

**Self-organisation and climate change: the neglected
dimension of collective social transformation**

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Introduction

The central concern of this paper is how a better understanding self-organisation can help us develop a better understanding of collective societal transformations that address the climate change challenge. Accordingly the paper focuses on ‘clearing the theoretical ground’ by critically engaging with the concept of self-organisation in the existing literature and developing a framework that can be deployed in the empirical analysis of self-organisation. This concern arises out of research, the SELFCITY¹ project, which explores collective governance, innovation and creativity in the face of climate change in the UK, Germany and The Netherlands.

In the paper we argue that self-organisation is a key element in a non-linear planning process based on collective intentionality and mediated, dynamic micro-level interactions with structural forces that operates as a potential driver for societal transformation. We contend that prioritising governments or markets alone has not, to date, led to significant changes in adaptation to climate change and that the role(s) of local forms of self-organisation have been neglected. The key argument of the paper is that a focus on the role of grassroots or community-led action opens up an approach in which politics, uneven development and progressive agendas for climate change adaptation can develop and be taken into account.

Climate change is an enormous, multifaceted and complex issue. It is one that refuses to respect academic disciplinary boundaries, public policy silos, spatial units (whether hierarchically, contiguously or across units) or the ways in which societies are organised. Climate change is the proposition that the Earth’s climate systems have been changed as a result of human activity over and above any natural climate variability (see IPCC, 2014). For many of the poorest communities, this additional variability is potentially lethal given that many current social and economic structures, such as the built environments in the developing south, are mal-adapted to existing climate variability. However, additional future variability will potentially increase the scope and scale of dangerous (lethal) climate risk (IPCC, 2014). It is generally acknowledged that the climate change problem meets most (if not all) of the criteria for being a ‘wicked’ public policy problem (see Rittel and Webber, 1973; Grin, Rotmans and Schot, 2010) and as such requires a “broad policy and practice ‘response space’” (Tompkins and Adger, 2003, ??). Such collective responses need to address several interrelated issues: managing the spatially and socially uneven distribution of climate variability risk (build resilience/ reduce current vulnerability); reducing the likely causes of anthropogenic impact on climate systems (mitigation); enabling societies and economies to adjust to inevitable climate change,

¹ SELFCITY (Collective governance, innovation and creativity in the face of climate change) is funded through the Joint Programming Initiative “Connecting Climate Knowledge for Europe (JPI Climate)”. The views expressed in this paper do not necessarily reflect those of the funding organisations.

whatever its cause (adaptation).

Most research and political effort in the Developed North has gone into understanding and facilitating climate change responses from the perspective of government and/or market; actors. However, other approaches are now receiving attention. For instance, Foxon (2013, p. 11) in the context of reducing greenhouse gas emissions in the UK electricity industry proposes a third pathway to transition: the ‘thousand flowers’ pathway whereby civil society actors dominate the processes of change. While Satterthwaite (2014) argues that in the Developing South, the ‘thousand flowers’ strategy is the only way open to communities living in places where governments are poorly resourced and where markets find it difficult to extract ‘value’. But equally in the relatively well-resourced nations of Europe, civil society is gradually being recognised as a sector from which collective responses to climate change can emerge and provide a viable response to the dilemmas facing those societies.

The ‘thousand flowers’ pathway places less emphasis on rational and instrumental planning. This pathway emphasises the discursive processes and practices of framing problems, opportunities and necessary actions through deliberation and social learning (see Collins and Ison, 2009). However, these processes have largely been neglected by researchers and policy makers and as a result are less well understood. Given this we need to explore ways to better understand how social learning occurs within communities/ groups/ networks and the ways in which social learning is spread (social contagion) through civil society in relation to climate change responses.

The SELFCITY project uses the concept of *self-organisation* as a heuristic framework to engage conceptually with issues of social norming, social learning and social transition within communities/groups and their (local) responses to climate change. In essence self-organisation is a process by which the social relationships that characterise loose networks are institutionalized through the definition of mutual interests, positions and relations (Ostrom, 1990; Mayntz, 2006). Trust based on individual relationships is, thus, transformed into trust expressed in collective forms of action that are “other” regarding. This enhanced cooperation as “collective intentionality” (e.g. Searle, 2010; Hasanov and Beaumont, 2015) allows for differentiation and specialisation within the collective which strengthens the potential for developing key interests through citizens and “grassroots’ action” (Castells, 1983; 2013). However, there are multiple understandings of what constitutes self-organised responses as distinct from ‘local’ responses or ‘community-led’ responses that might typically arise in Europe. Thus for instance Nederhand et al. (2014, p. 2) define self-organisation as a “collective process of communication, choice, and mutual adjustment of behaviour resulting in the emergence of ordered structures”. While self-organisation for Boonstra and Boelens (2011) is the absence of any governmental

involvement through external control (see also Boonstra, 2015).

Given this lack of clarity about the concept the paper will review the existing literature on self-organisation in relation to the climate change challenge in three sections. First, the paper will outline how researchers working on the concept of self-organisation understand the term. Second, the paper will examine the claims made about self-organised responses to climate change. Third, the paper constructs a heuristic framework that will be used to analyse and understand local collective responses to climate change in the case studies of the SELFCITY project and which can contribute to more general debates relevant to the field.

