Spatial knowledge management and participatory governance : Rethinking the trajectories of urban, socio-economic and environmental change and the politics of 'sustainability' in Southern cities .

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ANALYTIC FRAMEWORK 1

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1 Introduction[1]

This paper presents the analytical framework developed iteratively by the research team of the Chance2Sustain (C2S) research project[2] between 2010 and July 2014, in order to answer *the main research question* which was posed at the outset of the research, namely: how can spatial knowledge management (SKM) and participatory governance contribute to sustainable urban development? The aim of the paper is therefore to present a theoretical framework for understanding the empirical research undertaken in the C2S project in order to make a contribution to the current debates about the transitioning of cities of the South to more sustainable futures.

To answer this question, the C2S project was designed to undertake comparative empirical research in 10 cities in four fast-growing countries of the South to understand the role of SKM and participatory processes in facing the challenges in a number of strategic *domains* of urban development; those of economic growth, social inequality and vulnerability, and environmental governance. This demanded that the research team locate the project and its parts in a range of theoretical frameworks at different levels, namely, the meta framework of the project, described in this paper; the theoretical and methodological frames for each domain; and the theoretical framework for comparative urban.

In each city, there were researchers from both the North and South working together in the five domains of economic growth through megaprojects; social mobilisation and social exclusion in sub-standard settlements; environmental governance with the focus on water-related issues; spatial knowledge management; and fiscal decentralisation and participatory city budgeting. The development of theoretical, conceptual and methodological frameworks for the research were developed collaboratively for each domain in order that comparison of the urban processes across the cities could take place. Furthermore, since the main aim of the project is to *compare cities* in terms of the extent to which they have shifted towards building adaptive capacity for a trajectory towards a more sustainable future, the research project adopted a relational approach to comparing the case study cities, which accepts that the complex territorial histories [re]produce the human geography of places within a network of cities. Based on the concept of relational space, it is assumed in this project that many urban phenomena are created by, tied into, and shape sets of connections, which can be socio-economic, political, and spatio-temporal. It is these connections, which we consider to be our unit of analysis. This processual, interpretive approach draws on the recent work within the field of comparative urban research (Ward, 2006; Robinson, 2011a, 2011b; McFarlane, 2010; McFarlane and Robinson, 2012).

It is not within the scope of this paper to expand on these theoretical frameworks, but rather to focus on the development of the analytical framework for the primary normative research question regarding the role of SKM and participatory processes in contributing to sustainable urban development. This analytical framework presented here is thus located in the current debates about urban governance; governance for sustainability and the recent debates around the notion of 'sustainability transitions' (Shove and Walker, 2007; Meadowcroft 2011; Swilling and Annecke, 2011; Frantzeskaki et al. 2012; Arias-Moldonado, 2013).

The overall frame for the Chance2Sustain paper emerged as a product of combined iterative processes of inductive and deductive thinking. The empirical results of the research revealed the importance of governance configurations in sustainable urban development, while at the same time, our in-depth literature reviews and internal discussions of the literature related to resilience and sustainability, assemblages, governance and sustainability transitions contributed to the notion of the 'spatial knowledge management configuration' which emerged as

1 This document draws contributions from members of the research team as the analytical framework has been workshopped among Chance2Sustain researchers on a number of occasions (Durban: October, 2013 ; Amsterdam : February 2014; Paris : April 2014).

2 We gratefully acknowledge the funding provided by the EU 7th Framework Programme. under project no. 244828). Project Partners in this project are the European Association of Development Research and Training Germany; Amsterdam Institute of Social Science Research University of Amsterdam (The Netherlands); French National Center for Scientific Research (CNRS) France; School of Planning and Architecture (SPA) India; Cities for Life Forum (FORO) Peru; Centro Brasileiro de Análise e Planejamento (CEBRAP) Brazil; Norwegian Institute for Urban and Regional Research (NIBR), Norway and the University of KwaZulu-Natal (UKZN) South Africa. For more information on the research programme see: http://www.chance2sustain.eu/

what we consider as the important concept for understanding SKM. Thus, the theoretical insights and the empirical evidence were iteratively combined through collaborative debate and application to produce the framework presented in this paper. For us what is interesting and important is the conceptual structure of the final analytical framework, as well as the process through which it was developed.

