews a summary report was drafted that was sent back to the interviewees for validation. The interviewees were often aware of and involved in more than one case. It is expected that this (partly) helped to overcome a sampling bias of administrators (and participants) who were overly enthusiastic about their 'own' programme (Sanderson 2002). It should be noted that, because interviewee data were used as a means to fill gaps in data from other sources, the interviewees are not given a direct voice (through quotes) in the remainder of this article.

The data were processed by means of a systematic coding scheme and qualitative data analysis software (Atlas.ti) – Online Appendix C provides an overview of the codes used. By taking this approach the data were systematically explored and insights were gained into the 'repetitiveness' and 'rarity' of data points reported in the information studied. The data were further analysed using fuzzy set qualitative comparative analysis (fsQCA) logic, techniques and FS/QCA software (version 3.0; freeware available from www.compasss.org; Ragin and Davey 2014). In this article fsQCA is applied as it allows for a rather precise insight into qualitative differences in the empirical data – that is, the degree of presence or absence of a condition or outcome in the cases under analysis.

Table 2 – Raw data matrix

Case nr	country	target group	scale	Conditions							Outcomes	
				CG	PR	RE	R1	R2	R3	DN	O1	O2
1	Australia	Firms	city	1.00	1.00	0.67	1.00	0.33	0.67	0.00	0.00	?
2	Netherlands	Households	nation	0.00	0.67	0.33	1.00	0.00	0.00	0.00	0.00	?
3	Netherlands	firms/households	city	1.00	0.33	0.67	0.67	0.00	0.67	0.00	0.00	?
4	United States	Firms	nation	0.33	0.67	0.67	1.00	0.67	0.67	0.00	0.00	0
5	Australia	Firms	city	0.67	1.00	0.67	1.00	0.67	1.00	1.00	1.00	1
6	United States	Firms	nation	0.00	0.33	0.33	0.67	0.67	0.67	0.00	0.00	1
7	Netherlands	Firms	nation	0.00	0.33	1.00	0.67	0.33	0.33	1.00	1.00	1
8	Australia	firms/households	city	1.00	0.33	0.33	0.67	0.33	1.00	0.33	0.00	1
9	United States	Firms	city	0.67	0.67	0.67	0.33	0.67	0.67	0.00	0.00	0.33
10	Australia	Firms	nation	1.00	1.00	0.33	0.33	1.00	1.00	0.33	0.33	0.67
11	United States	firms/households	city	1.00	1.00	0.67	0.33	0.00	1.00	0.00	0.00	1
12	United States	Households	nation	0.00	0.33	0.67	1.00	0.00	0.00	0.00	0.00	?
13	Netherlands	firms/households	nation	0.33	1.00	0.33	0.33	0.67	0.33	0.00	0.33	?
14	United States	Households	nation	0.00	0.67	1.00	0.67	0.00	0.33	0.00	0.00	1
15	United States	Firms	nation	0.00	0.67	1.00	0.67	0.00	0.00	0.00	0.33	1
16	Australia	firms/households	nation	0.00	1.00	1.00	0.67	0.00	0.33	0.33	0.33	1
17	Australia	Firms	city	1.00	0.67	0.33	1.00	0.33	0.00	0.33	0.00	?
18	Netherlands	firms/households	nation	0.00	0.67	0.33	0.67	0.33	1.00	0.00	0.33	?
19	Australia	Firms	nation	0.00	0.33	1.00	1.00	0.00	1.00	1.00	1.00	1
20	United States	Firms	nation	0.00	0.33	0.67	0.67	0.33	0.67	0.33	0.00	1
21	Australia	Firms	nation	0.33	0.33	1.00	0.67	0.00	0.33	1.00	1.00	1
22	United States	Firms	nation	1.00	0.67	0.67	1.00	0.33	0.67	0.00	0.00	1
23	United States	Firms	city	1.00	0.67	0.33	0.33	0.00	1.00	1.00	0.33	0.67
24	United States	Firms	city	1.00	0.67	0.33	1.00	0.33	0.00	0.00	0.00	0.33
25	Netherlands	firms/households	nation	0.00	1.00	0.67	0.67	0.67	0.33	0.67	0.00	1
26	Australia	Firms	city	1.00	1.00	0.67	1.00	0.00	0.33	0.00	0.00	1

Note: The table and symbols are explained in the text below.