What is self-organisation?

Self-organisation is not something new that we have suddenly ‘discovered’; as Ostrom et al. (1999, p. 278) point out “...it is...obvious that for thousands of years people have self-organized to manage common-pool resources and users often do devise long-term sustainable solutions for governing these resources”. Nevertheless, self-organisation has tended to be ‘ignored’, neglected or underestimated by academics and governments, particularly in the post-1945 era and especially within the climate change literature. In recent decades, however, there has been more emphasis on ‘bottom-up’ community-led initiatives (such as in urban regeneration) along with the increasing influence of a neoliberal desire to roll-back as well as roll-out the state to the third-sector. However, this engagement with forms of self-organisation has largely been on terms dictated by the state and not based on initiatives emerging directly from within civil society which frame the issues in their own terms.

The concept of self-organisation has been deployed within a wide range of academic disciplines. While there are some common elements there are also important differences. *Table 1* outlines three ideal-type categories of ideas that provide distinct approaches to self-organisation. It does so by drawing a distinction between approaches that are *objectivist* in their ontology (seeing self-organisation as something pre-given in relation to actors/ agents being organised) and *constructivist* (seeing self-organisation as being constructed by those who are being organised). *Table 1* then outlines the main characteristics of self-organisation in relation to what the concept of self-organisation is applied to, what is being organised, the types of research questions that flow from the position and then provides examples of where the stance has been applied.

Table 1: Main conceptual positions on self-organisation

	Objectivist 'hard science' stance	Objectivist 'social science' stance	Constructivist 'social' stance
Social organisation is applied to:	Characterising emergent organising of systems. Systems might be closed or open.	Characterising emergent organising of social systems (i.e. self-organisation). Systems can be open.	Framing of social practices/ discourses (i.e. self-organising)/ governance
What is being organised?	Cellular automata	Independent agents	Activity, social action, communities of practice
Typical research questions	What are the rules that regulate relationships between automata?	What are the rules that regulate the relationships between agents? What are the conditions under which self-organising emerges?	Who decides to organise? Who is learning what from whom?
Examples	Neural networks, human immune system	Cities, economies, pedestrian flows, ant societies	Social practices, social movements

Although the concept of self-organisation is widely used in natural science fields such as physics, biology, chemistry, cybernetics (see Di Marzo Serugendo et al., 2004; Di Marzo Serugendo et al., 2011; Hasanov and Beaumont, 2015; Uitermark, 2015) Di Marzo Serugendo et al. (2004, p. 2) argue it is difficult to find a 'precise and concise' definition of self-organisation. Despite these difficulties it is possible to identify a common set of ideas associated with the objectivist stance: in essence self-organisation refers to the spontaneous establishment of order in highly disorganised environments. Ashby (1962) sets out criteria to identify a self-organising system such as memory, demonstrating regularity and useful organisation. Di Marzo Seguendo et al. (2004) point out that self-organisation emerges without explicit control from beyond the 'system' being organised and the interactions between the components parts of the system guide the overall pattern as the system evolves dynamically in space and time (ibid, p. 2). Within complexity theory the simple rules of localised interaction may follow a linear or non-linear trend, implying some element of feedback between the component parts but also a degree of communication in the case of social systems. Sometimes the individual components of such systems might be conceptualised as cells or as cellular automata following simple rules at the scale of their individual interactions through which 'system-wide' patterns of organisation appear.

These ideas reflect the objectivist social science stance in *Table 1*. Witt (1997) discusses whether the concept of self-organisation (seen as a dissipative system) as developed in the biological sciences might be applicable to the economy. Witt argues that the economist's 'invisible hand' might be extended to the concept of self-organisation creating a form of 'spontaneous order'. Although Witt (1997, p. 504) emphasises that economic systems are different from biological ones in that the former are shaped by "intelligent human action, imagination, and a growing knowledge that supports the process" of being self-organised. Martin and Sunley (2007) go further arguing that we should understand economic systems as evolutionary where self-organisation is part of 'complexity thinking' (p. 578 – *Table 1*). So in evolutionary economic systems macro structures emerge spontaneously out of micro-level interactions. It is these micro-level interactions that give complex economic systems their capacity to adapt in response to "self-organised criticality" (p. 578).

Within spatial planning conceptualising the urban realm in terms of self-organization emerged in the mid-1990s (see Portugali, 2011; Haken and Portugali, 1995). Much of this scholarly attention refers to the domains of complexity and non-linearity. The complexity view considers cities as dynamic systems where self-organisation indicates a system which arranges interplay without coercive (external) causes. The non-linearity issue focuses on the positive and negative feedback loops that exist in the ways that individual components relate to each other. In a series of publications, Portugali (1997; 2000; 2008; 2011) argues that cities are self-organising systems comprising various spatial layers, such as infrastructure, built environment and free agents, and that those layers are in constant interaction. In a similar manner, Farazmand (2004) contends that self-organisation rests on a twofold assumption: the ability of a system to organise itself and the ability of the system to be self-governed, self-controlled, and self-regulated, by achieving order and stability.