The paper commences with the rationale for the selection of case studies and characteristics of this sample of cities in section 2, followed in sections 3 to 6 by the building blocks of the analytical framework. In section 3, the theoretical framing of the research question about 'sustainable urban development' in relation to current theoretical literature is presented while in section 4, the main concept of the framework, namely that of the 'configuration', is developed. Section 5 locates the analytical framework in the debate around the 'new' concept of sustainability, while section 6 advances the argument calling for an understanding of the role of governance in the transition to sustainability. The final section argues that building capacities to enhance knowledge about the transition to sustainability is critical to understanding the extent to which cities are transitioning to sustainability.

2 Case Study Selection

The Chance2Sustain project is based on a comparative analysis of 10 cities. Our analytical selection consisted of middle-sized, fast growing cities from mainly BRICS countries with populations between 1-5 million. These cities are fast growing with relatively low levels of funding and spending; they have high proportions of people living below the poverty line, as well as high levels of inequality (*High Gini coefficient in South Africa, Brazil and Peru, and moderate in India*), low levels of basic services and high levels of need. They are also characterised by large areas of sub-standard settlements (*share of the households living in informal settlements*) as significant features of the city.

The results from C2S show that there is currently a highly unequal exposure to risks, stresses and injustices in the urban context:

Table 1: Characteristics of case study cities

	Pop. Growth rate 2000-2005	Pop growth rate 2010-2015	**Gini coefficient (country)***
Durban	2.1	1.7	63.1
Cape Town	2.6	1.7	63.1
Guaruhlos (SP)	2.9	1.4	54.7
Rio de Janeiro	1.2	0.9	54.7
Salvador	2.3	2.6	54.7
Lima	2.1	1.9	48.1
Arequipa	2.1	1.8	48.1
Kalyan Dombivli	n.a.	n.a.	33.9
Chennai	1.7	3.0	33.9
Delhi	2.7	3.1	33.9

* Figures are from 2009, 2010 (WB); figures on growth rate 2010-2015 are from World Urbanization Prospects revision 2011, and from 2000-2005 from the Revision of 2007.

- The cities face different levels of historical injustices in different domains
- They experience the issues of sprawl and compactness in development processes in different ways
- The cities have different physical settings, issues of degradation and levels of natural restoration and protection
- Cities are faced with an urgency to act to address short-term issues versus taking a long-term perspective

In addition, the cities show different institutional arrangements linked to various forms of the scaling and rescaling of governance. There also exists in the cities different expressions of democratic processes; and the fragility of institutions varies throughout them.

There are tensions between neoliberal pro-growth and pro-poor social development policies and practices which are expressed and traded-off differently in each country depending on the historical, spatial and political economy context. In the second place, our selection of cities was also pragmatically linked to the availability of capacity in our research network.

The aim of the Chance2Sustain project is to compare the 10 cities along various dimensions via the application of a comparative approach.

3 The Position of the C2S Project in International Theoretical Debates

We locate ourselves broadly in the debates taking a critical stance towards the concept and discourses of *sustainability* and *sustainable development*, with particular reference to the critiques of the sustainable development rhetoric and practices derived from the early theories of sustainability (Scoones 2007), current post-climate change conceptions of sustainability (Arias-Maldonado 2013), and the call for a politicization of socio-environmental sustainability that supports new ways of imagining different, alternatives possibilities and futures (Swyngedouw 2010).

Our approach towards sustainability focuses on cities and local governments. It is based on a conceptualisation of cities as a geographical 'plexus' of exchange and connection (Allen et al. 1999), made up of many networks both within the city and connecting the city locally, nationally and globally. The city also involves bringing people together in particular ways and according to specific relations and under varying forms of governance (cf. the concept of *configuration*). We adopt a relational understanding of cities that necessitates an understanding of 'multiple spaces' that become relationally constructed, interlinked and superimposed within extending urban regions' (Healey, 1995, in Graham and Healey, 1999, 629). This recognises that these 'multiple space-times' are inscribed into the cities' 'power geometry' (Massey, 1993, cited in Graham and Healey, 1999, 629).

Our contribution in the C2S project relates to the role of *participatory spatial knowledge management* in directing urban governance towards more sustainable forms of urban development. Sustainable urban development is understood in this project as a locally defined and negotiated process linking a set of interrelated social, economic and environmental goals that are aimed at reducing social inequalities, supporting more equitable patterns of economic growth, and greater environmental protection. Spatial knowledge management is interrogated in relation to its specific elements (knowledge, spatialised and digitized knowledge and participatory processes) in urban development. We argue that spatial knowledge management (consisting of knowledge construction, exchange, contestation, and use) is a critical domain for supporting more sustainable urban development. It provides resources that enable actors to develop knowledge management configurations, with city governments as one of the strategic actors, to address the complex interplay of economic, social and environmental processes. We also argue that *participatory,* or more broadly, *interactive governance* is important for sustainability as it can incorporate different types of knowledge and actors across scale levels (i.e. hybrid arrangements), and increase the democratic quality of decision-making through more inclusive processes (Torfing et al, 2012).