Table 2 gives an insight into the qualitative differences in the outcomes and the conditions observed. It should be borne in mind that whilst fsQCA uses numerical symbols, it is a qualitative method. The numerical information provided in Table 2 and throughout this article should be understood as a description of the data patterns that underlie the dataset, but not as a simplistic reduction of the qualitative data obtained:

- A value of 0.00 implies the complete absence of a condition or outcome; for example, in Case 2 the 0.00 score for R2 indicates that participants do not obtain exclusive leadership rewards when joining the programme.
- A value of 0.33 indicates a category where the condition or outcome is more absent than present, but not completely absent; for example, in Case 1 the 0.33 score for R2 indicates that participants get very modest leadership rewards when joining the programme.
- A value of 0.66 indicates a category where the condition or outcome is more present than absent, but not completely present; for example, in Case 10 participants show considerable improvements in their behaviour after joining the programme (here a 13 to 16 per cent reduction in energy consumption), but have not yet achieved the threshold set to assess the case as successful (20 per cent; see above).
- A value of 1.00 indicates the complete presence of a condition or outcome; for example, in Case 11 participants show, on average, an improvement in their behaviour of 20 per cent (here energy consumption reductions) after joining the programme.
- A question mark ('?') indicates there are no data or no trustworthy data available for some of the O2 scores. These cases are excluded from the analyses into the effect of city government involvement in voluntary urban climate programmes on the behaviour of programme participants.

Table 2 also indicates the geographical location of each case, as well as the level on which they operate (that is, only in one city or at various or all cities within a nation). Again, Online Appendix A provides a more detailed operationalisation and calibration of the data obtained; Online Appendix B provides more detailed case descriptions.

Findings

In what follows, the data (see Table 2 for the raw data matrix) will first be analysed to gain an insight into which condition or combination of conditions (the design of a voluntary programme, city government involvement, and the density of the market of prospective participants) best captures the empirically observed variance in programme performance. This allows us to gain quite a precise insight into what part of the variance can be attributed to city government involvement in these programmes – in other words, it helps to answer the question of whether city governments should be involved. Following this analysis, the data will be analysed to gain an insight into whether and how city government involvement combines with other conditions in voluntary urban climate programmes that show desired outcomes. This allows an insight to be gained into how city governments should be involved. The various observations are discussed in the section that follows.

Should city governments be involved in voluntary urban climate programmes?

Table 2 indicates considerable variance in the data collected, and no obvious pattern stands out. For example, when considering only the involvement of city governments in the development and implementation of voluntary urban climate programmes and the extent to which these programmes have attracted participants, both positive and negative associations are observed. That is, Case 1 and Case 7 show a negative association, whilst Case 2 and Case 5 show a positive association. Merely ‘eyeballing’ the data in this way gives good reasons to assume that city government involvement is by itself not a necessary or sufficient condition to attract a substantial number of participants (here considered to be at least 15 per cent of the prospective pool over a five-year period) (cf., Schneider and Wagemann 2012).

Table 3 – Observed variance captured with different theoretical models

Model tested	Outcome of interest	Unexplained cases	Variance captured
CG	O1	All	0%*
	O2	All	0%*
PR, PE, R1, R2, R3	O1	All	0%*
	O2	All	0%*
DN	O1	All	0%*
	O2	All	0%*
CG and PR, PE, R1, R2, R3	O1	All	0%*
	O2	4, 24	89%
CG and DN	O1	3, 5, 23	88%
	O2	All	0%*
PR, PE, R1, R2, R3 and DN	O1	12	96%
	O2	15	95%
CG and PR, PE, R1, R2, R3 and DN	O1	None	100%
	O2	4, 24	89%

* Due to conflicting data—implying the theoretical model is too limited to explain any variance observed

Table 3 presents the results of an iterative process of matching different theoretical models with the empirical data obtained, broadly following Layder’s adaptive theory approach (Layder 2006).

This iterative process is started with an exploration of how much variance in the outcome data is captured by theoretical models made up of the individual core conditions identified in the literature review – that is, city government involvement (CG), programme design (PR, PE, R1, R2, R3), and the density of the market of prospective participants (DN). For each core condition a full fsQCA is carried out (see Online Appendix A) for both positive and negative observations of the outcomes of interest. As indicated in Table 3, none of these theoretical models captures any of the variance in outcomes observed. This is a result of data conflicts when looking at the outcome data through the lens provided by a theoretical model made up of one individual core condition. For example, Case 1 and Case 2 show the same outcome data for outcome O1 (negative), but have opposite observations for the presence of city governments in these cases (present in Case 1; absent in Case 2). That none of these very simplistic theoretical models explains any of the observed variance in outcome data is not surprising. After all, the literature review pointed out that outcomes of voluntary programmes are likely to be caused by different interacting conditions (that is, conjunctural causation).