In order to maintain equilibrium in cities there is a necessity for constant interaction and communication between the actors which constitute "the city". Self-organisation provides stabilization of the system because it involves sporadic impulses, exchanged between the actors who allocate resources in order to manage instabilities (Roo and Silva, 2010). In other words, self-organisation refers to the uncoordinated pattern of events in a system between autonomous components that lead to new configurations in the same system. A substantial part of self-organisation in complex systems concerns processes that do not occur in isolation and the components of a system can be ascribed with specific meaning and purpose, which emerge in forms of collective intelligence (Heylighen, 2013). The notion of collective intelligence in framing self-organisation suggests that it is a result of a collaborative effort of agents who are involved in decision-making processes.

This way of understanding of self-organisation is similar to the concept of social autopoiesis developed by Maturana and Varela (1980). Social autopoiesis is the *modus operandi* under which a collection of living systems operate, and is characterised by certain cognitive features, such as self-creation and self-referencing. Autopoiesis is an element of living social systems. However, such self-referencing suggests that society is a closed system and interaction with the environment is limited. Luhmann (1995) refers to social autopoiesis as a self-referential reproduction of communicative processes, occurring between individuals in a closed system. While we would argue that self-organisation implies that social systems remain open and in constant interaction with its environment.

Fuchs (2002) asserts that self-organisation maintains a structural logic, which allows re-creation within social systems. Self-organisation “involves the permanent (re-)creation of new structures that influence individual thinking and actions” (ibid: 3). Additionally, Fuchs (2006) outlines two conceptual flows of self-organisation: it exists in all societies and all systems that involve human interaction; and it relates to the democratic dimension of inclusive and cooperative processes that emerge in social interactions. Social interaction, from this perspective, incubates information sharing and social learning that leads to collective action and creation of social capital (Putnam, 2000). Accumulation of social capital is largely understood as the result of negotiation and bargaining processes in collective action strategies (Ostrom, 1990). Since negotiation is a process of reaching common ground with specific aims, needs and viewpoints, self-organisation is neither a spontaneous occurrence nor is it a deterministic element of social systems. A state of the art study on self-organisation in the social environment by Hudson (2005) illustrates how the key role of consciousness, self-reflection and non-locality are insufficiently addressed in the literature.

Self-organisation defined within the objectivist stance seeks to identify sets of conditions under which self-organised responses might emerge within social systems. For example, Nederhand et al. (2014) propose a range of conditions that facilitate self-organisation. These include: (1) the existence of incentives that promote potentially disruptive interactions between agents that put existing practices and governance models under pressure; (2) the presence or development of trust-based relationships (social capital) and a sense of belonging; (3) the necessity of exchange and interplay of ideas, information and experiences with a joint or collective intentionality (“collective we”) in their exchange; (4) the geography of the self-organisation process, which is the physical and virtual location of the interaction (the locus or “locality”); (5) the importance of boundary spanning activities of (charismatic) key individuals to make connections which requires forms of linking leadership that facilitates/protects the free flow ideas, people and resources (Meerkerk et al., 2012); and (6) the mutual

adaptation of actor roles (e.g. the policy sector) and sufficient freedom/ flexibility of the actors to adjust behaviour in order to deal with new challenges, positions and rules.

Clearly much of the literature on urban self-organisation refers to developments in complexity theory and organisational science. From a similar, albeit somewhat different perspective, Boonstra and Boelens (2011) suggest that self-organisation denotes the capacity of civil society to set up and maintain initiatives without the help of government officials (see also Boonstra, 2015). Their theoretical assumption is that self-organisation represents a mixture of human behaviour in emergent systems and the projection of this behaviour in actor-network relationships. Found in the complex balance between systems and networks, self-organisation is an 'independent form' of public participation that originates outside yet also evolves together with institutional structures. Similarly Meerkerk et al. (2013) point out that self-organised initiatives represent a challenge to the existing governance structures, yet evolve together with existing institutional settings. While Horelli et al. (2015) outline the importance of self-organisation arguing that it balances different tacit narratives in the facilitation of co-governance strategies. Zhang et al. (2015: 161) describe self-organisation as "the result of behaviours of a number of individual agents responding to conditional change, structural breaks and mismatches between the function and the structure of an urban system".

In contrast to these explicit considerations of self-organisation some authors discuss it implicitly in their work, with reference to different forms of social action, regulated by social norms, social institutions and thus relate the notion of self-organisation to a higher level of moral decision making (Miller, 2001). If we accept that the expression of self-organisation in everyday life of human beings can be operationalised as a means for social action, we need to clarify the meaning of social action. Miller (*ibid.*, p. 2) defines social action as the "actions of the individuals performed in accordance with conventions, rules and norms and the actions of individuals qua occupants of social, institutional and professional roles". The significance self-organisation derives not from the fact that collective actions are socially constructed but that collective actions have rational, moral and intentional dimensions nested in a certain context and are other regarding (i.e. they do not occur in isolation). Hamdi (2004) in his work on the role of small actions and changes in the everyday life of cities suggest that the power of self-organisation is hidden behind a collection of interests energizing around a common need. Here self-organisation refers not only to the moral engagement of individuals but also allows for differentiation of performances that require a collectively recognized status that the person or object possesses (Searle, 2010).