Given our interest in urban inequalities and urban 'geographies of injustice', the contribution of spatial

knowledge is seen as strategic for three main reasons: first, by including different types of knowledge from different actors and perspectives, it can reflect the priorities of various urban communities with the potential to empower marginalized groups; second, spatialising information can contribute to a more targeted urban planning and management (Baud et al 2011; Martinez 2009) through the added value of visualizing the geographic distribution of phenomena and showing the concentrations of events or trends; third, the methodologies of producing spatial information and knowledge can make visible information on the assumptions made in terms of framing the issues, knowledge sources and classifications used. Our approach takes into consideration both the enabling potential of the use of participatory spatial knowledge management and its limitations and constraints, as we acknowledge that participation is linked to the nature of social relations and the power relations that shape the institutional and governance arrangements.

We therefore analyse the existing *capacities* of various sets of actors in digitized-spatialised knowledge management in order to explore their potential for imagining and implementing practices that support socio-economic and environmental change in complex urban environments according to locally negotiated conceptions of sustainability.

With regard to the comparative approach adopted in this research, we have investigated current debates in comparative urbanism and from this we adopt the notion of 'relational comparisons' (Ward, 2006, 2010; Watson, 2009; Myers, 2011; Robinson, 2011a, 2011b; Roy 2011; Parnell and Robinson, 2013). This approach recognises that relational histories and geographies of cities are critical in comparing cities; and that cities need to be theorised as "open, embedded and relational" (Ward, 2008, 407). C2S is therefore adopting a critical approach to *reveal, 'decipher'*, or unmask, the 'variegated articulations' and connections "among the different spatial, political-institutional, economic and environmental elements" of the ten cities which are all part of the 'emergent planetary urban configuration' (Harvey, 1989 in Brenner et al. 2011, 237).

4 The Configuration: A Key Concept in Our Analytical Framework

We use the concept of *'configuration'* to capture the important combination of elements that contribute to urban development decision-making and outcomes in the social, economic and environmental domains with specific reference to the knowledges produced, exchanged and used in these processes, which we are analysing in specific urban contexts/cities in the South. The concept of configurations related to spatial knowledge management has emerged from the fieldwork in our case studies and was applied in-depth to the issue of spatial knowledge management in the WP5 fieldwork report and is defined below.

We define a *spatial knowledge management configuration* (SKMC) as an ensemble of:

1. Discourses /framings about spatial knowledge management;
2. Actor coalitions and/or networks and their power relations in managing spatial knowledge in work processes (particularly of local government, but not exclusively);
3. The main processes of knowledge generation, exchange, and contestation;
4. Spatial knowledge platforms and products produced and utilized (ICT-GIS-based products; maps) (cf. Baud et al. 2013; van Buuren 2009).

Although the changes in processes, power relations and outcomes are part of the SKM ensemble, we have kept them separate in recognizing that outcomes are also influenced by other factors than those in the SKM configuration.

The concept of a configuration, as an ensemble of dimensions, can also be used more generally as an analytical tool. During the 2014 Chance2Sustain workshop we came up with the following general definition of urban configuration as an analytical tool with which to interpret the knowledge-related results from the other WPs across cities:

1. The discourses/framings concerning the domain issues;

2. The actor coalitions and their power relations (related to a particular domain–WP);
3. The main processes within that each domain (WP) (economic growth through mega-projects ; social mobilisation ; environmental governance related to water ; spatial knowledge management ; and fiscal decentralisation and participatory budgeting);
4. The platforms (technologies), products and infrastructure, produced for the configuration (cf. Pfeffer et al. 2013; Baud et al. 2011; van Buuren 2009).

Urban *spatialised knowledge management configuration (SKMC)* is the main concept we use to study the question of how urban development processes can be made more sustainable and inclusive, by looking at ways in which spatialised knowledge is drawn together (Latham and Sassen 2005). Spatial knowledges reflect a strategic set of resources, to which all stakeholders in urban governance processes can contribute. The question also concerns whether demands for, and contributions to, such spatial knowledge can become more inclusive, embedded and a product of participatory and interactive governance in urban decision-making processes, and what the implications of this would be for more sustainable urban development outcomes.

