

RESEARCH ARTICLE

Blending adaptive governance and institutional theory to explore urban resilience and sustainability strategies in the Rome Metropolitan Area, Italy

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Acknowledgements

The authors acknowledge the financial support by the European Union FP7-ENV.2011.2.1.5-1 (TURAS Project) Grant Agreement no. 282834. The authors would also like to acknowledge the assistance of the following people in the preparation of this paper, Mariella Iunessi, Luca Polizzano, Ilaria Corsi, Massimo Felicetti, Patrick van den Abeele, Jo Sinclair.

Abstract

Adaptive governance is an emerging theory in natural resource management. This paper addresses a gap in the literature by exploring the potential of adaptive governance for delivering resilience and sustainability in the urban context. We explore emerging challenges to transitioning to urban resilience and sustainability: bringing together multiple scales and institutions; facilitating a social-ecological-systems approach and; embedding social and environmental equity into visions of urban sustainability and resilience. Current approaches to adaptive governance could be helpful for addressing these first two challenges but not in addressing the third. Therefore, this paper proposes strengthening the institutional foundations of adaptive governance by engaging with institutional theory. We explore this through empirical

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research in the Rome Metropolitan Area, Italy. We argue that explicitly engaging with these themes could lead to a more substantive urban transition strategy and contribute to adaptive governance theory.

Key words: urban resilience; urban sustainability; adaptive governance; urban transitions; institutions

1. Introduction

In an increasingly urbanized world, social inequalities, economic boom and bust, degraded environment, climate change and unsustainable resource use are all problems that are discussed in the urban context (see, for example, Harvey 2009; Rydin and Kendall Bush 2009; Lancet 2012). In the face of these challenges, urban sustainability and resilience are emerging as twin goals, whereby policymakers are articulating visions for the way urban societies and places should be (Ahern 2013). Given the complexity of the urban context, how to deliver these visions remains a key governance challenge, particularly in a socially and environmentally equitable way.

In this paper we explore a central question: how helpful is an adaptive governance lens in exploring transition strategies to achieve urban sustainability and resilience? After firstly outlining the challenges for urban sustainability and resilience, we review adaptive governance, which has evolved within natural resource management literature. Our analysis suggests that adaptive governance can help address urban challenges of combining multiple governance scales and institutions and adopting a systems approach that integrates the social, economic and ecological. However, we highlight a limitation common to discourses in urban sustainability and resilience and adaptive governance: addressing environmental and social equity and the impacts of asymmetric power relations. We propose blending adaptive

governance and institutional theory to develop a refined conceptual framework that could address this gap. We explore this framework through analysis of urban resilience and sustainability strategies in the Rome Metropolitan Area, Italy. We reflect on the empirical analysis and how helpful the conceptual framework is in understanding complex real world processes to establish sustainable and resilient urban strategies and how our contribution can address gaps in the adaptive governance literature.

2. Urban sustainability and resilience: definitions and challenges

Sustainable development has become a paradigm that has guided many global processes and policy developments in terms of elaborating societal and environmentally beneficial development goals. Three important principles were established by the World Commission on Environment and Development and the first intergovernmental Earth Summit in Rio in 1992. These principles were: the three pillars of sustainable development (environment, society, economy); the need for both global and local actions; the need to consider future generations (WCED 1987). Neumayer (2010) distinguishes between weak and strong sustainability concepts, where strong sustainability is an effective combination of the three pillars so that there is balance between environmental, social and economic goals. In the urban context, where social and economic concerns have tended to dominate, a primary goal of urban sustainable development is the explicit inclusion of environmental considerations within urban policy, planning and development (Cities Alliance 2007; Wilkinson 2012; Pickett et al 2013). However, the concept of an urban system based on an environmental system is far from the mainstream approach to urban planning and management (Da Silva et al 2012). Discourses about how to achieve urban sustainability often take place within particular disciplines, for example: architecture; urban design;

planning; engineering; transport management; energy management; and green business. Thus, debates at policy level often tend to focus around low carbon technologies, resource efficiency, sustainable construction materials and methods and minimising pollutants, and more recently climate change adaptation. Whilst there is ongoing progress in the development of new technologies and innovative approaches to urban challenges, harnessing these innovations to most effective use is often a governance issue (Vandergert et al 2013). Williams (2010) highlights the need to move beyond dualistic thinking in relation to technological advances on the one hand and social change on the other. Policies and practice to integrate multiple disciplines and scales in a systems approach remain a key urban challenge, as does the form of governance best able to harness a systems approach.

Resilience is identified as a specific property of an element or system whereby it can recover after an endogenous or exogenous shock. Within urban disaster management, resilience is identified as the ability to respond positively to exogenous shocks, such as earthquakes or flooding, to recover normal functions quickly (Ye 2001; Price 2008). Within ecology, resilience is the ability of species or ecosystems to recover and/or adapt in the face of endogenous and exogenous shocks (Holling 1986). Unlike sustainability, resilience in origin is objective rather than normative: resilience is not necessarily a ‘good thing’ – poverty or invasive species can be resilient to efforts to reduce or eradicate them. However, discourses of resilience have been evolving to become more normative, more abstract, and to emphasise the positive resilience property of adaptation within an anticipatory/proactive conceptualisation, rather than as a return to the status quo paradigm (e.g Cowell 2013). This is particularly evident in discourses of climate adaptation and resilience (see, for example, Tyler and Moench 2012; Bahadur and Tanner 2014). Thus, whilst urban resilience has long been discussed in relation to (natural) disaster management such as earthquakes, it is emerging as a new policy and planning vision in relation to climate change adaptation, and

how cities' infrastructures, communities and governments can adapt to the impacts of a changing climate, particularly the increased occurrence of extreme weather events (Davoudi 2012; Da Silva et al 2012; Collier et al 2013). In the UK, for example, climate change adaptation has been included as a risk in Local Resilience Forums, alongside terrorism (Welsh 2014).

Whilst these definitions of urban sustainability and resilience are useful, we believe there are critical dimensions that are not well addressed. That is, environmental and social equity and the impact of asymmetric power relations on outcomes. The concept of contested domains within sustainable development has been drawn out in academic discourses where underlying sociological and political ecology dimensions to agents, choices and processes are explored within a more political context of asymmetric power relations and social and ecological inequities (e.g. Forsyth 2003). Redclift argues that it is an illusion to believe that environmental objectives are 'other than political, or other than distributive' (Redclift 1984:130) and advocates an analysis of power structures in relation to the environment (Redclift 1987). By examining power structures and conflict over use and access to resources, Bryant and Bailey (1997) argue that many environmental problems are social and political in origin.

Davoudi (2012) sounds a note of caution about over-extending the usefulness of resilience and Welsh (2014) questions the use of resilience as a 'de-politicising' concept, shifting responsibility for sustaining livelihoods and communities onto individuals rather than government, and the inherent 'blindness' to political processes associated with asymmetric power and government responsibility. Boyd (2012 p.258) expresses the gap thus: 'resilience thinking fails to consider how power and fairness influence outcomes, however important they might be to institutional resilience'.

We therefore suggest that there is an overarching wicked problem for urban policies - how do decision-makers ensure socially and environmentally equitable outcomes from urban resilience and sustainability visions and practice? We propose that environmental and social equity and a consideration of the consequences of asymmetric power relations should be explicitly embedded within definitions of urban sustainability and resilience in order to address this wicked problem, see figure 1 below.