Given our focus on self-organisation in specific places locality is an important notion. However, 'locality' is not a homogenous object; multiple forms and dimensions are possible (Duncan and Savage, 1989). In this sense it is a 'relational construct' that is fluid and the 'outcome' of a variable, and contingent, combination of social, political, economic and cultural forces (Brickell and Datta, 2011; Anderson et al., 2012; cf. Nicholls et al., 2013). Localities can be strictly demarcated or more open depending upon the particular focus and starting point. The more a locality is demarcated, the more exclusive it tends to be. A 'strong' example of a restricted form is a luxury housing estate (or 'gated community') where the spatial dimensions are clearly defined and entry is strictly regulated and controlled, or those parts of a city where 'outsiders' do not go (often viewed as 'dangerous spaces' by those living on the outside). Most of the time, the regulation of access to space works through more subtle means of control and identification. A person can belong to several localities (e.g. where they live, work, spend leisure time and so on). Multiple local identities in this sense can indicate that either a person feels 'at home' in different places within different communities, or that the respective identities are compatible with each other.

The locality is not an autonomous unit, but sits at a crossroads of diverse cultural, social, economic and political interventions; in other words it is a relational space that is a constructed and reconstructed depending upon the particular focus of attention and over time (Brickell and Datta, 2011; Anderson et al., 2012; cf. Nicholls et al., 2013). Although some constructions will be more 'permanent' where they are legitimated by and articulated with wider politico-institutional arrangements (e.g. administrative units). The 'power' of these processes is that they play a role in structuring action and are interpreted and internalised as self-descriptions and often play a crucial but ambivalent role in conflicts within the locality, by providing access to strategic resources. How to 'navigate' a way through these institutional and organisation arrangements is one of the crucial dilemmas facing self-organisation. Indeed some forms of local self-organisation (e.g. Transition Towns) have decided to attempt not to engage with these arrangements or seek an 'arms-length' relationship, while others have sought to actively engage with them in order to gain access to resources to support local action. Others have sought to establish "intentional communities" (Bohill, 2010) that are 'autonomous' and largely separate from conventional state and economic relations by creating their own local currency, local economic production and consumption².

Conceptualisation of self-organisation in the existing objectivist literature is focused primarily

² Although it should be noted that such attempts still have to interface with the wider economic and political systems as they require a degree of external (state) authorisation and are limited by the extent to which a local currency is accepted within a locality (e.g. by shops and firms) and by the wider financial system (e.g. in terms of electronic payment) (see North and Longhurst, 2013).

on the changes occurring at the level of the system and tends to underestimate the role of human agency and (social) action. The appeal of self-organisation for contemporary practice rests on its incorporation of innovative and unorthodox inputs in a field of research that has largely been dominated by objectivist approaches. In our view self- organisation represents not only a sign of structural change in the operations of governance systems but it also needs to be investigated through the prism of social action, social framing and social learning, in every-day situations, within communities (of place and/ or interest) and manifest in a collective manner.

Self-organisation as an approach to understanding collective responses to climate change

From the previous section it can be seen that self-organisation concerns a series of interactions within a system that might be framed in terms of micro-level components – such as biological cells, ants or urban citizens – and as part of a wider, regular and organised macro-structure (like those of a nervous system, ant colony or a city). Self-organisation moreover focuses on the rules and frames (non-linear and non-deterministic) that lead to spontaneous macro-level organising rather than on interactions that result from structures imposed by macro-level agents like rational policy programmes or government interventions. Depending on how they are understood these interactions at the micro-level can be negotiable in the constructivist frame, or can be given and deterministic in the objectivist sense. In the introduction we raised the issue of whether self-organisation emerges in the absence of a functioning macro-level structure such as the state or whether it emerges as a radical alternative to a functioning macro-level structure. Climate change may be a particularly fruitful arena to explore the ways in which self-organisation occurs because governments and markets are either unwilling or unable to respond to the challenges that derive from the (wicked) problematic of climate change.

The concept of self-organisation, however, has not been applied explicitly to research on climate change responses to explore and understand how people and places collectively adapt to the threats and opportunities of climate change. We have asserted that self-organisation is potentially a useful heuristic explanatory device for understanding the processes of change and adaptation. It is, however, apparent that related and synonymous concepts have been deployed to understand the processes involved in responding to (perceived) climate change and its effects. The aim now is to make the linkages explicit between our understanding of self-organisation and climate change adaptation.

Here we use a revised version of *Table 1* that retains only the social science objectivist and social constructivist stances on self-organisation. In order to offer a simple map of the

literatures on climate change adaptation (incorporating both change that results in lower carbon emissions and change that responds to inevitable climate change), we will use the four fold categorisation offered by Smith (forthcoming). Smith (ibid.) outlines four bodies of literature on climate change adaptation: the systems theory approach; the socio-technical transition school; the social practice approach; and the urban politics body of work. Each of these explains climate change adaptation from different conceptual perspectives. The key issue for relates to how these bodies of work explaining climate change might be categorised and understood using the concepts presented in *Table 1*.