This question fits into a broader debate on how urban policy-making processes are changing from processes in which government domains are the dominant locus of power to those in which *networks* of different actors participate in governance networks, i.e. the shift to a network society (Barnett and Scott, 2007; Baud and De Wit, 2008; Castells, 2000, Coaffee and Healey, 2003; Hajer and Wagenaar, 2003; Innes and Booher, 2003). This includes the discussion on how policy-making processes are being influenced by the rapid exchange of ideas, people, and technologies, linked through internet and other forms of exchange internationally and the fluidity of local combinations of such 'things' into urban assemblages (Fairclough, 2006; McFarlane, 2011; McCann and Ward, 2011).

Our specific contribution to analysing our results as knowledge management configurations is the assumption that analyzing spatial knowledge production, exchange and use will provide a deeper understanding of current and emerging processes of governance and the building of capacities (see below) in cities and indicate how such processes can contribute to more sustainable urban development outcomes.

Since the main question of the Chance2Sustain project relates to understanding the role spatial knowledge

5 The 'New' Concept of Sustainability

management could play to enable cities to move towards a more sustainable future, it is therefore critical to interrogate the concept of sustainability. The terms 'sustainability' and 'sustainable development' have been heavily criticized as scientific concepts and policy discourses for their vague, poorly defined understandings, and their ambivalent, divergent and contested meanings (Scoones 2007; Swyngedouw 2010), as well as the difficulty in operationalising them. Considered as an expression of the dominating "managerialism and routinized bureaucratisation of the 1990's", scholars consider that the concept of sustainability has failed to take into consideration the wider political economy of development (Scoones 2007, 594). The sustainability discourse is also seen to promote a conservative and reactionary view of the social-nature order based on a consensus that prevents critical political and democratic questions and therefore negates any possibilities of allowing for the expression of divergent or contradictory positions on possible 'environmental futures' under what Swyngedouw (2010) refers to as the 'post-political' condition.

There has been a revival of sustainability debates under a different guise in the late 1990s with the acknowledgement of the failure of the 'Bruntland' concept of sustainable development and of the 1992 Rio agenda to fulfill their political commitments (Scoones 2007). A 'new' concept of sustainability has emerged in the context of climate change, which adopts a critical perspective. It is this perspective that shapes our understanding of sustainability.

Debates about sustainable development have also been

characterized by the growing use of the concept of 'resilience', considered as a condition for sustainable development, in both the academic and practioner literature in the fields of risk management and adaptation to climate change, but also increasingly in the fields of urban planning and economic development (Pickett et al. 2004; Christopherson et al. 2010; Wilkinson et al. 2010; Raco and Street 2012; Toubin et al. 2012), and in relation to processes of urban transitions or urban transformations as well (Pelling 2012; Ernston et al. 2010; Satterthwaite and Dodman 2013). However, the use of the concept of resilience remains debated, and even contested. Its transposition from natural to social sciences has raised a number of issues related to its positivist assumptions and its 'naturalizing positions' that may lead to the potential "depoliticisation of the planning field" (Porter and Davoudi 2012, p. 331, 333). The normative dimension of resilience is questioned in relation to its outcomes and purposes, the exclusionary impacts of a vision of bounded systems, and power and politics (Davoudi 2012). Finally, scholars underline its potential for promoting conservative politics and justifying particular forms of neoliberal governance or neoliberal governmentality through the claim of neutrality, common-sense objectives and pragmatism (Leach 2008, Christopherson et al. 2010, Raco and Street 2011, Davoudi 2012, Porter and Davoudi 2012, Shaw 2012, Joseph 2013, Welsh 2013).

The 'new concept of sustainability' has emerged in the Anthropocene, a new epoch in which it is declared that one species (human beings) has become the driving force of change (Bierman et al. 2012; Lorimer and Driessen, 2013). This concept is also a response to the economic uncertainties and socio-economic issues that have emerged in the post-2008 recession period which are referred to as the 'polycrisis' (Swilling and Annecke 2012). The recession, which has resulted in deepening poverty coupled with the impacts of climate change have created an 'unsustainable modernity' (Swilling and Annecke 2012). They therefore propose that with "the breakup of the neoliberal orthodoxy … [this has] created a space for innovation and creativity (ibid, 94). This has led to the emergence of many context-related 'experiments' in the area of governance (Bulkeley and Shroeder 2011; Braun 2014; Bulkeley and Castan Broto 2012; Wakeman and Braun 2014).