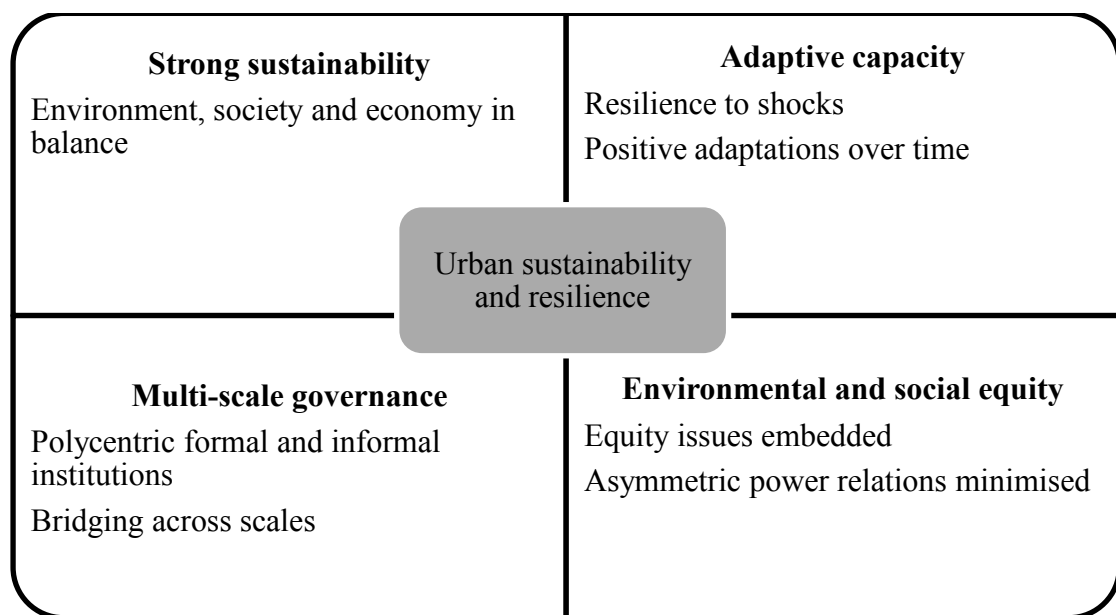


Figure 1 Urban sustainability and resilience

Based on the definitions of urban sustainability and resilience outlined in figure 1 above, our research question is this: how helpful is an adaptive governance lens in exploring transition strategies to achieve urban sustainability and resilience? In the next section we critically analyse adaptive governance and propose a conceptual deepening of its framing of institutions through blending adaptive governance with institutional theory concepts, in order to strengthen its engagement with environmental and social equity and asymmetric power

relations. We then explore this framework as a lens to analyse urban resilience and sustainability strategies in the Rome Metropolitan Area, Italy to start to understand how this conceptual blending adds depth to analysing processes for transitioning to urban resilience and sustainability.

3. Conceptual framework

In this section we explore the emerging theory of **adaptive governance** in terms of facilitating the vision and transition strategies to build urban resilience and foster sustainability at a local level, where adaptive governance is the bundle of formal and informal institutions and individuals who collectively come together across different scales (such as spatial and governmental) to envision collaborative sustainable and resilient environmental outcomes (Folke 2007). Adaptive governance has developed in relation to natural resource management and focuses on interactions between communities and local resources from a **social-ecological-systems perspective**. Evolving from common property theory (Berkes 1989, Ostrom 1990), it has helped clarify the role of communities and human actors in ecosystem management. Adaptive governance systems have been found to self-organize as social networks and connect individuals, organizations, agencies and institutions at multiple organisational levels (Folke 2007). Also explicit within adaptive governance is the concept of **polycentric institutions**, where multiple governance units exist at multiple scales, with each unit having some self-governing capacity appropriate to its scale (Ostrom 2010). It is this institutional foundation of adaptive governance that we are particularly interested in exploring further, together with related themes that have informed the evolution of adaptive governance thinking: social-ecological systems and resilience.

Increasingly, within the literature on adaptive governance, there is acknowledgement of the wider applicability of adaptive governance principles beyond the natural resource sphere and its applicability in a wider socio-ecological context. For example, Brunner (2010a) examines adaptive governance with regard to climate change. Brunner also develops adaptive governance as an explicit reform strategy that can apply beyond the social-ecological context, looking at healthcare policy, international aid and even national security (Brunner 2010b). Cooney and Lang (2007), meanwhile, take an adaptive governance approach to analyse the World Trade Organisation and its treatment towards national measures to prevent the spread of invasive alien species. They find the WTO wanting in regard to responding to uncertainty when analysed through the adaptive governance lens. Folke et al (2005) and Birkmann et al (2010) outline their interpretations of emerging governance discourses in relation to the environment and urban planning systems. The former refer to nested, polycentric institutional arrangements involving multi-scale actors with quasi-autonomous decision-making capacity, finding a balance between decentralised and centralised control. The latter describe urban governance discourse as evolving to refer to non-formal and non-governmental action, whereby governance is distinct to government. Both these approaches echo the early conceptualisation of polycentric institutions in relation to metropolitan government, as proposed by Ostrom et al (1961) who contend that these smaller institutions within an urban system can in some cases deliver more effective public goods services at local levels compared to a larger authority ('gargantua'), and that this is often related to their ability to be responsive to the wishes of local citizens rather than a more remote authority.

Institutional entrepreneurship has been identified as an important element for successful adaptive governance because of the often complex network of actors and

institutions that constitute change agents within social-ecological systems (Westley et al 2013). Institutional entrepreneurs are identified as important in relation to transformation associated with the adaptive cycle and spotting windows of opportunity in different phases associated with the shift to a new configuration of a social-ecological system, namely institutionalizing innovation, releasing resources for innovation and stimulating emerging innovations and partnerships (Westley et al 2013). Conversely, in mature social-ecological systems actors are likely to resist change, preferring to maintain a stable context and there would need to be disruption to existing institutions and / or resources to stimulate the desire and need for change (Embirayer and Mische 1998; Westley et al 2013). Institutional entrepreneurs can act as bridging organisations across scales, fostering co-operation and conflict resolution between different actors and thus enabling change (Kampelmann et al, 2015).

In an urban context, **social-ecological systems (SES) thinking** is increasingly being recognised as important, even if not common. According to Pickett et al (2013), cities and other urban ecosystems are jointly biological, social, built and geomorphic. Boyd and Folke (2012) argue that economic systems and social-ecological systems are deeply nested concepts, suggesting coherence with the concept of strong sustainability (Neumayer 2010). The relevance of this is illustrated through the empirical analysis we present below. This complex systems approach could be facilitated by polycentric institutions or there could be challenges regarding fit between institutions and systems (Folke et al 2007). The link between **resilience** and adaptive governance is explicit in the literature, with adaptive governance scholars asserting that ‘adaptive governance requires the capacity to learn to manage for resilience, and that any institutional arrangement that does not have this capacity is not appropriate for managing social-ecological systems’ (Garmestani and Benson 2013).

Adger proposes that social resilience mirrors ecological resilience and that this may be central to successful sustainable development programmes (Adger 2000, 2006).

It is suggested in the literature that polycentric institutions are well suited to managing for resilience, because they can enable the flow of local social and ecological knowledge and facilitate linkages between scales because they have diverse information flow capabilities (Ostrom 2010; Garmestani and Benson 2013). From an institutional perspective, Anderies et al (2004) propose a framework for analysing robustness of institutions, rather than their resilience, arguing this is a more useful term when considering the design of institutional arrangements to manage a system. Boyd and Folke (2012) refer to adapting institutions as: ‘the capacity of people, from local groups and private actors, to the state, to international organisations, to deal with complexity, uncertainty and the interplay between gradual and rapid change’ (Boyd and Folke 2012, p.3)

However, Boyd (2012) examines gaps, barriers and limitations of the resilience approach to evaluating the success of adapting institutions in terms of how to determine the efficiency and equity of outcomes and how to tackle complex, multi-layered challenges such as climate change in practice. Crucially, she touches on a significant gap in current resilience-based thinking on social-ecological systems: ‘resilience thinking fails to consider how power and fairness influence outcomes, however important they might be to institutional resilience’ (Boyd 2012, p.260). Thus, whilst adaptive governance has resonance in relation to the urban challenges of embedding social-ecological-systems thinking, the complex relationships between polycentric institutions and multiple scales and resilience, it has a limitation in terms of addressing issues of environmentally and socially equitable outcomes.