The relationship between self-organisation and climate change adaptation from a *systems theory* perspective perhaps offers the simplest understanding. The systems theoretical perspective, exemplified by Brooks and Adger (2005), understands adaptation as occurring when a certain number of preconditions are present to frame micro-level interactions. Adaptation here might involve fiscal incentives or the presence of social capital in certain localities. However concepts of self-organisation such as understanding the micro-level feedback loops and interactions between ‘cellular automata’ (such as individuals, households or communities) can conceivably lead to an altered macro-level structure (of society or the economy). Under this framework the self-organisation agenda might focus on the adaptive capacity of particular local groups or explore the attitudes and responses of individuals to particular sets of fiscal and behavioural incentives.

It is possible to identify a broader and more nuanced understanding of self-organisation in the *socio-technical* school of thought, or Strategic Niche Management (SMN) on climate change adaptation. The socio-technical school, exemplified by Schot and Geels (2008) focuses on the ways people interact with technology, often infrastructural such as heating systems or energy generation technology. Their approach conceptualises interaction as taking place at multiple levels: a ‘landscape’ level, a socio-technical regime level and at the level of localised consumption – thus the Multi-Level Perspective (MLP). Change relating to any particular technological regime emerges from the interactions between these multiple levels. Equally change in the overall regime is understood as resulting from innovation within localised ‘niches’ of consumption that then de-stabilise the wider regime over a lengthy period (most studies focus on a timeline of decades). While writing on transition through socio-technical regimes may have started from a focus on the strategic management of change (either in terms of the whole transition or in terms of strategic niche management), and this goes against the grain of the self-organisation literature (where change and challenge are spontaneously developed from within), their more recent considerations of how localised niches understand what they are doing is compatible with the notion of self-organisation arising from civil society.

More recent SNM literature recognises the significance of such actions, for instance Schot and Geels (2008, p. 538) argue:

SNM as a policy tool does not suggest that governments create niches in a top-down fashion,...but focuses instead on endogenous steering, or steering from within. Such steering can be enacted by a range of actors, including users and societal groups...Niches are not inserted by governments but are assumed to emerge through collective enactment.

Thus they view SNM as a form of reflexive governance. Clearly this literature is seeking to acknowledge and integrate into its analysis the role of agency, power and problem definition/ construction (see also Geels, 2011). However, we would argue that notions such as 'reflexive governance' and power largely function as a set of *deus ex machina* and are not fully integrated into the analysis and remain underdeveloped both in terms of their theorisation and analytical utilisation. Nor does it seem to us that actions emanating from communities are, as yet, a central part of their research agenda (see. Seyfang and Haxeltine, 2012, for an attempt to rectify this).

A research agenda built around self-organisation and the socio-technical regime concentrates on either the conditions under which local innovative niches emerge or the ways in which agents in localised niches make sense of their use of technology. An objectivist approach might investigate the rules and social norms under which technological and process innovation become possible in localised niches. Such a view might also explore the degree to which localised niches can be strategically managed, although this raises a series of definitional issues as to whether a localised niche strategically managed from without would constitute a self-organised entity at all. A more constructivist view would seek to develop an understanding of how local agents (within localised pockets of innovation) make sense of climate change and how they respond to this through their use of technology. Ultimately the processes of social learning and framing potentially unsettle the wider socio-technical regime, signalling the possibility of wider change (transition) to another macro socio-technical regime and landscape.

An alternative approach which may have the potential to address these issues draws on *social practice theory* (SPT) (see Shove and Walker, 2010). While not denying the role of wider structural forces, this theory focuses on the 'practices of everyday life' and how they are embedded in mundane routines which are, often unconsciously, produced and reproduced. This 'unconscious reproduction', dependent upon wider systems of production and consumption, is a source of their 'power' and of the perpetuation of unsustainable practices. The focus here, in contrast to the multi-level perspective of SNM, is on "...the horizontal circulation of...the

‘elements’ of practice...” (ibid., p. 472). They argue for intervention in these practices and the creation of new ‘elements’ conducive to more sustainable practices.

For SPT the key idea is that the practices of everyday life are framed and therefore made sense of through community-held understandings of what is appropriate. Local agents operate with frames through which they enact social practices related to climate change response, such as walking rather than driving, buying and growing local food as opposed to buying commodified food products. Here the notions of ‘social norming’ and ‘social learning’ are most apparent from the self-organising literatures (mainly the constructivist position), but the frames of social practice influence what can be changed and the lessons that are un-learnable. Emancipatory research might focus on making explicit these frames to the local agents who might then recast them. The self-organisation element is the focus on localised interactions between actors and between actors and the frames that influence social practice. If, in the language of a long-standing debate, SNM may be situated more in the domain of ‘structure’, SPT sits more within the ‘agency’ domain. There have indeed been attempts to bring these two approaches together (see Hargreaves et al., 2011) in order to address weaknesses in both.