There is a however some continuity with the traditional conception of sustainable development. The 'new' concept of sustainability retains the norms and values of the concept of sustainable development and therefore accords great importance to the "over-arching, symbolic role–of aspirations, visions and normative commitments–that remains so politically potent" (Scoones 2007, p. 594). Furthermore, the 'new' concept of sustainability proposes conceptualising current realities as a set of intersecting ecological, economic and socio-political domains with local and global dimensions. It stresses the interconnections, intersections and entanglements between environment and development (human, economic and social processes), and the overlaps and interdependencies among these domains. It calls for the adoption of a *multi-scalar and long-term* perspective to understand local and global dimensions.

However, this new approach to sustainability differs from the conventional conception in several ways. It challenges the modernist understanding of Nature as a single domain separate from society/economy *(*Arias-Maldonado 2013*).* Following Swyngedouw (2010), critical approaches to current discourses and practices of sustainability also deconstruct the concept of nature by arguing that there is a "no single Nature (p. 202) "but rather a great variety of distinct and often radically different (if not antagonistic) natures". There is a greater recognition of the complex and changing environmental dynamics impacting human life and therefore the non-linear dynamics of the human-natural system[3]. Different paths and patterns of sustainabilities are negotiated in specific urban contexts: it is "a general, pluralistic, open principle that allows for many different solutions to be democratically discussed and acted on (Arias-Maldonado 2013, 430). It is a concept therefore that emphasizes the democratic processes at play. The new concept of sustainability critiques the mismatch between those interventions or actions, which are needed, and the current governance structures (see section on governance below).

We therefore understand sustainability from a constructivist perspective as a long-term multi-dimensional and multi-scalar process driven by socially negotiated and potentially contested or antagonistic visions, goals and values. We consider that questions of sustainability must be articulated with key political questions about who (or what) gains from practices and policies implemented under the label of 'sustainability', who benefits from or are excluded from them, and what arrangements and strategies can be conducive to enhance the democratic content of decision-making linked to sustainability policies (Shove and Walker 2007; Swyngedouw 2010). Our understanding pays particular attention to contextual differences.

3 See the 'panarchy model' in Welsh, 2014.

6 The Role of Governance in 'Sustainability Transition'

In this research project, we see policy making increasingly taking place through networks of actors who are "relatively stable sets of independent, but operationally autonomous and negotiating actors, focused on joint problem solving" (Hajer 2005, 241). Such organisational interaction is necessary to solve problems of urban sustainable development, characterised by complexity, uncertainty of trajectories, and a variety of stresses. We recognize the necessity of focusing on the *combinations of issues* that governance networks do or do not include in governing, and the extent to which spaces for more deliberative processes are created and utilised ; as well as what knowledge and information is constructed in them to inform decision-making processes (from expert to community-based), and how reflexive such processes are.

A first question is the extent to which governments recognise and work with other actors. This has stimulated debate around concepts of democracy and citizenship, as contemporary policy-making arenas and public participation approaches are critiqued for a lack of representation in decision-making (Innes and Booher 2004; McEwan 2005). This literature has also stimulated discussion on the strength of emerging forms of citizenship built up within social movements and civil society organizations to empower their members and engage with state institutions (e.g. Holston 2008 ; Scott and Barnett, 2009). In our work, we are interested in the actors driving transition processes, and the extent to which collective agency is built up, based on the rules of engagement within and around such spaces governing how actors engage with each other, and the sets of recognised legitimate knowledge framing discourses within them.

Conceptualising how power is dispersed throughout multi-scalar governance arrangements requires a recognition of the complex ensemble of power relations which create hybrid arrangements. Assemblage is a concept that helps to grasp non-linearity without reducing the grouping to its component parts, and can be defined as a fluid arrangement of different clusters of ideas, actor coalitions, spaces, materials and their relationships. It is the very processual nature of the relationships between these elements that define the assemblage (Deleuze and Guattari 1987; Delanda 2006). However, rather than simply thick description, the assemblage perspective requires an analysis of how power relations are produced (Brenner 2011). In doing so, it opens up new avenues for socio-spatial inquiry on the strength of emerging forms and the continual shifting of relations across space, time, scale and boundaries (McFarlane 2011) whilst remaining firmly anchored in locally negotiated arrangements.