In considering ways to embed social and environmental equity into visions of urban sustainability and resilience (Harvey 2009; Boone 2010; Bulkeley 2013), we suggest that

strengthening the institutional aspects of the adaptive governance framework could help analyse some of these more political dimensions. The rest of this section outlines key concepts developed within institutional theory that we propose could strengthen the institutional underpinning within adaptive governance.

Within political economy, institutional theory has developed explicitly to give insights into the complex processes, incentives and constraints that shape the formation and evolution of institutions, where institutions are the formal rules and informal norms that influence human behaviour. Scholars have broadened the scope of institutional theory beyond market settings and economic development to consider politics and ideology. For example, Bates (1989) argues that public policies do not evolve due to objective decision-making by government in pursuit of optimal efficiency, but rather as a result of the struggle between competing interests.

By focusing on the political nature of institutions, scholars are able to study institutional choice and change as a result of asymmetries in power and **distributional conflict**. The relative **bargaining power** of the parties and competing interest groups (whether individuals or organisations) influences the distributive outcomes, with potential losers having the incentive to impede change, whilst potential winners have the incentive to support and facilitate change (Libecap 1989; Knight 1993). Bargaining power is based on factors such as financial and other resources (for example, technological) that can be used to influence outcomes, the knowledge base of the bargaining parties and their links to those with political power. North (1990, p.16) describes the influence of bargaining power on institutions thus: 'Institutions are not necessarily or even usually created to be socially efficient; rather they, or at least the formal rules, are created to serve the interests of those with the bargaining power to devise new rules' and argues that the bargaining strength of individuals and organisations is fundamental to whether changes occur or not: 'only when it

is in the interest of those with sufficient bargaining strength to alter the formal rules will there be major changes in the formal institutional framework' (North 1990, p.68). Libecap (1989) argues that vested interests in the status quo will resist changes to the institutional framework that they perceive would make them worse off economically or politically.

The role of **ideology** as a factor in institutional choice and change has been identified as a significant one. Ideology is variously described by institutionalist scholars as the subjective models that individuals have to explain the world around them, which are often based on incomplete or erroneous information (North 1990) and as the values and beliefs that determine people's goals and shape their choices, which can involve altruism as well as self-interest (Ensminger 1996). North states that such ideologies exist at the micro level of individual relationships as well as at the macro level of organisational ideologies, and that these theories are influenced by individuals' normative views of how the world should be organized. Any decision-making is thus influenced by the subjective beliefs and motives of the actors and therefore actors' perceptions matter (North 1990, p. 137). Ensminger defines ideology as 'the values and beliefs that determine people's goals and shape their choices' (1996, p.5) and that it is ideology that shapes people's notions of fairness and justice, including the proper distribution of benefits within the society. Where institutions and actors have differing ideologies, conflicts often arise.

A final factor identified as significant by institutional theorists which is worth considering within the analytical framework is the role of history, in particular the concept of **path dependence**. This is defined as the constraints placed on future behaviour by the existing institutional and ideological structures in a society (Ensminger 1993). Whilst North (1990) stresses that path dependence does not mean that the future is pre-determined by the past, and that there are always a number of choices along the path of institutional evolution, nonetheless he proposes that the 'cultural inheritance' of a society can influence the ability of

bargaining parties to effect institutional change. Libecap sees path dependence as a limiting factor to the range of possible institutional solutions. He argues that, although the nature of the constraints posed by history depend on the case in question, in order to understand the process of institutional change one has to take account of the 'prevailing distributional norms, past political agreements, the precedents they foster, and the vested interests they create' (Libecap 1989, p.116). However, an analysis of historical processes can also help illuminate factors that influence institutional change. For example, changing ideologies and changing power relations between actors over time can all influence institutional choice and change. They can create a facilitative environment for new institutional approaches, enabling modifications to existing arrangements (MacKinnon et al 2009).

Whilst institutional theory is not the only theoretical approach that enables an analysis of power relations and equity (see, for example, Bryant and Bailey 1997 and Forsyth 2003 for a political ecology approach), it provides a good 'fit' for adaptive governance because of the latter's focus on institutions. Figure 2 outlines a refined framework that blends concepts as a lens for exploring urban sustainability and resilience strategies.

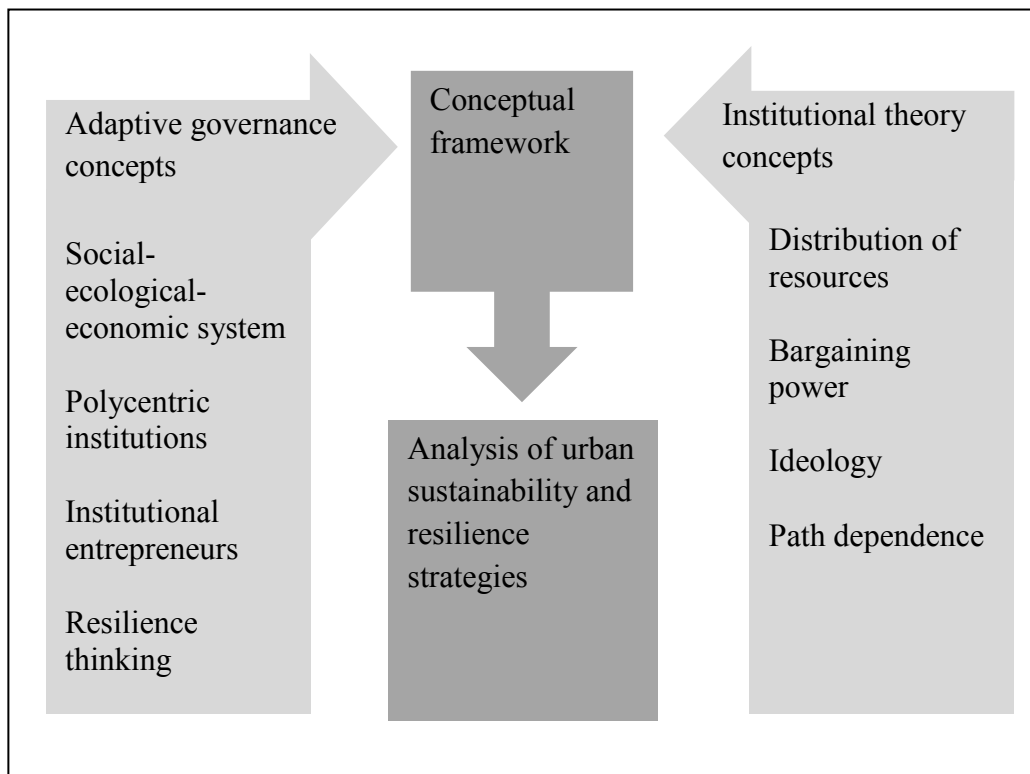


Figure 2 Conceptual Framework

In summary, adaptive governance embeds social-ecological systems thinking and provides a framework for understanding governance as bundles of locally appropriate institutions and multi-scale networks that are resilient through adapting positively to shocks. To address a gap in the adaptive governance literature regarding equitable outcomes, we suggest that concepts from institutional theory provide scope to explore power relations and environmental and social equity through a more politically nuanced analysis.