Table 2: How self-organisation offer insights into climate change adaptation

	Objectivist social science stance	Constructivist social stance
Systems theory understanding (e.g. Brooks and Adger, 2005)	How much social organising (social capital) is required to enable adaptation? What incentives required to enable adaptation?	No examples identified
Socio-technical understanding (e.g. Schot and Geels, 2008)	What are the rules that permit/ forbid innovation? Can localised consumption niches be strategically managed to enable wider transition?	How do local agents make sense of their use of technology in relation to the climate change issue? How to local agents (un-)learn and understand social norms?
Social practice theory (e.g. Shove and Walker, 2010)	No example identified	How do local agents/ practitioners make sense of their social practices? What can't be learned?
Urban politics (e.g. Betsill and Bulkeley, 2006)	How do communities of communities emerge? What is most effective combination of participation/ deliberation?	Who decides what climate change responses should be? Who decides on who decides? Who should benefit?

The *urban politics* theme is the widest and most diverse of the four in Table 2 and has been the heterogeneous frame through which a suite of environmental activist issues have been

considered. The main focus for climate change adaptation under the banner of urban politics is on the identification of 'problems', the power relations apparent in the definition and resolution of such problems (such as climate change) and the governance structures through which responses are decided. Patterns of exclusion resulting from power relations, valorisation of knowledge and expertise have to be challenged and modified, e.g. the hierarchical distinctions between scientific and other forms of knowledge such as everyday and local knowledge (see Atkinson and Klausen, 2011; Atkinson et al., 2011), to allow for participatory forms of decision-making about the future development of cities and regions. Such participatory forms mean that 'inhabitants' must be transformed into 'other' regarding citizens. This form of change requires and gives rise to organisations that enable the articulation of interests within the public sphere and the creation of supporting social and economic practices, such as self-help, mutual cooperation, business networks, informal sector, and so on. Accordingly, various orders of governance (local, national and international) have to interface with these organisations. This interplay requires what is widely described as multi-level governance or as the transitions literature terms it a multi-level perspective (see also the socio-technical transition approach such as Geels, 2011). Rather than simply functioning as an 'add-on' self-organisation is a crucial process for such a transition towards real (instead of symbolic) citizen participation that enables local engagement in the construction of goals, visions and action.

This approach goes beyond the traditional political process of citizen representation, for instance through elections or forms of 'consultation'. With the concept of self-organisation, rather like SPT, the aim is to draw attention to processes taking place within everyday life that shape and negotiate the urban and regional sphere. In other words, how citizens directly (and indirectly) bring about social change and transition through their own activities adapting to the conditions, making use of and creating opportunities, innovations and so on. These activities are often linked to both political as well as planning processes. However, they often follow a different logic derived from local conditions and the associated ways in which problems are framed. As a consequence, as Bahadur and Tanner (2014, p. 206) argue "[t]he ways in which different people and groups frame resilience and the need to negotiate trade-offs between groups is a factor in any programme of building resilience." While the point is made with specific reference to a particular construction of how to address climate change – resilience – it is relevant to the wider debate. The issue of how something becomes defined as a problem and acted on is by no means obvious. As Atkinson (2000, p. 214) has argued for something:

to be defined as a 'problem' it needs first of all to be constructed and articulated as an object amenable to diagnosis and treatment in and through a narrative discourse which carries with it an 'authority', or in Bourdieu's (1991) terms is enunciated by an individual or

organization possessing the relevant symbolic capital to make performative utterances, i.e. to develop a narrative which will be 'listened to' and heeded.

Planning in relation to climate adaptation for instance has traditionally been based on an instrumental, apparently apolitical, rationality, in the sense of selecting the most appropriate means for reaching a defined end. While portraying itself as 'apolitical' planning is deeply embedded in a wider system of institutional and power relations that structure its approach to the identification of relevant issues to be addressed and problem definition as well as what are considered to be 'appropriate forms of action'. This embeddedness has tended to be 'top-down' and has served to marginalise local understandings, knowledge and action and despite the so-called 'collaborative turn' in planning (Healey, 1996; 2002), and public policy more generally, planning remains deeply enmeshed in established politico-institutional systems (on the uses of knowledge in urban contexts see Andersen and Atkinson, 2013). As Boonstra and Boelens (2011, p. 106) point out "...participation is always based on the idea of a conflict between the *powerful and the powerless*, in which the powerful determines the procedures along which the powerless shall participate." Here problems continue to be defined from a governmental perspective.

By contrast we argue that self-organisation is rooted in locally-situated contexts and utilises 'communicative rationalities' within everyday life that are drawn on to tackle climate change challenges. This does not mean that we assume the existence of an 'ideal speech situation' as theorized by Habermas and central in the collaborative planning assumptions. We recognise that there are likely to be unequal power and knowledge relations in such contexts that have structural origins. The wider issue at stake is how these local understandings and activities are integrated into broader approaches, involving other actors and levels of governance, and be recognised as 'legitimate', deserving to be 'heard' and acted upon.