For urban governance, the assemblage concept allows a deeper understanding of how 'packages' are put together through interaction. With the rise of the Internet and global communications, ideas, knowledges and policies are mobile and can be drawn into assemblages across boundaries, and thus changing the dynamics of local governance (McCann and Ward 2011). Knowledge creation, sourcing, and transformation are multi-scalar and multi-spatial processes that can uncover different nuances of inclusion or exclusion for negotiating new sustainabilities. The question is then how these knowledge configurations are put together from local and global sources and the implications of such processes for governance.

However, the assemblage perspective is almost too fluid. Particularly in the context of the global South, there are enduring socio-political and economic features which bring some stability to multi-scalar governance arrangements. In this sense, configurations of governance can be conceptualised as the midway point between the stability of regime and the fluidity of assemblage theory (Baud et al. 2013). Configuration, as a concept, allows an analytical openness to the emergence of power relations from complex interactions with uncertain directions, particularly with new issues changing all the time, but also indicates that such assemblages have a staying power over time (path dependency).

Having discussed how knowledge is embedded in epistemic communities and urban development processes, two recent transformations in constructing knowledge are noted; namely, the explosion of digitization of data and the 'spatialization' of knowledge. The discussion on what the spatialisation of information and knowledge contributes to knowledge-building is at two levels; first the added value of visualizing the geographic concentrations of events or trends, also referred to as *geographic governance*. This is particularly strategic, given our interest in urban inequalities and urban 'geographies of injustice' and what spatializing information can contribute to more targeted urban planning and management (Baud et al 2011; Martinez 2009). The second level of discussion on the spatialisation discussion concerns the methodologies of producing spatial

information and knowledge, which can both make visible or hide information according to the choices made in framing issues, utilising knowledge sources and deciding upon which classifications are used. Therefore, we have an interest in the set of digitised and spatialised knowledge building processes, which build capacity for reflexive learning, and are designed to make cities more sustainable as their outcome.

Processes towards more sustainable forms of development, whatever definition has been adopted, are often framed in terms of 'transition' – broadly defined as "a substantial change and movement from one state to another" (Shove and Walker 2007, 763). The emerging fields of 'transition studies' or 'sustainability transitions' provide a rich theoretical discussion on sustainability and governance (Markard et al. 2012; Frantzeskaki and Loorbach 2012). While we adopt a different perspective in terms of our epistemological position, object of analysis and approaches, we share a number of positions that have recently emerged as part of the critiques in these fields (Shove and Walker 2007, Meadowcroft 2011), particularly around issues of agency, power and politics and governance.

The literature on 'transition', which is rooted in traditions of systems thinking, has experienced a surge of interest lately and a number of approaches have developed, notably in the study of socio-technical or socio-ecological systems, innovation and technology (Markard et al. 2012). These approaches to transition, which combine concepts and approaches from evolutionary economics, science and technology studies, structuration theory and neo-institutional theory, mostly deal with function-oriented systems and infrastructures, the provision and supply of resources, often analysed using a sectoral approach (energy, water, mobility, transportation). These approaches are based on a systemic, co-evolutionary approach to technical, social and environmental change framed in terms of the assumptions of complex systems and mutual adaptation (Shove and Walker 2007). The central concepts related to this literature include 'regime'[4], 'regime shift', 'niche' and 'landscape' in relation to a multi-level perspective (Markard et al. 2012). More recently, some strands of this literature have focused on sustainability transitions at regional and local scales (Spira et al. 2014; Egermann et al. 2014), and more specifically on cities and urban settings (Bulkeley and Castan Broto 2013). This strand of literature on 'sustainability transitions' acknowledges that governance plays a particular role in transition (Smith et al. 2005).

Within this literature 'sustainability transitions' are defined as "long-term, multi-dimensional and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption" (Markard et al. 2012, 956). A system is here defined as a network of actors and institutions, material artifacts and knowledge. Elements of the system are inter-related and interdependent. Sustainability is understood in relation to the use, supply and sufficiency of resources, as well as in relation to pollution, risks, infrastructure renewal and extension. When addressed more broadly, transition approaches conceptualise sustainable development as "an open-ended process of societal change that entails values of ecological integrity and protection, and intergenerational justice and responsibility" (Frantzeskaki and Loorbach 2012, 32). Transition assumes the following: far-reaching changes; different dimensions; a broad range of actors; and impacts on related societal domains (living, housing, working, planning, and policymaking).