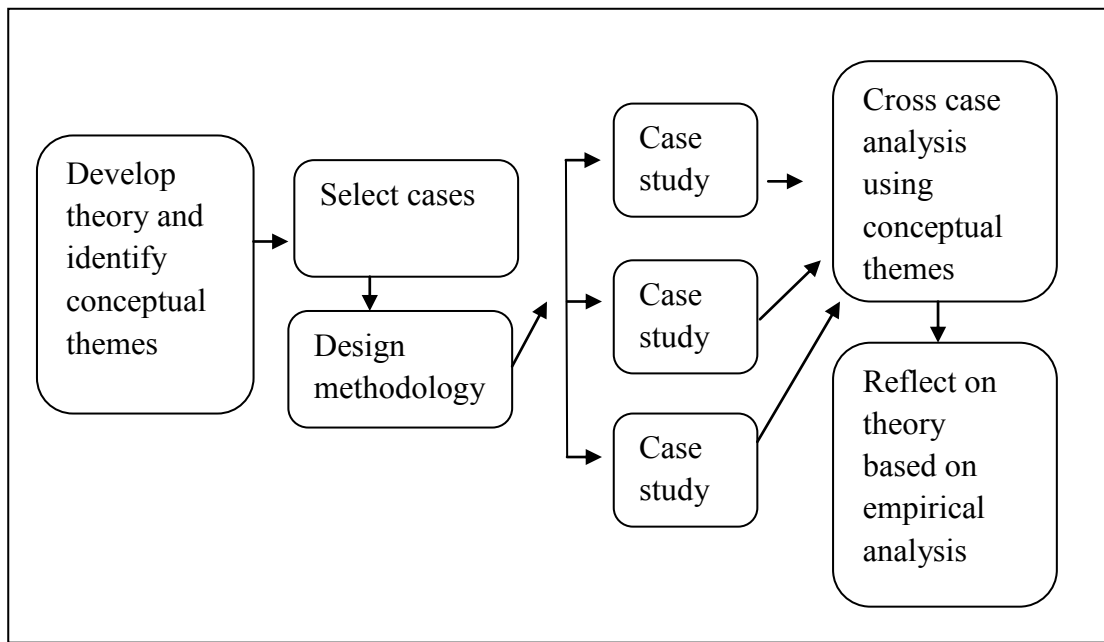
4. Methodology

We use the conceptual framework developed above as an orienting framework and explore it in the context of the empirical research, analysing urban sustainability and

resilience strategies in the Rome Metropolitan Area, Italy. Combining theoretical concepts in this way has been explored by Krellenberg et al (2014) in their research on supporting local adaptation; they combined concepts of urban fragmentation and vulnerability in order to understand how context-specific and overarching responses to climate change and urbanisation can be developed.

Empirical research, and particularly case study research, has been a core part of the evolution of adaptive governance, which has developed from empirical research in the sphere of natural resource management such as water use (Pahl-Wostl and Kranz 2010) and community forestry (Carvalho-Ribeiro et al 2010). In terms of resilience thinking and the institutional analysis that underpins adaptive governance, Boyd and Folke (2012) note the importance of understanding real world responses: ‘Insights are required that are based on empirical observations of the features of the institutional responses to sudden and slow-onset shock at local, national, regional and global levels’ (Boyd and Folke 2012, p.2). The usefulness of case studies has been noted in relation to new approaches to urban planning (Sevenant and Antrop 2010), and the context-dependent knowledge generated through case study research is argued to be a key contribution to advancing understanding of processes and actors that more generalised research often misses (Flyvbjerg 2006).

The refined conceptual framework of adaptive governance and institutional theory informs the data analysis. The data is then used to reflect back on the conceptual framework with a view to identifying emerging strengths and weaknesses and areas for future research. This follows the methodology outlined by Yin (2009), see figure 3 below.



Source: adapted from Yin (2009)

Figure 3 Methodology

The cases are two peri-urban agriculture initiatives and one cultural initiative within the Rome Metropolitan Area, Italy. These initiatives were purposefully selected as useful research subjects because: each of their visions has been framed by the actors themselves explicitly to develop local resilience in response to the economic crisis and austerity measures and to do so within social, economic and environmental parameters; they aim to do this through multiple actor engagement and the development of a network of formal and informal institutions who they identify as being necessary to the realisation of the vision; the initiatives are geographically bounded yet relate to complex connections between a city and its surrounding areas in terms of land and governance, thus requiring a multi-scalar approach (Neuman 2007). In order to explore the processes, relationships and motivations of relevant actors in developing these strategies, qualitative interviews were conducted with 15 actors representing a range of interests from the public and private sectors at both regional and local levels. The private sector interviewees were all entrepreneurial small enterprise owners; the

public sector interviewees were both senior elected officials (at the local municipal level), senior officers (at regional and local levels) and academics (at regional level). Interviews were conducted in Rome, Bracciano, Manziana and Viterbo. The interview analysis is supplemented by data gathered from the regional development agency ('institutional entrepreneurs' – see below) over several months through observation of their participation in workshops and through analysis of project documentation.

The aim of the interviews was to gain a deeper understanding of the strategies and how they are evolving in the local and regional context by a range of actors, representing formal and informal institutions and governance processes. The interviewees were particularly interested to hear the interviewees' perceptions of opportunities and challenges in relation to the strategies. Interviews were qualitative and the conceptual framework provided a lens to guide both questions and analysis. Of particular interest to the interviewees was identifying whether interviewees discussed the projects in terms of a social-ecological vision and resilience; how they viewed resource allocations and any conflicts, particularly physical assets and finance; and their perceptions of the roles and relations of the formal and informal institutions involved.

5. Empirical analysis

Our three cases are in the Rome Metropolitan Area (RMA), which is within the Lazio Region of Italy. RMA encompasses 121 communes (*comuni*) including the city of Rome (*Roma Capitale*). The city of Rome is itself divided into 15 municipalities (*municipi*). Our cases are based in two of the communes of the metropolitan area (Bracciano and Manziana) and in one of the municipalities of the capital (XIV Municipality). The cases involve

strategies to build local social and economic resilience and develop sustainable entrepreneurial activities. The strategies have emerged from a programme of work developed by BIC Lazio, the regional business innovation agency for the Lazio Region. Being a public agency, BIC Lazio relies on Lazio regional government funding and EU structural and research funds. The programme has actively sought to sustainably renovate locally significant former industrial buildings and sustainably develop under-used land through cultural and agricultural small business development. The main focus of this research is the projects to establish sustainable sub-regional food networks in Bracciano and XIV Municipality, and the sustainable redevelopment of a former sulphur factory in Manziana. Bracciano is a town situated 30km north west of Rome and, directly connected by rail to Rome City, is increasingly becoming a commuter town for young professional families. Manziana is a small urban settlement bordering Bracciano, located about 40 km north west of Rome city. The XIV Municipality is within the boundary of the City of Rome, and lies to the north west of the city centre.

The I-Agri project is part of a continuum of projects that began in 1999 to facilitate innovative small business activities in the Bracciano area of Lazio Region. This has been funded by various European Commission funding streams, including rural development funds (LEADER +) and latterly research funds (Framework Programme Seven). Under the EU LEADER + programme, a network of innovative small businesses mainly in the food and culture sectors was established under the banner of GAL '*Tuscia Romana*'. This network has provided the basis for the I-Agri project, which aims to provide 60ha of under-used agricultural land in the Bracciano area in 3ha plots to small, innovative businesses for sustainable agricultural growing and production, with physical incubator space also being available for value-added processing. The aims of the project were specified in the call for applicants, where priority has been given to enterprises in the field of organic / biodynamic

agriculture that wish to promote diversification through short production and supply chains (short circuit economy); use of species and autochthonous varieties that have a high risk of genetic erosion; regionally typical and traditional products of the Lazio region; testing of innovative techniques; models of social farming.