We should note that there is another dilemma facing local forms of self-organisation which is particularly relevant to an issue such as climate change that has a global dimension. Arguably to be successful one of the ultimate aims of local forms must be to transcend localism and move towards a 'community of communities' with the objective of creating forms of societal collective governance that can address the wider dimensions of climate change at national, international and global scales.

It is in this way that a conceptualisation of self-organisation in the sphere of meta-governance (Jessop, 1997; 2002; 2004) is essential in order to fulfil the essential needs for adaptation to and mitigation of global environmental change. For Jessop (2002, p. 49) "[Meta-governance] is the organisation of the conditions for governance and involves the judicious mixing of market,

hierarchy, and networks". We would add self-organisation represents a distinct form of societal organisation. Thus meta-governance is concerned with how political authorities are involved in promoting and guiding the self-organisation of governance systems through rules, values, organisational knowledge, political strategies and institutional tactics (Jessop, 1997). The problem from a meta-governance perspective is that traditionally the emphasis has been placed on hierarchical systems and more recently on the role of markets and networks (*a la* governance). Thus self-organisation, particularly from 'below', has tended not to feature in these debates. We contend that it is necessary to redress this imbalance in research and practice vis-à-vis climate change.

The decreased capacity for hierarchical policy making implies that governments have to rely more on communicative, non-instrumental and collective modes of governance to govern complex social systems, allowing other actors to articulate their interests more explicitly in the policy making process. However, the lack of the "shadow of hierarchy" (Scharpf, 1994), in terms of the absence of an external authority which might "result in the risk and fear of anarchy, can also provide an intrinsic motivation for non-state actors to practice self-governance" (Börzel and Risse, 2010, p. 121).

Self-organisation therefore presents a dilemma to conventional modern governance systems. By definition, the concepts of self-organisation and governance are antonyms. However, despite the heuristic and philosophical differences both concepts have, in the recent years, increasingly been brought together in the guise of "urban governance". Zhang et al. (2015) argue that self-organisation and intentional planning are the two sides of the same coin, and position self-organisation between the dynamics of micro-, meso- and macro levels of governance. Self-organisation represents not only a break in the system but also a change in the social institutions and the rules of the game. In other words, self-organisation is not only about individuals' capacity to form collectives but it is also about accommodating local community initiatives in the wider institutional context. What remains unknown, however, is the 'game' (and the 'rules of the game') at the interface between the process of self-organisation and institutional aptitude of governance structures to adapt to these new situations.

It is therefore necessary to differentiate between alternative forms of self-governance (self-regulation and self-management) in terms of "initiative", "action" and "result". Ismael (2010) provides a twofold distinction between self-organisation and self-governance. Self-organisation is a set of activities that are by their nature cooperative and are not mediated by external forces, whereas self-governance is a collective process that is context dependent and engages certain goals, deliberative standpoints and choices over means. Ismael suggests that self-governance is a result of self-organisation, seen as micro-level governance, and an additional layer of a

“self-representational loop”.

There are clear intersections between the literature that focuses on self-organising and the literature that focus on adaptation to climate change. For the most part an agenda situated in and around the self-organisation literature focuses on localised relationships and how local agents come to ‘know’ about and understand the nature of the climate change problem and how multiple local sites of adaptation might interact. Such an agenda would allow for an emancipatory re-drawings of how to respond to climate change and assumes that the possible ways of responding are not ‘designed’ in advance by others at a macro-governance level.

Furthermore in order to fully comprehend self-organisation we need to go beyond the traditional political process of citizens’ representation and investigate what Purcell (2003, p. 567) describes as ‘restructured’ form(s) of citizenship emerging in response to contemporary global political-economic changes of capitalism. By utilising the concept of self-organisation we wish to draw attention to processes taking place within everyday life that shape the city and the region and society more generally. In other words, how do citizens directly affect societal change through the development of their own (local) adaptation strategies to the conditions of climate change, make use of and create opportunities.

This requires a focus on everyday life practices which form the basis for collective action and have the potential to create flatter, less hierarchical organisational structures by drawing on face-to-face relations between individuals (Cleaver, 2007). The advantage of such organisations is that they create opportunities for the coordinated actions of a (local) collective to emerge and articulate its interests both locally and in a wider public sphere. The implication is that any such organisation is connected to society in a double way: first, to the emergence of (spatially delimited) collectives that have similar or related interests, and have identified (or are in the process of identifying) what these interests are; and second, the pattern and organisational form has to be embedded in everyday life institutions to allow for coordination and communication within the organisation. A further feature is that organisations are not isolated, but usually these organisations interact with other (similar) organisations (on different scales and levels). Thus, thirdly, in order to interact organisations have to develop forms of communication that facilitate communication with other organisations. This often leads to antinomies within an organisation, as the very act of communication with other organisations may conflict with communication within an organisation and potentially may undermine internal group cohesion as groups become engaged in wider networks as more differentiated and specialised roles develop within a group. Following Purcell (2003) the way to resolve this dilemma is to de-couple organisational and action structures and to focus on their distinct rationalities.