In that regard, 'transitions towards sustainability' differ from other historical transitions in that they are 'goal-oriented' or 'purposive', that is, they seek to address specific problems, they require changes in economic and political frame conditions (in order to allow innovations to take place and replace existing systems) as well as strategic reorientation of actors, which defend existing systems and regimes (Geels 2011, p. 25). As a result, theoretical approaches must address both the multi-dimensional nature of transitions and the dynamics of structural change (ibid.). Since we have not systematically investigated the interventions in the domains from the outset of the research, apart from WP4, an *inductive approach* is adopted in understanding the transitions to sustainability.

The field of 'transition studies' has been recently subjected to a number of critiques (Shove and Walker 2007; Geels 2011; Meadowcroft 2011): scholars point to the insufficient emphasis on the role of agency and interventions; on politics and power relations; as well as the neglect of cultural and demand side aspects. They also argue that research in transition studies has failed to acknowledge the limitations of thinking that deliberate transition management can be possible and potentially effective (Shover and Walker 2007). Transition approaches are also criticised for not taking into consideration the influence of political contexts; not questioning the democratic legitimacy of governance designs; for

4 Socio-technical regimes are defined as relatively stable configurations of institutions, techniques and artefacts, as well as rules, practices and networks that determine the 'normal' development and use of technologies (Rip and Kemp 1998). Regimes fulfil socially valued functions, which they also help to constitute (Geels,2002a,b ; Smith et al. 2005, 1493).

overlooking the potential to marginalize particular interests and social groups; and for having an implicit normativity (Voß and Bornemann 2011, 2).

Another critique is that adaptive and transition management takes the 'politics of learning' insufficiently into consideration. The conception of learning builds on "an idealised image of cognitive learning that assumes unbiased observers of systemic changes, open-minded consideration of options, unequivocal interpretations of results from experimentations"; it overlooks "the possibility of strategic actors to shape or even to manipulate (…) experience against the background of their own beliefs and interests" (Voß and Bornemann 2011, p. 13). The main argument of Voß and Bornemann (2011, 2) is that knowledge production and politics are closely intertwined; they argue for the need to consider politics as a 'constitutive element of reflexive governance' and "to reflect carefully on how it may play out in specific designs for participatory experimentation and learning". The authors seek to develop adequate procedural arrangements in order to address these issues.

There have been some refinements of transition approaches over time, in particular to integrate issues of agency, politics and power, and the geographical and spatial dimensions of transition (Markard et al. 2012). Scholars in the fields of transition studies propose a refinement of existing definitions of governance with an emphasis on politics (Markard et al. 2012), and on experimentation and learning (Voß and Bornemann 2011; Bulkeley and Castan Broto 2013). This goes along with a call for integrating complementary approaches from other disciplines, such as organisational and sociological studies in order to rework the understanding of agency and economic and institutional geography in order to more explicitly conceptualise the geographical dimension of transition processes. There is also a call for supporting a stronger normative orientation in transition process (Markard et al. 2012).

A number of scholars have acknowledged that governance needs to be reconceptualised in order to respond to challenges linked to the governing of 'sustainability transitions' (Smith et al. 2005; Lebel et al. 2006; Voß and Bornemann 2011; Frantzeskaki and Loorbach 2012; Bulkeley and Castan Broto 2013):

- The "tensions between the open-ended and uncertain process of sustainability transitions and the ambition for governing such process" (Frantzeskaki et Loorbach 2012, 21) need to be considered.
- There is a need for "joint efforts to stream societies towards sustainable development" but "what is defined as sustainability at any given moment is inherently ambiguous, contested and uncertain, and therefore inherently challenged and changing. The sustainability values (environmental integrity, societal cohesion, welfare and intergenerational justice) must be safeguarded and remain adaptable, thus open, to future needs" (ibid., p. 21).
- According to Frantzeskaki and Loorbach (2012, 21), dealing with complex risks and uncertainties requires "a different set of guiding principles in the context of sustainability transitions. Transitions cannot be governed in a linear manner with simple objectives and targets following regular implementations models".

Also engaging into a discussion on changing forms of governance in governing societal transitions to sustainability, Frantzeskaki et al. (2012) put forward a number of principles that would be necessary to follow: employing participatory and deliberative forms of governance; formulating an open agenda; integrating different interests; ensuring inclusion and active involvement of multiple actors and co-construction of pathways (p. 24); and committing to fundamental values of social cohesion and equity.