From this programme a complementary project has been identified in the XIV Municipality of Rome City, where almost 400 hectares of land have been designated by the local municipality as a '*parco agricolo*' – a protected agricultural area. Of the total area, half is in municipality ownership and half is in private ownership – but the whole can only be used for agricultural purposes. Currently, the land is under-utilised, with only about 60 ha of the municipal-owned land being actively farmed as an agricultural co-operative. The municipality wants to develop a sustainability and resilience strategy for the land that adapts the I-Agri Bracciano project approach by encouraging local entrepreneurial ecological food production that can primarily serve the densely populated local neighbourhoods that include three local food markets. They are embarking on a collaborative planning process with local and regional actors to establish a shared vision for the site based on strong sustainability principles, plus the involvement of international mentors to act as facilitators and guides to the visioning process.

The **Manziana** project has received European LIFE + funding to decontaminate a former sulphur factory and land (*solfatera*), so it can be redeveloped as a cultural and creative hub. Although at an early stage of visioning, emergent themes shaping the project are culture, especially cinematic and film projects, and regional food production and processing. Early visioning work was undertaken through an 'Experience Lab' methodology which involved collaborative and creative storytelling through a facilitated 'walking workshop' with local actors to vision potential uses. This experimental approach used the former industrial area as a case study for developing a methodology to identify the specific development opportunities

of the local area and linking them with the strategic capacities of local stakeholders. The aim was to enable strategic actors at different levels to support local actors develop a local plan that could build resilience and sustainable activities in response to the economic crisis that started in 2008. The vision seeks to create a balanced relation between environment, technology and society; and facilitate sustainable development while respecting the needs and expectations of the local community.

The three projects share some key characteristics of interest. In each case, local and regional actors in both the public and private sectors have expressed a shared vision in supporting the development of local, resilient economic activities that benefit the local communities and respect the local environmental assets. In each case, there are multi-scalar institutions that will be needed to bring the visions to fruition. In each case, the economic crisis of 2008, and subsequent austerity measures, is cited by local actors interviewed as both opportunity and rationale for developing these local development models. Interviewees in the public and private sectors consistently described how the location of Rome within Lazio has an enormous influence to shape surrounding areas' development, including through real estate development both within the city of Rome boundaries and in surrounding towns of the Metropolitan Area, which are increasingly becoming dominated by commuters. The construction industry is very powerful, and this pressure has seen loopholes being exploited for residential development even in areas that are not zoned for this use. Interviewees described how the economic crisis meant that the pressure for real estate development has greatly reduced, which gives breathing space for local institutions to vision alternative development models. In addition, interviewees articulated the cultural values attached to regional food specialities and the unique character of the Lazio region products.

In the following paragraphs we explore how the conceptual framework developed in the previous section could be a useful lens for analysing the development of these three urban sustainability and resilience strategies. We discuss interviewee responses in relation to each of the themes identified from the adaptive governance and institutional theory literature outlined in section 3 above, exploring how they can help in understanding not only the processes and motivations in developing the strategies but also some of the challenges and barriers.

The concept of **integrated social ecological systems** (Folke 2005, Boyd and Folke 2012) seems to resonate with the actors interviewed and seems to be embedded in project development documents. Whilst objectives for each of the three projects were described by interviewees primarily in terms of local economic and social benefits, activities were expressed in ecological language. In Bracciano, the I-Agri project has been framed within the context of supporting small entrepreneurial businesses, developing innovative local employment opportunities through ecological agricultural production and zero kilometre local supply chains. In the XIV Municipality, the project objectives were expressed as ecological agricultural activities, local food supply chains through neighbouring markets, providing economic opportunities in agriculture for local young people and continuing with the social agriculture approach already established through the existing social co-operative on site. For the Manziana project, it was expressed as sustainable renovation of a former industrial site for post-industrial uses, primarily cultural and creative, but with local businesses identifying the complementary role that local food producers and processors play in the broader cultural offer of the area.

Interviewees articulated connections between the ecological and social, particularly in relation to the local place and tradition of regional farming, with interviewees for each of the three projects specifically referring (unprompted) to the regional food specialities that are

best in the Lazio region compared to other parts of Italy. However, there was also a strong sense of innovation expressed by the enterprises especially, with regard to new sustainable techniques and methods and in terms of social innovation regarding involvement of local people through social agriculture. Younger people were especially identified as being a target to attract to these new enterprises, as a way of renewing and reinvigorating local communities' relationships with the land. The 'Zero Kilometre' and organic principles² were referred to by most interviewees and seen as an aspirational guide to production, distribution and consumption goals. However, in the Bracciano case, some of the private partners were keen to develop high value, niche products that would find international and national markets as well as local and regional markets, thus undermining the local short supply chain aspirations.

All three projects contend with **polycentric institutions** that operate at multiple governance and spatial scales, as elaborated by Ostrom (2010). For Bracciano and Manziana, the local municipality is not the only formal local institution with jurisdiction over the land, with local *agraria universita* in each case being the custodian for public lands for civic use. In addition, the regional government has responsibility for agricultural development and associated structural funds. The key institutional actor in the three projects is the regional business innovation agency, BIC Lazio, headquartered in Rome. They have local semi-autonomous innovation hubs working with local enterprises, one of which is located in Bracciano. The personnel therefore have strong connections at both regional and local scale with public and private partners and this multi-scalar institutional dimension (Neuman 2007) appears to have been significant in ensuring the buy-in of these multiple formal and informal institutions. This also resonates with the analysis of Ostrom et al (1961) that the provision of

² Zero Kilometre' is the aspirational name for short local food supply chains

urban public services and goods can be more responsive to local needs within a polycentric urban governance system.

Furthermore, an interesting aspect of the Bracciano and Manziana cases is the complexity of spatial as well as governance scales. The regional business innovation agency has successfully harnessed local municipalities and businesses to self-identify with the '*Tuscia Romana*' informal area, which covers 13 municipalities in the central Lazio region, between Rome city and Viterbo in the north of the region. The *Tuscia Romana* network of local small businesses that was established under the EU LEADER +- funded GAL programme still functions beyond the life of the programme as an informal institution and provides a loose co-operative umbrella for collaborative private sector alliances, with its own online presence. This revival of *Tuscia Romana* as a cultural 'place' rooted in Etruscan history has been both a marketing strategy and, in talking to both business and public sector interviewees, it seems to resonate with their identification with the local area that in actuality is not bounded by administrative divisions. Possible tensions were indicated from our public sector interviewees, with some being more open to acknowledge the capacities of the private sector actors and institutions whereas others focused on their own role as decision makers.

Whilst more research would be needed on this, our initial research suggests that Ostrom's (2010) description of 'nested' institutions, whilst helpful in understanding the multiple levels of negotiation and decision-making that is required to be harnessed in these three programmes, is not without challenges for some participants in terms of sharing decision-making. This also suggests that polycentric institutions are not without equity issues, nor problems associated with asymmetric power relations. Nonetheless, the concept of polycentric institutional arrangements involving multi-scale actors seems to be a useful lens to understand complex urban governance processes in these cases (Ostrom et al 1961; Folke et al 2005, Boyd and Folke 2012).

The central role that BIC Lazio has played in the development of each of these three projects suggests that they act as **institutional entrepreneurs** (Westley et al 2013) in each of the cases. The role of institutional entrepreneurship in the successful evolution of the Bracciano sustainable local food network project, and in leveraging the required buy-in of the key local and regional actors at public and private levels, appears to be significant. In particular, two key personnel for BIC Lazio have been the driving force from both a governance and a social-ecological perspective in terms of establishing the vision for the local sustainable food network, persuading local and other regional public authorities to participate, recruiting businesses and entrepreneurs, engaging potential regional financiers (both in terms of providing land and regional banks for providing preferential business loans) and successfully attracting EU project funding. These two personnel are embedded in the local community in which they are based, being well-known and respected and having personal stakes in the life of the community. In their professional capacity they are embedded in the regional agency and therefore also have capacity to influence at the regional level.