An analysis of processes of self-organisation has to take these dimensions into account, and follow the “history” or ‘genealogy’ of self-organisation, which usually originates in inter-personal relations (the internal dimension) and only later is the act of seeking to represent a collective (external dimension) added along with interfacing with other organisations. This implies that the character of an organisation changes, as it has to adapt to interacting with ‘outside’ institutions.

The vast majority of the authors that we have discussed so far draw a sharp distinction between the fields of self-organisation and self-governance. However, in an operational sense, we need a more nuanced typology that pays more attention to intentionality and does not ignore the instances where self-organisation occurs without intent. It is crucial to conceptualize self-organisation as a multistage phenomenon that not only has philosophical but also institutional importance, which not only refers to local levels of governance, and avoids referring to examples as “lower” or “higher” stage of intentional action.

Dimensions of self-organisation

Based on the preceding discussion we propose a heuristic framework based on six preliminary ‘idealised’ propositions on ‘bottom-up’ self-organisation that are juxtaposed with more ‘top-down’ conceptions of how society is organised and change/transition brought about. It is important to note that these are stated in a rather binary either/or manner when in reality the relationships will be much more complex and nuanced. Nevertheless this serves to highlight the differences between self-organisation and other more established modes of organisation based on the state and market(s) and to bring out the implications of these different ways of organising.

1. Cooperation with the state/economy is structured by higher level (political and economic) authorities who set ‘the terms and conditions’ for cooperation (‘hands-on meta-governance’) while self-organisation seeks to challenge or deny (sometimes consciously, at other times unconsciously) these conditions and create its own norms and ways of organising that transgress state and economic structures (‘hands-off meta-governance’);
2. The forms of organisation and cooperation entailed in states and markets are strongly orientated towards rational economic ‘ends’ while those associated with self-organisation are orientated towards ‘becoming’ a community (in the sense of a ‘social body’);

3. Conventional forms of state and market organisation involve institutionalisation of 'partners' and specify the need for clear goal orientated courses of action while self-organisation involves more spontaneous ('disorganised') forms of social action based on 'trial and error';
4. The compartmentalised and 'goal' orientated nature of top-down forms of governance creates a one dimensional approach while self-organisation seeks to adopt a multidimensional/integrative approach;
5. Top-down approaches are structured by a small number of dominant actors (with a centralising power) while self-organisation involves a diverse collection of actors with the intention of engaging in collective decision making (in this sense power is 'decentred');
6. States and markets operate at a particular geographical scale focussing on the regional/(supra-)national scale while self-organised forms emanate from and are rooted in the local/neighbourhood scale.

These dimensions can then be used to guide the analysis and understanding of empirical manifestations of, and engagement with, local collective responses to climate change in different countries and situations. On this basis it will then be possible to gain insights into how they can contribute to collective (societal) transformations vis-à-vis climate change and how states and markets can interface with, learn from and support such activities.

Concluding remarks

Understandings of self-organisation emerge from three broad ontological and epistemological stances. We can apply these understandings of what constitutes self-organisation to broad families of literature on climate change adaptation. The notion of a self-organised transition to an adapted society that is climate friendly can emerge from the re-working of micro-level transactions interacting with and (re)shaping a broader social structure.

Our aim has been to explore heuristically the notion of self-organisation in understanding climate change responses by localised groups. As such we are arguing that, from an advocacy point of view, the focus on either government or markets does not appear to have produced significant changes in terms of adaptation. Focusing on the "thousand flowers" of grassroots or community-led action may provide a more fruitful means of producing change.

The process of self-organisation is useful for several reasons. First, self-organisation offers a heuristic device to focus on the processes of social norming, social learning and social

transitions within the climate change debate. Second, it focuses on the linkages between localised discussions and framing(s) of climate change to the transformation of human societies as a whole (across multiple spatial levels). Third, it offers an emancipatory potential that may allow previously 'silent' voices to come to the fore in the climate change debate, either directly (through invitation) or through a transformative critique of existing governance frameworks and action. Fourth, the concept of self-organisation brings back a human perspective and places a greater emphasis on the agency of individuals and communities: the very act of focusing on self-organisation is an implicit critique of current modes of societal organisation and contains the potential to open up normative pathways to the "good life" and the "just city" (Amin, 2006; Marcuse et al., 2009; Fainstein, 2011), as well as more progressive climate governance (Bulkeley, 2015). Finally, it means we are dealing with 'small scale' processes that imply greater possibilities for (local) collective action at multiple scales of interaction.

One final point needs to be made. Self-organisation should not be seen as a 'magic bullet' that will somehow provide the 'solution' to all of society's problems including climate change. It offers the potential of developing new approaches to climate change rooted in local contexts and understandings of how climate change impacts on those localities. But by itself it will be unable to resolve the problem for the basic reason that climate change is a global problem and that multiple, highly differentiated, localities will frame and respond differently to the problem. It is not simply a matter of 'adding-up' or aggregating the multiplicity of local responses to produce a 'global solution'; what is required is a new articulation of different sectors (state, market and civil society) at different scales over time to create a 'global response' that provides an alternative to neoliberalism and its emphasis on markets (see Connolly, 2013). However, this will entail a revisualisation and reframing of the relationships between the sectors and their internal structures and organisation across time and space.

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