In a second step of the iterative process two core conditions are combined. Table 3 indicates that these more complex theoretical models capture the observed variance in outcome data better. The model ‘CG and PR, PE, R1, R2, R3’ captures none of the variance in outcome data for O1, but it captures 89 per cent of the variance in outcome data for O2. The model ‘CG and DN’ captures 88 per cent of the variance in outcome data for O1, but none of the variance for O2. The model ‘PR, PE, R1,

R2, R3 and DN' shows a much more promising fit than the previous two: it captures 96 per cent of the variance in outcome data for O1, and 95 per cent of the variance for O2. This model is unable to explain, respectively, Case 12 and Case 15. This indicates that for these two cases more seems to be at play than the core conditions included in this theoretical model. The model may be considered to have a good fit for explaining the data obtained (cf., Rihoux and Ragin 2009).

In the third and final step, all the core conditions are combined in the most complex theoretical model possible with this set of explanatory conditions—that is 'CG and PR, PE, R1, R2, R3 and DN'. This model captures all the variance in outcome data for O1, and 89 per cent of the variance for O2. Thus, the theoretical model shows a perfect fit for understanding the observed variance in how well voluntary programmes are able to attract participants. It shows a less perfect (albeit still good) fit for explaining whether programme participants change their behaviour after joining a programme. Still, because of the perfect fit in explaining the variance in outcome data for O1, and because this model includes the assumption that city government involvement in voluntary urban climate programmes affects the performance of these programmes, this model is used in the remainder of the article.

How should city governments be involved in voluntary urban climate programmes?

Following established QCA practice, the data are first analysed for necessary conditions before exposing them to more complex analysis to identify configurations of sufficient conditions (Rihoux and Ragin 2009, Chapter 5, Box 8.1; Schneider and Wagemann 2012, Chapter 11). Again, for the reasons just mentioned, the theoretical model 'CG and PR, PE, R1, R2, R3 and DN' is used for this analysis. For a condition to be necessary to cause an outcome, the membership scores of the outcome need to be a perfect subset of the membership scores of the condition. Table 4 presents the results of the analysis for the necessary conditions for outcomes O1 and O2; Table 5 presents the results of the analysis for the necessary conditions for outcomes ~O1 and ~O2. Here the '~' symbol indicates 'negated', and thus the absence of an outcome or condition.

Table 4 – Necessary conditions for outcomes O1 and O2

Conditions	Outcome O1		O2	
	Consistency	Coverage	Consistency	Coverage
CG	0.33	0.16	0.44	0.78
PR	0.66	0.23	0.69	0.87
PE	0.94	0.35	0.75	0.92
R1	0.88	0.28	0.73	0.87
R2	0.32	0.26	0.29	0.78
R3	0.72	0.31	0.60	0.85
DN	0.83	0.68	0.41	0.95

Table 5 – Necessary conditions for outcomes ~O1 and ~O2

Conditions	Outcome ~O1		~O2	
	Consistency	Coverage	Consistency	Coverage
~CG	0.48	0.71	0.33	0.10
~PR	0.33	0.77	0.44	0.21
~PE	0.47	0.96	0.66	0.33
~R1	0.32	0.91	0.44	0.24
~R2	0.72	0.78	0.55	0.13

~R3	0.52	0.86	0.44	0.17
~DN	0.88	0.95	0.89	0.22

For necessary conditions, two issues are of importance: consistency and coverage. *Consistency* indicates how strongly the condition relates to the outcome. In other words, if a hypothesised relation between a condition and an outcome is not consistent (where the advisory cut-off point for consistency is a score of 0.90), the hypothesised relation cannot be supported by the data as being necessary (Rihoux and Ragin 2009, 45). *Coverage* indicates how relevant the condition is to causing the outcome. Coverage is only assessed for conditions that meet the consistency test. Here it is important to distinguish between relevant and trivial necessary conditions. In other words, if a consistent relation only covers a small number of cases (it has a low coverage score) it can be considered to be trivial in causing the outcome (see also Schneider and Wagemann 2012, Chapter 9). Another way to distinguish between relevant and necessary conditions is to assess whether the data are skewed towards conditions that have high scores for both the condition and the outcome. This suggests that such a condition may pass the test for both necessity and sufficiency, and is likely to be a trivially necessary condition in achieving this outcome (Schneider and Wagemann 2012, 232–237). Tables 4 and 5 indicate that only one condition passes the test for necessity: the presence of strict enforcement for outcome O1. However, it has a low coverage score, indicating that it is likely to be a trivially necessary condition.