As a direct result of the success achieved by BIC Lazio in developing the vision for the agricultural incubator in Bracciano, they have been asked to help develop a similar vision for the XIV Municipality in Rome. Whilst the XIV Municipality is leading this project, BIC Lazio are using their institutional entrepreneurship to facilitate its development, leveraging EU-funded projects to transfer knowledge and organise local actor engagement workshops. In Manziana, BIC Lazio are exploring innovative ways to engage local actors to create a vision for the former industrial site and co-ordinating regional and EU funds to support the development of the initiative at the local scale. They have played a bridging role (Kampelmann et al, 2015) between regional and local spheres and public and private actors and this has helped overcome potential conflicts and fostered co-operation. BIC Lazio have

identified windows of opportunity for change (Embirayer and Mische 1998, Westley et al 2013), and attempted to harness those opportunities at both local and regional levels.

The language of local **economic and social resilience** within environmental parameters was clearly expressed by interviewees of all three projects. For the public sector and elected interviewees, the projects were seen as a more sustainable and locally beneficial development path than residential development, which had been a dominant force prior to the economic crisis of 2008. Indeed, the economic crisis was seen as an opportunity to develop more sustainable alternatives to real estate, because the pressure for residential development had lessened, and to create sustainable jobs and business opportunities to help alleviate the unemployment which had risen sharply as a result of the recession, especially amongst younger people. This resonates very well with the adaptive governance concepts expressed of resilience and adaptation in the face of shocks (Folke et al 2007). Knowledge of new systems and new ways of approaching food production was expressed by the enterprises we interviewed as crucial to the projects' success. All of the interviewees were clear this represented a 'new, resilient way of doing things'. This resonates with Garmestani and Benson's (2013) articulation of the capacity to learn as being a fundamental requirement of institutional capacity to manage for resilience.

The preceding paragraphs indicate that there appears to be resonance between adaptive governance concepts and our empirical analysis in relation to two of the urban challenges outlined in section 2 above: firstly, conceiving of a social-ecological-system in a local place; and, secondly, institutional complexity of dealing with multiple spatial and governance scales. However, these adaptive governance concepts seem less useful for analysing some of the challenges that interviewees articulated. In developing our analytical framework we suggested that the institutional elements of adaptive governance theory could be strengthened through an explicit engagement with institutional theory. We proposed that,

by analysing institutional factors that can act as barriers or facilitators to change, a gap in adaptive governance theory could begin to be addressed namely addressing social and environmental equity and asymmetric power relations. In the following paragraphs we analyse the empirical data through the lens of these institutional concepts to explore how helpful they might be in addressing *inter alia* complex equity issues. We approach these concepts as potential facilitators as well as barriers to change, as developed by MacKinnon et al. (2009).

Institutional theory offers insights into how **distribution of resources and bargaining power** influence policies and the equitable nature of outcomes (Knight 1993, Libecap 1989). Distribution of resources, particularly with regard to the allocation of land and access to finance, can be identified as both opportunities and barriers for our cases. In terms of the private sector, there are a number of entrepreneurial businesses who are actively seeking to develop a regionally innovative food network, and young people who are keen to enter the sustainable food sector. However, private property institutions can act as barriers to this, with interviewees identifying very low turnover of farming lands and traditional farmers being resistant to new ideas and practices. Whilst the availability of under-utilised publicly owned land and buildings in the three project areas is a key opportunity and therefore facilitator to change, there are political and bureaucratic hurdles to be overcome to enable these lands to be used in new ways. Another key challenge is finding the institutions at local, regional, national or international scale who might release funding for development of the land and regeneration of the former industrial site. Lack of funding seems to be inhibiting development beyond the visioning stage.

The conflict of interest between, on the one hand, the commercial residential development of peri-urban land around Rome and the development of local sustainable agriculture on the other hand will probably remain an ongoing tension. This conflict could,

for instance, hamper investments in the agricultural infrastructure of the land (for example, access roads, construction of water management or storage facilities, commercial space for farm shops) or render the extension of the cultivated area too expensive in the face of mounting real-estate pressures. Moreover, the small-scale farming practiced in the agricultural incubators will have to find strategies to overcome the enormous bargaining power of conventional food retailers and the price competition of highly subsidized conventional agriculture in general. A common strategy for small-scale farming of this type is to convince customers that local products are worth more than conventional, non-local products and can therefore be sold at higher prices. But such a high added-value strategy also creates winners and losers, as relatively poor households may not be able to afford the products— in which case the subsidies invested in its creation would mainly benefit the more affluent inhabitants of the area. It is also the case that, whilst they are instrumental as institutional entrepreneurs, BIC Lazio has limited bargaining power in terms of some of the key aspects of the three initiatives. So in terms of land allocation, they can influence but cannot make decisions on changes of use to the lands held by the *universita agraria*. As a regional public body they use their expertise to lever EU funding to projects, which brings a certain influence, but they also have to engage a range of public and private actors in regard to delivering projects on the ground. This is the case for the Bracciano and Manziana projects whilst the XIV Municipality project may be easier to implement because bargaining power rests with the municipality itself and there are fewer institutional actors needed to deliver the vision. Conversely, where decision-making is more dispersed, working to develop a shared vision and ideology can bring actors together and thus increase their bargaining power (Libecap 1989), and our interviews and observations suggest that this has been evident in Bracciano. Our analysis suggests that, whilst polycentric institutions may increase responsiveness to local needs within an urban system, they do not necessarily lead to more

equitable outcomes. An analysis of asymmetric power relations between polycentric institutions would seem to be an important aspect of developing an urban transition strategy that does embed environmental and social equity.

As explored in section 3, **ideology** is a key influence on outcomes. It is ideology that shapes people's notions of fairness and justice, including the proper distribution of benefits within the society (Ensminger 1993). The role of ideology is a key consideration in the three cases. They are reliant on a shared, coherent vision of local sustainability and resilience that encourages the development of innovative alternative local development models. However, although currently there seems to be a shared vision, it is not considered a given that this will remain. Some interviewees expressed concerns that politicians who currently support these alternative economic development models to residential development in the light of the 2008 economic crisis could change again if economic conditions changed or elections resulted in regime change. As North (1990) describes it, decision-making is influenced by the subjective beliefs and motives of the actors, so changing beliefs and motives of those with greater bargaining power could undermine these projects at future stages.

Another ideological dimension to the cases is indicated by our perception that the actors interviewed in the agricultural initiatives display a normative preference for everything 'local' or 'regional', often combined with an implicit opposition to the 'non-local' that is regarded as less desirable. Whilst an ideology centred around local identity might be conducive to foster 'local products' or 'local jobs', it can also be a barrier for institutional change. For example, despite its apparent self-explanatory reference to a geographical location, it might be less evident what 'local' actually means in the context of the agricultural projects' day-to-day operations. Interviewees who championed local were vague when asked to describe the geographic sphere, although 'Zero Kilometre' and 'Short Circuit' were terms used by most interviewees to describe their intent. Some (but not all) of the enterprises

expressed aspirations for finding export markets for high value produce, which is not within the vision of the zero kilometre locally-sourced food network. The governance framework of the initiatives will have to address such issues in order to provide a coherent ideological underpinning that all actors can agree to.

Path dependence can be seen to play a positive role as well as act as a potential barrier to change in the case studies. As outlined in section 3 above, path dependence is the influence exerted by prevailing norms that can make change difficult or influence direction (Libecap 1989, North 1990). However, MacKinnon et al (2009) also discuss the positive aspects of path dependence. The agricultural incubator in Bracciano sets out to benefit from regional assets that are historically important, including traditional varieties of fruits and vegetables as well as the area's rich gastronomic heritage. In Manziana there is a proposition to use the region's historic links to the film industry to base the cultural regeneration project around a cinema, a film archive and film studio space for creative businesses, as well as linking with the regional food networks. However, in these two cases, regional lands held by the local public institutions *Universita agraria* would require a broader interpretation of civic use beyond traditional grazing rights or subsistence gathering. For the XIV Municipality, the *parco agricolo* is already established so they want to build on this existing designation by providing opportunities for innovative farming and short circuit food supply on their own lands, but also influence the private land owners on the park.

