Municipal Climate Governance and Formation of Local Transition Places

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Introduction

Local level climate action has evolved globally and plays an increasingly dynamic role in transition to a low carbon society. Municipalities in Denmark and in EU/worldwide have adopted climate policies and planning going beyond national and international obligations, and they are experimenting with new governance concepts directed towards the integration of citizens, enterprises and sector actors in long term transition processes.

Development of local low carbon societies represents a new generation of policymaking for municipalities requiring new forms for capacity building and governance. The local implementation of climate strategies demands multi-actor, multi-sector and multi-scalor governance; municipalities have to develop a capacity to stage changes in socio-technical systems of energy, mobility, housing, water management etc., systemic changes that involves a multiplicity of actors, sectors and levels of public-private interaction. The necessity of transition to a low-carbon society and adaptation to climate change puts pressure on existing socio-technical systems, and provides possibilities and openings for reconfiguration of local as well as national and global socio-technical systems.

Local municipalities have taken voluntary action developing different kinds of climate policies, action plans and projects, thus entering this local arena of reconfiguration of and experimentation in the socio-technical systems. Frontrunner municipalities experiment with innovative and pro-active governance forms in their efforts to create strategies for local transition. Local climate mitigation and adaptation projects and local socio-technical experimentation co-evolves with new forms of climate mitigation policies. Climate policies and programs in municipalities are developed for intentional transformation of local socio-technical systems, and local arenas for climate mitigation; they become transition places - places where a diversity of innovation and creativity evolves, based on specific local configurations of actors, material settings, institutions and technologies, enabling contextual learning processes for actors in the local as well as in the overall socio-technical systems.

In this way, the paper argues, municipalities have to develop climate governance oriented towards transition of socio-technical systems in order to fight climate change and strategically gain local benefits. As part of
this they become strategic actors, entering the local arenas of socio-technical transition and contributing to a shaping of local transition places towards a low-carbon economy.

The paper examines how municipalities develop new governance forms in climate policy as strategic actors in local transition processes and discusses how they in their pursue of local climate governance may contribute to over-all transition of the socio-technical systems. It is based on studies of climate mitigation policies and planning in Danish municipalities with a focus on their efforts to transform local combined housing and energy systems.

The paper starts off in the first part by introducing the theoretical framework for the studies as a dual perspective on local climate governance: on the one hand local climate governance is viewed as embedded in multilevel governance structures; on the other hand the local governance is discussed in view of its role in transition of socio-technical systems. In the second part, the paper examines potential roles and governance forms of municipalities, in general and in Denmark, in climate mitigation with a focus on the energy/housing complex. These issues are further examined by presenting cases of innovative governance forms and actor roles in climate efforts in Danish frontrunner municipalities (focus on socio-technical system of energy and housing). In conclusion, the paper discusses emerging local climate governance as local political projects, as development of new governance forms and structures, and as part of transition processes. It addresses the strategic role that municipality may take in contributing to local transition and the possible implications for general transition to low-carbon economies. And as part of this it calls for supporting policies from national or supranational levels.

Part I: Studies of Climate and local governance

Multi-level governance and emerging local climate governance

A growing number of municipalities and cities, in Europe and worldwide, are taking climate action (Corfee-Morlot et al 2009), and we witness development of new local forms of climate governance (Kern and Bulkeley 2006, Kern and Bulkeley 2009, Bulkeley 2010). It can be seen as an effect of the multi-level government and governance schemes, as they have developed within the regimes of UN and EU. But it can also be seen as a development of local agency and actors establishing local governance structures and being independent forces reconfiguring the existing multi-level governance structures (e.g. Bulkeley 2010:240). In both cases, the multilevel governance structure forms a framework for the ongoing development of local climate governance in municipalities and cities.