'Reflexive governance', in particular, has attracted much attention for its potential to take into consideration the complexity of problems at hand as well as a multi-level stakeholder perspective (Shove and Walker 2007). It acknowledges that there are different ways of framing problems, different and sometimes convergent interests and strategies at play, and that goals are ambivalent (Voß and Bornemann 2011). But reflexive governance has also some limitations (Shove and Walker 2007, 767): how can managers adjust to constant change in environmental and social conditions (cf. the circuits of feedback, monitoring, action and reaction)? What are the institutions and mechanisms through which goals and policies can be revised? What should be monitored? How can managers identify signs of change of trajectories? Most importantly, how can we ensure that new ideas and techniques are not incorporated 'into political business-as-usual'?

In their analysis of the governing of climate change, Bulkeley and Castan Broto (2013, 363) also challenge traditional conceptions of government and governance on the basis that urban responses to climate changes 'exceed governance'. Their approach, which is located in the study of socio-technical regime transformation (with the use of concepts such as 'niches' and 'experiments'), builds on Foucault's governmentality approach and the notion of 'assemblage', which pays particular attention to the shaping of conducts and subjects.

Authors, who position themselves in perspectives other than 'transition management', also challenge traditional

views and account of governance and focus rather on the 'government of urban life' or the government of everyday life in response to climate change. They emphasize the need to rethink governance as ad hoc, provisional and decentered (Wakefield and Braun 2014; Braun 2014).

There has also been a shift from thinking about governance as 'participatory' to that of 'interactive governance' (Torfing et al. 2012; Pfeffer et al. 2013). Although inclusion, co-design and management are the focus of both approaches, the interactive governance approach focuses explicitly on how power is exercised in governance processes, acknowledging actor-based attributional and relational power (through hybrid institutional arrangements). Although governments may utilize participation and forms of interactive governance, the ways in which it is institutionalized, and its rules and performance, set limits on the extent of influence which networks can bring to bear on policy and strategy (Hajer and Wagenaar, 2004).

7 Governing from a Knowledge Perspective: Building Capacities for Knowledge Building

In summary, the C2S project focuses on *governing from a knowledge perspective* as the main cross-cutting questions of the research. We therefore apply the concept of a *knowledge configuration* to partly examine the use of knowledge in governance (across the domains). The project has developed an *analytical framework for understanding the knowledge configurations* related to the processes of governance that aim at addressing issues of social inequality, economic inequality and environmental and climate protection. The configuration is therefore our way to encapsulate all elements to assess particular governance arrangements and transitions, and issues where urban development decision-making is taking place across the domains.

Governing the present and the transition to the future means looking at *building capacities* for reflexive learning (based on knowledge building processes) to achieve a different relationship between environment and development (with the emphasis on the role of human endeavour). The building of capacities would be designed to make cities more sustainable as an outcome. Thus, we ask the question of what capacities have been built up, and embedded in specific arrangements, that allow cities to develop practices that support urban, socio-economic and environmental change according to locally negotiated conceptions of sustainability? It is also important therefore to ask: what are the arrangements that might prevent this from happening, and what are the limitations and constraints that cities are facing in developing such practices?

We therefore examine what *capacities* are evident in the governing processes (in WP2, 3, 4, 5, 6). What are the capacities that have emerged and are emerging to achieve a different relationship in contrast with 'business as usual' (the dominance of the economic growth)? The central question that needs to be addressed when dealing with capacity is the following: *capacity of what/who, for what/whom, and with what effects?*

In our analytical framework the concept of 'capacity' is conceptualised in relation to the notion of 'configurations' and in close connection with knowledge production, exchange, contestation and use. It is linked to two central aspects of our analysis: our approach to *governance* (inclusive, participative, reflexive, interactive) and the *long-term goals of sustainability or the transition towards sustainability addressed at the urban and more global level*. In our understanding, *building capacities* means building different types of knowledge as our main focus, accessing resources in a generic way, considering inclusion and exclusion of actors and knowledge, while taking structural constraints into consideration.

In conclusion, we do not take a universalising approach but rather propose that configurations need to be contextualised and can have locally produced pluralistic outcomes related to cross-scale uncertainties and complexities. These knowledge management configurations need to be anlaysed over time within actor coalitions and processes, which may have spatial-temporal and contextual dynamics with spill-over effects across boundaries and scales (open sustainability); or within locally negotiated processes (pluralistic visions of sustainability).

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