6. Discussion

Through our analysis of adaptive governance in relation to urban resilience and sustainability strategies in the Rome Metropolitan Area we are contributing to the growing literature that engages with adaptive governance theory beyond its original scope of natural

resource management. In exploring how helpful an adaptive governance lens is in exploring transition strategies to achieve urban sustainability and resilience, we have proposed a strengthening of the institutional elements of adaptive governance through blending with institutional theory.

We have clarified three challenges for urban resilience and sustainability strategies: bringing together multiple scales and institutions; facilitating a social-ecological-systems approach and; embedding social and environmental equity into visions of urban sustainability and resilience. Our initial findings indicate that the adaptive governance literature resonates in relation to the first two of these urban challenges: considering the central role of polycentric and entrepreneurial institutions and social-ecological systems. An acknowledged gap in adaptive governance literature is the third challenge of embedding social and environmental equity (Boyd and Folke 2012). By explicitly considering some of the more political aspects of institutions through blending with institutional theory, we suggest that adaptive governance could engage with issues of power asymmetries and social and environmental equity in addition to its strengths in understanding social-ecological-systems and resilience. Our exploratory research suggests that this approach could contribute to addressing a gap in adaptive governance literature in relation to equitable outcomes by engaging with how institutions themselves can create barriers to change and adaptation. Figure 4 illustrates the relationships between these concepts that our exploratory empirical research suggests are present in the three case studies. These relationships would need to be further investigated theoretically and empirically to investigate further how the institutional concepts act as facilitators or barriers to institutional choice and change (MacKinnon et al 2009).

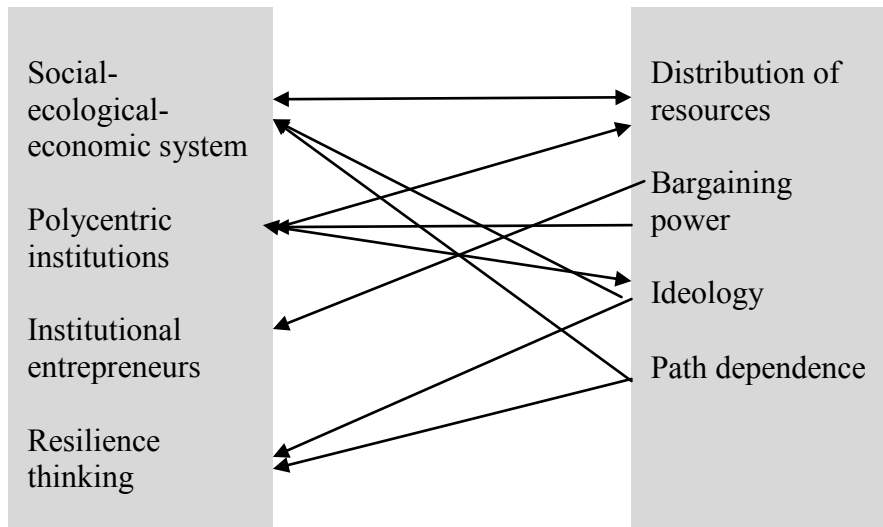


Figure 4 Emerging linkages between adaptive governance and institutional theory

By considering institutional challenges and barriers, it could be possible for the multiple institutions involved in conceiving and implementing sustainable and resilient urban transition strategies to incorporate concepts of environmental and social equity that have local resonance. It would appear from our research that this local resonance, and building of a shared ideology, is a critical phase in developing urban resilience and sustainability strategies at the local level. However, our research also suggests that local buy-in appears to be insufficient to overcome some of the institutional barriers that can be encountered with regard to distribution of resources, asymmetric power relations and path dependence. Thus more strategic actors at regional levels, or institutional entrepreneurs, can help identify appropriate processes to overcome institutional challenges.

Our research also suggests that understanding the different bargaining powers of institutions is a vital step towards creating appropriate governance structures where multiple scales and institutional robustness can be accommodated. Different ideologies amongst institutions can undermine transition strategies because, whilst project language may state sustainability and resilience goals, these terms can encompass different meanings to the different institutional actors. This supports the importance of ideology, where agreeing a shared vision at the outset of a transition strategy is an important step. Considering path dependence in institutions can help identify unintended or unwanted resiliencies and why they can be so persistent, as well as helping to imagine the steps needed to reach alternative directions. Our cases have shown evidence of this in relation to exploiting loopholes for real estate development and difficulties in changing land use.

Whilst other approaches can also address equity issues, such as political ecology (Bryant and Bailey 1997) or ecological Marxism (Swyngedouw 2014), we have identified institutional theory as being a good fit for adaptive governance, because of the shared understanding of institutions as informal as well as formal rules, norms and networks, and therefore moving beyond discourses that focus solely on formal government. However, the ‘fit’ between institutions and systems is an acknowledged area of tension (Folke et al 2007). Further research and theoretical development is needed to test these exploratory propositions. Nonetheless, our initial research suggests that strengthening the institutional foundations of adaptive governance by blending with institutional theory could help address acknowledged gaps in adaptive governance theory in relation to social and environmental equity and understanding the impacts of asymmetric power relations. In turn, this offers a framework for more politically nuanced urban sustainability and resilience strategies.

References

- Adger WN. 2000. Social and ecological resilience: are they related? *Progress in Human Geography*, 24, 347-364.
- Adger WN. 2006. Vulnerability. *Global Environmental Change*. 16:268-281.
- Ahern J. 2013. Urban landscape sustainability and resilience: the promise and challenges of
- Bahadur A, Tanner T. 2014. Transformational resilience thinking: putting people, power and politics at the heart of urban climate resilience. *Environment and Urbanization*. 26:200-214.
- Bates RH. 1989. *Beyond the miracle of the market: the political economy of agrarian development in Kenya*. Cambridge (UK): Cambridge University Press.
- Berkes F. 1989. *Common property resources: ecology of community-based sustainable development* / edited by Fikret Berkes. London: Belhaven.
- Birkmann J, Garschagen M, Kraas F, Quang N. 2010. Adaptive urban governance: New challenges for the second generation of urban adaptation strategies to climate change. *Sustainability Sci*. 5.5.185-206
- Boone G. 2010. Environmental justice, sustainability and vulnerability. *Int J of Urban Sustainable Dev*. 2.1-2:135-140.
- Boyd E. 2012. Adapting to global climate change: evaluating resilience in two networked policy institutions. In Boyd E, Folke C. eds 2012. *Adapting institutions: governance, complexity and social ecological resilience*. Cambridge (UK): Cambridge University Press
- Boyd E, Folke C. eds 2012. *Adapting institutions: governance, complexity and social ecological resilience*. Cambridge (UK): Cambridge University Press.
- Brunner RD. 2010. Adaptive governance as a reform strategy. *Policy sciences*. 43.4:301-341.
- Brunner RD, Lynch AH. 2010. *Adaptive Governance and Climate Change*. Boston (MA): American Meteorological Society.
- Bryant RL, Bailey S. 1997. *Third World political ecology*. London: Routledge.
- Bulkeley H. 2013. *Cities and Climate Change*. London: Routledge.
- Carvalho-Ribeiro SM, Lovett A, O'Riordan T. 2010. Multifunctional forest management in Northern Portugal: moving from scenarios to governance for sustainable development. *Land Use Policy*. 27:1111-1122.
- Cities Alliance. 2007. *Liveable Cities: The benefits of urban environmental planning*. Washington DC: Cities Alliance.