Having studied the data for necessary conditions, the next step is to examine them for sufficient conditions. For a condition or a configuration of conditions to be sufficient to cause the outcome, the fuzzy set membership scores of the condition or the configuration of conditions need to constitute a perfect subset of the membership scores of the outcome. Because of space limitations, the full analyses for sufficient conditions for outcomes O1, O2, ~O1, and ~O2 are presented in Online Appendix A. Tables 6 and 7 present the results.

Table 6 – Configurations of conditions associated with outcomes O1 and O2

Condition	Configurations								
	O1		O2			O3		O4	
	I	II	III.i	III.ii	IV.i	IV.ii	V.i	V.ii	V.iii
CG.		●	∅					∅	
PR.	∅			●	●	●	∅	∅	●
PE.	●	●	●	●	●		∅	∅	∅
R1.	●	●				∅			∅
R2.		●	∅	∅		∅	∅		
R3.		●					●	●	●
DN.	●	●			●	●	∅	∅	∅
Raw coverage	0.39	0.17	0.46	0.50	0.25	0.17	0.12	0.08	0.17
Unique coverage	0.39	0.17	0.15	0.10	0.04	0.02	0.02	0.02	0.02
Consistency	0.70	0.75	0.96	0.96	1.00	1.00	0.86	0.80	1.00
Overall solution coverage	0.56		0.79						

Overall solution consistency	0.77	0.97
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Notes: see Table 7

Table 7 – Configurations of conditions associated with outcomes ~O1 and ~O2

Condition	Configurations									~O2 IX
	~O1 VI.i	VI.ii	VI.iii	VI.iv	VI.v	VI.vi	VI.vii	VII	VIII	
CG.			∅			∅	∅		∅	
PR.		∅		●		∅	●	●	●	●
PE.					●	∅	●	∅	●	●
R1.				∅				∅		∅
R2.	∅	∅	∅		∅			∅		●
R3.	∅								∅	
DN.	∅	∅	∅	∅	∅	∅	∅			∅
Raw coverage	0.45	0.29	0.37	0.28	0.52	0.13	0.27	0.18	0.25	0.33
Unique coverage	0.34	0.02	0.02	0.07	0.03	0.02	0.02	0.03	0.01	0.33
Consistency	0.95	1.00	0.96	1.00	0.97	1.00	1.00	1.00	0.88	0.43
Overall solution coverage	0.79									0.33
Overall solution consistency	0.94									0.43

Note: These tables present the results of a set-theoretic analysis for the outcomes O1 and O2 (Table 6) and ~O1 and ~O2 (Table 7), see further the Online Appendix A. The nine core configurations (I – XI) are the logically reduced empirical observations of conditions that are sufficient for causing the outcome under scrutiny. Full circles (●) indicate causal conditions that must be present in causing the outcome; crossed out circles (∅) indicate core causal conditions that must be absent.

In Tables 6 and 7 full circles (●) indicate causal conditions that must be present in causing the outcome, and crossed out circles (∅) indicate core causal conditions that must be absent. Tables 6 and 7 confirm the earlier expectations about voluntary programmes: multiple conditions combine in causing the outcomes of interest (conjunctural causation) – these are the various configurations in the tables; and various combinations of conditions can cause the outcome of interest (equifinality) – the groups of configurations for each outcome of interest in the tables. The tables also indicate that some conditions are present and some conditions are absent in the configurations. This highlights the interacting effects between these conditions, and illustrates how QCA helps to explore complex qualitative data systematically. Table 6 indicates that two configurations are related to outcome O1 (configurations I and II). The configurations (‘solution’) indicate that voluntary urban climate programmes that have attracted 15 per cent or more of the full pool of participants they target over a five-year period, or are on track to do so, are characterised by:

- Lenient rules, stringent enforcement, assured financial rewards for participants, and a dense diffusion network (I); or,

- City government involvement, stringent enforcement, assured financial rewards for participants, leadership rewards for participants, other rewards for participants, and a dense diffusion network (II).

The solution coverage (0.56) is moderate (Ragin 2008), and this indicates that the solution (the full set of configurations) relates favourably to the outcome observed (see Schneider and Wagemann 2012, section 5.3). The solution consistency (0.77) is high, and indicates that the solution is of high empirical importance in reaching the outcome. Table 6 also indicates that seven configurations in three clusters (III.i, III.ii, IV.i, IV.ii, V.i, V.ii, V.iii) are related to seeing improved participant behaviour of at least 20 per cent since joining the voluntary urban climate programme. The solution coverage (0.79) is high, indicating that the solution strongly relates to the outcome observed. The solution consistency is also high.