- Collier MJ, Nedović-Budić Z, Aerts J, Connop S, Foley D, Foley K, Newport D, McQuaid S, Slaev A, Verburg P. 2013. Transitioning to resilience and sustainability in urban communities. *Cities*, 32, Supplement 1:S21-S28.
- Cooney R, Lang A. 2007. Taking uncertainty seriously: Adaptive governance and International trade. *European J of Int Law*. 18.3:523-551.
- Cowell MM. 2013. Bounce back or move on: Regional resilience and economic development planning. *Cities*. 30:212–222
- Da Silva J, Kernaghan S, Luque A. 2012. A systems approach to meeting the challenges of urban climate change. *Int J of Urban Sustainable Dev*. 4.2:125-145
- Davoudi S. 2012. Resilience: A Bridging Concept or a Dead End? ‘Reframing’ Resilience: Challenges for Planning Theory and Practice. *Planning Theory and Practice*. 13.2:299-334.
- Emirbayer M, Mische A. 1998. What Is Agency? *American J of Sociology*.103.4:962-1023.
- Ensminger J. 1993. *Making a market : the institutional transformation of an African society*. Cambridge (UK): Cambridge University Press.
- Folke C. 2007. Social-ecological systems and adaptive governance of the commons. *Ecological Research*. 22:14-15.
- Folke C, Hahn T, Olsson P, Norberg J. 2005. Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources*. 30:441-474.
- Folke C, Pritchard L, Berkes F, Colding J, Swedin U. 2007. The problem of fit between ecosystems and institutions: ten years later. *Ecology and Society*. 12.1:32. [online] URL:<http://www.ecologyandsociety.org/vol12/iss1/art32/>
- Forsyth T. 2003. *Critical political ecology: the politics of environmental science*. London: Routledge.
- Flyvbjerg B. 2006. Five Misunderstandings About Case-Study Research. *Qualitative Inquiry* 12 (2), 219-245.
- Garmestani AS, Benson MH. 2013. A framework for resilience-based governance of social-ecological systems. *Ecology and Society*. 18.1:9. <http://dx.doi.org/10.5751/ES-05180-180109>
- Harvey D. 2009. *Social justice and the city*. Athens (GA): University of Georgia Press.
- Holling CS. 1986. The resilience of terrestrial ecosystems: local surprise and global change. In: Clark WC, Munn RE (eds.) *Sustainable development of the biosphere*. Cambridge (UK): Cambridge University Press.
- Kampelmann S, Vanhollebeke S, Vandergert P. 2015. *The Governance of Economic Resilience: 20 Years of Urban Adaptation Projects in Brussels*. DULBEA Working Paper, Research series, N°15-01.RS, February

- Knight J. 1993. *Institutions and social conflict*. Cambridge (UK): Cambridge University Press.
- Krellenberg K, Link F, Welz J, Harris J, Barth K, Irarrazaval F. 2014. Supporting local adaptation: The contribution of socio-environmental fragmentation to urban vulnerability. *Applied Geography* 55, 61-70
- Lancet. 2012. Shaping cities for health: a UCL/Lancet Commission. *The Lancet*. 379: 2079-2108.
- Libecap GD. 1989. *Contracting for property rights*. Cambridge (UK): Cambridge University Press.
- MacKinnon D, Cumbers A, Pike A, Birch K, McMaster R. 2009. Evolution in Economic Geography: Institutions, Political Economy and Adaptation. *Economic Geography* 85 (2), 129-150.
- Neuman M. 2007. Multi-scalar large institutional networks in regional planning, *Planning Theory and Practice* 8: 319–344.
- Neumayer E. 2010. *Weak versus strong sustainability: exploring the limits of two opposing paradigms*. Cheltenham: Edward Elgar.
- North DC. 1990. *Institutions, institutional change and economic performance*, Cambridge (UK): Cambridge University Press.
- Olsson P, Folke C, Berkes F. 2004. Adaptive comanagement for building resilience in social-ecological systems. *Environmental Management*. 34:75-90.
- Olsson P, Gunderson LH, Carpenter SR, Ryan P, Lebel L, Folke C, Holling CS. 2006. Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems. *Ecology and Society*. 11.1: 18. [online] [URL: http://www.ecologyandsociety.org/vol11/iss1/art18/](http://www.ecologyandsociety.org/vol11/iss1/art18/)
- Ostrom E. 1990. *Governing the commons: the evolution of institutions for collective action*. Cambridge (UK): Cambridge University Press.
- Ostrom E. 2010. Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change*. 20:550-557.
- Ostrom V, Tiebout CM, Warren R. 1961. The Organisation of government in metropolitan areas: a theoretical inquiry. *American Pol Sci Review* 55.4: 831–42.
- Pahl-Wostl C, Kranz N. 2010. Water governance in times of change. *Environmental Science & Policy*. 13: 567-570.
- Pickett STA, Boone CG, McGrath BP, Cadenasso ML, Childers DL, Ogden LA, McHale M, Grove JM. 2013. Ecological science and transformation to the sustainable city. *Cities* 32, Supplement 1, S10-S20.

- Price RK, Vojinovic Z. 2008. Urban flood disaster management. *Urban water*. 5.3: 259-276.
- Redclift MR. 1984. *Development and the environmental crisis : red or green alternatives?* London: Methuen.
- Redclift MR. 1987. *Sustainable development: exploring the contradictions*. London: Methuen.
- Rydin Y, Kendall Bush K. 2009. *Megalopolises and sustainability*. London: UCL Environment Institute Seminar Series Report.
- Sevenant M, Antrop M. 2010. Transdisciplinary landscape planning: does the public have aspirations? Experiences from a case study in Ghent (Flanders, Belgium). *Land Use Policy* 27, 373-386.
- Swyngedouw E. 2014. From Water Justice to Eco-political Equality: Politicizing Water', 'Viewpoints - Santa Cruz Declaration on the Global Water Crisis. *Water International* 39.2: 258-259.
- Termeer C, Dewulf A, Van Lieshout M. 2010. Disentangling scale approaches in governance research: comparing monocentric, multilevel and adaptive governance. *Ecology and Society*. 15.4: 29. [online] URL: <http://www.ecologyandsociety.org/vol15/iss4/art29/>
- Tyler S, Moench M. 2012. A framework for urban climate resilience. *Climate and Dev*. 4:311-326.
- Vandergert P, Sandland S, Newport D, Van Den Abeele P. 2013. Harnessing advances in eco-innovation to achieve resource efficient cities. In Bartolo H et al. (eds) *Green Design, Materials and Manufacturing Processes*. London: Taylor and Francis Group.
- Welsh M. 2014. Resilience and responsibility: Governing uncertainty in a complex world. *Geographical J*. 180.1: 15-26.
- Westley F R, Tjornbo O, Schultz L, Olsson P, Folke C, Crona B and Bodin Ö. 2013. A Theory of Transformative Agency in Linked Social-Ecological Systems. *Ecology and Society*. 18.3: 27.
<http://dx.doi.org/10.5751/ES-05072-180327>
- Wilkinson C. 2012. Social ecological resilience: Insights for planning theory. *Planning Theory*. 11.1:148-169
- Williams K. 2010. Sustainable cities: research and practice challenges. *Int J of Urban and Sustainable Dev*. 1.1-2:128-132.
- WCED. 1987. *Our common future*. Oxford: Oxford University Press.
- Ye Y, Okada N. 2001. Improving management of urban earthquake disaster risks. In Spencer BF, Hu YX (eds). *Earthquake engineering frontiers in the new millennium*. Lisse: Swets and Zeitlinger.

Yin RK. 2009. Case Study Research Design and Methods. Sage Publications.