Table 7 indicates that nine configurations in three clusters are related to not attracting at least 15 per cent of the pool of prospective participants (VI.i to VI.vii, VII, VIII). The solution coverage (0.79) and solution consistency (0.94) are both high. Table 7 further indicates that one configuration is related to not seeing improved participant behaviour of at least 20 per cent since joining the voluntary urban climate programme (IX). The solution coverage (0.33) is low, indicating that the configuration does not relate very favourably to the outcome observed. The solution consistency (0.43) is also low, indicating that the configuration relates only moderately to the outcome observed. Both low scores are most likely due to a lack of variance in the empirical data obtained for outcome ~O2. Findings related to this outcome will therefore not be included in the discussion that follows.

Discussion

The iterative step of data–theory matching provides an answer to the first research question: should city governments be involved in voluntary urban climate programmes? For the 26 voluntary programmes studied, the answer to that question is: it depends on what programme design they use, or it depends on the market of the prospective participants they face, or it depends on both. At first glance this is an unsatisfying answer, and one that confirms earlier literature on voluntary programmes for urban climate governance (Bai, Roberts and Chen 2010; Hoffmann 2011; Moloney, Horne, and Fien 2010). However, Tables 2 and 3 taken together also indicate that in some instances a specific programme design, a specific market of prospective participants, or both, are best served by having a city government involved in the voluntary programme. These are more finely-grained findings that may help with improving the development and implementation of these programmes – an issue I return to later.

Table 3 further indicates that the involvement of city governments has different impacts on attracting programme participants and on seeing their performance improved. This observation is relevant. First, overall it indicates that attracting participants is no guarantee that improvements in their environmental behaviour will be seen (also, Potoski and Prakash 2009). Second, this research indicates that city governments have a bigger impact on attracting participants than on changing their environmental behaviour. In other words, when city governments wish to be successful in attracting participants to a voluntary programme in which they are involved *and* they wish to see an improvement in the environmental behaviour of the participants, they must be careful about the design they choose and about the market of prospective participants they target. Being successful in attracting participants is no guarantee that the city government will also see other desired programme outcomes.

Both insights are supported by the fsQCA analyses for necessary and sufficient conditions (Tables 4, 5, 6 and 7). From these analyses, it becomes clear that city government involvement (CG) is, by itself, not necessary for successful voluntary programme outcomes (O1 and O2). Likewise, the absence of city government involvement ($\sim$ CG) is, by itself, not necessary for there to be a lack of participants in voluntary programmes ($\sim$ O1). In sum, within the 26 programmes studied, city governments were not found to be, by themselves, necessary or sufficient for programme success or the lack thereof. This finding suggests that there should be some toning down of the high hopes and expectations expressed about the role of city governments in voluntary urban climate governance by policymakers (UNCED 1992; UNEP 2015) and non-governmental organisations representing cities around the globe (C40 Research Team and Arup 2014; ICLEI 2012).

The fsQCA analyses for sufficient conditions (Tables 6 and 7) give some indications of how city governments can best be involved in voluntary urban climate programmes. From Tables 6 and 7 it becomes clear that when designing and implementing voluntary urban climate programmes, city governments may wish to take up, particularly, roles in monitoring compliance with the programme rules. Whilst being a contributing causal condition only, particularly for attracting participants, city governments may increase the legitimacy of a voluntary programme through enforcing it, which itself may make the programme more attractive for prospective participants (cf., Kickbusch, Hein, and Silberschmidt 2010; Solomon 2008).

In seeking to improve the performance of voluntary urban climate programmes, city governments may also seek to reward participants. Strikingly, providing financial rewards was not consistently found to be a contributory factor for success; nor was the absence of financial rewards consistently found to be a contributory factor for lack of success. This is a promising insight, particularly, for less financially wealthy cities. They may, for example, be highly suited to collect best practice and knowledge from participants and share these with others. Such 'other rewards' (R3) are part of the configurations that are positively associated with outcomes O1 and O2 (Table 6). From Table 7 it becomes clear, however, that a lack of leadership rewards is often part of a configuration of conditions associated with not achieving desired number of participants ($\sim$ O2). Here city governments may seek to take up the role of rewarding participants by showcasing their desired practice in the (local) media and other outlets (cf., Van der Heijden 2017).

That having been said, there is no guarantee for city governments that they will achieve the desired outcomes by taking up these specific roles in the development and implementation of voluntary urban climate programmes. When closely inspecting Tables 4 and 5 it becomes clear that there are asymmetries in how the presence of conditions and outcomes are related and how the absence of conditions and outcomes are related. For instance, the presence of PE is likely to be a trivially necessary condition for O1, whereas the absence of PE ($\sim$ PE) is not a (trivially) necessary condition for the absence of O1 ($\sim$ O1). Tables 6 and 7 certainly support this finding and indicate that a condition present in a configuration that leads to a desired outcome (for instance, 'PE' in configurations III and IV) can just as well be absent in a configuration that leads to the desired outcome (for instance, ' $\sim$ PE' in configuration V). The data indicates that voluntary urban climate governance programmes are delicate governance instruments that need be understood and used as a whole – cherry picking specific conditions may yield undesired results.

Then, when it comes to engaging with the market for prospective participants there appears to be much to be won by city governments. The density of the diffusion network is the only condition that shows an almost perfectly symmetrical association with the outcomes of interest – and indeed, Tables 4 and 5 indicate that both DN and $\sim$ DN are borderline conditions in the

assessment of necessity (they just fall short of meeting the cut-off consistency score of 0.90, but have high coverage scores). It is particularly here where city governments may rethink their strategies for reaching out to prospective participants. When faced with a loose or heterogeneous network of prospective participants, city governments may seek to ensure cohesion in this network, increasing peer pressure and the exposure of prospective participants to the voluntary programmes (cf., Rogers 1995). Likewise, when they are aware of a specific close-knit and homogeneous network, they may seek to target it with a tailored voluntary urban climate programme (cf., Van der Heijden 2017).

A final relevant insight to report is that the findings do not cluster around a specific country, nor around voluntary programmes with a local or national focus, nor around programmes that target households, firms, or both (Table 3 and Online Appendix A). The lessons learnt from this study seem constant, to a certain degree, for small and local voluntary programmes as well as larger and national voluntary programmes. The lessons learnt are also sufficiently constant across the three country contexts that it may be expected that they are transferable to other cities with comparable contexts. That is, they can be understood as ‘moderatum generalisations’ that indicate patterns likely to be found elsewhere, albeit that specific empirical observations in other contexts may differ from what has been presented here (Payne and Williams 2005).

Conclusion

Seeking to understand whether and how city governments may use voluntary programmes in their urban climate governance strategies, this article has studied 26 real world voluntary programmes that seek to reduce resource consumption and waste production in cities in Australia, the Netherlands and the United States. These programmes had variety in their focus (local programmes and national programmes), in their approaches to seeking improved participant behaviour (voluntary labelling of the environmental performance of buildings, novel forms of financing, and action networks in which governments, firms and citizens collaborate to take local climate action), in their outcomes (positive and negative), and in city government involvement in their design and implementation. This variety of real world programmes allowed a unique empirical insight into whether city government involvement is important (necessary, sufficient, or both) in achieving desired programme outcomes, as well as how important it is when combined with other conditions (programme design and diffusion network), through a QCA analysis.

Keeping in mind the caveats of any configurational comparative study such as the one presented here – it results in moderatum generalisations and not in statistically significant generalisations – it is worth repeating the key findings from this study in this concluding section. First, it might be time to temper the high hopes and expectations of city governments in voluntary urban climate governance. Whilst some of the 26 programmes studied have yielded their desired outcomes, the majority have not. Further, whether and how city governments were involved in these programmes was observed to have had little impact on their performance. That is not to say that city governments should abandon their involvement in these programmes, or that they should stop using voluntary programmes. However, which is a second main conclusion from this study, city governments may wish to rethink how they are involved in voluntary urban climate programmes. When combining the findings of this study with broader studies in this area, strategies can be envisaged that may help city governments to add value to voluntary programmes. For example, they may become actively involved in collecting best practice and knowledge from participants and transferring this knowledge to others, or they may seek to reach out to prospective participants and attract them to voluntary urban climate programmes. Third and finally, voluntary programmes for

urban climate action are very delicate governance instruments. Small differences in their context or design can have a major impact on their performance. Whilst this indicates that there are limits in how transferable specific programmes are from one place to the next, this insight also brings hope. It implies that a voluntary urban climate programme that has not yet achieved the desired results is by no means in need of a full overhaul. Small adjustments – for example, moving from financial rewards to leadership rewards – might yield major performance improvements.

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