Multi-level governance, as a conceptual policy framework, replaces notions of hierarchical and national policy structures with a conception of an emerging multilevel structure (Kern 2010:2, Jänicke 2000). It identifies a movement of power and competences from the national level to super-national and local/regional

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(CIBS) http://www.climatebuildings.dk/
levels (the vertical dimension). It expands the notion of governance to include non-state forms of governance, such as public-private partnerships and networks (e.g. the principle of integrating the solution of environmental problems in the polluting sectors – the core idea of "ecological modernisation") (the horizontal dimension). It implies that processes of policy and building of capacities for acting are seen as dispersed on many levels and distributed among many actors (Kern 2010:2, Jänicke 2003).

Firstly, the multilevel governance model was adopted in the development of the Rio-model (the policy synthesis laid down in the Rio-declaration 1992). It stipulated a multi-level, multi-sector and multi-stakeholder governance model; a deliberate governance approach intended to grasp with the complexity of sustainable development, both in term of complex systemic linkages and multitude of actors involved (Jänicke 2003:1). Main elements in the program were a combined use of long term goals, time-frames, monitoring and assessment (management by objective), integration of sectors in the work of sustainability (development of sectoral strategies), participation of stakeholders, pursuit of programs of co-operation and activated self-regulation, and multi-level co-ordination. On a general level it stipulated a voluntary process of policy innovation, lesson-drawing and policy diffusion (Jänicke 2003).

The model can be seen as an experiment with a new regulatory paradigm in its attempt to integrate active stakeholder involvement in designing and implementation, combining market based approaches and capacity building, in the shaping of a new interplay of supranational, national and sub national entities, and in the intention to spur the involvement of non-government actors – public-private partnership and involvement of NGO and citizens - to encourage and facilitate bottom up processes (e.g. Local agenda 21).

In this respect local (climate) governance is an integrated part of the established policy schemes of sustainable development (including climate mitigation and adaption policy schemes) in the Rio-model. The emerging local climate governance can be seen on the one hand as a new policy field highly dependent on capacities and experiences achieved as part of earlier efforts to implement the Rio-model - in particular, experiences achieved as part of Agenda 21 activities (Holm 2010), on the other hand it can be seen as a response to failed efforts to make the Rio-model work.

Local Agenda 21, as part of the multi-layered and governance based regulatory regime (The Rio-process), can be seen as a window of opportunity for local government to turn eco-modernistic (Holm 2010). Local agenda 21 programs contributed to a capacity building in local and regional level; a circumstance that is reflected in the experience that pioneers and frontrunners within the agenda 21 sustainability program tend also to be climate change pioneers and frontrunners (Kern 2010:14, Holm et al 2011). Local agenda 21 efforts have given municipalities valuable experience in how to include local actors and initiate changes in local practices (Holm 2010). The profound transition needed in climate mitigation, demanding transition on a systemic level of production and consumption systems, however, demands a new level of multi-actor and multi-sector approaches, going beyond Agenda 21 experiences.

The Rio-processes have not delivered the intended framework in terms of international agreements capable of driving climate action. A main problem is that the Rio-model was an essential voluntary mode of governance, which has been subject to power-based resistance. In general the implementation of the intentions in the Rio Declaration, both on an international and a national level, has been overruled by dominating agendas of growth/competitiveness (and welfare) – as a policy program it has experienced the fragility of visionary driven policy program. In absence of international and national programs, we witness that local climate action emerges as a still more dynamic and innovative level driving both development of technologies, solutions and policy schemes.
Local drivers of this development can be manifold. One aspect is that the climate challenge links to crises and conflicts in the fields of health, scarcity of food/water/energy, security, eco system degradation … (Najam, 2010), linkages which make climate action a matter of urgency to many societies and communities even if climate effects may still have to be experienced. For many cities and local communities climate changes hold the potential of profound local impacts, and in many cities we have a sense of urgency, and a growing sensation of a need to act. Local agendas of climate action, by-passing international and national governance, have accordingly emerged and today form a new independent dynamic force.

In a European context, EU, operating with a multi governance structure, has developed (to some extend as part of the Rio-Process) a comprehensive program and regulatory framework for climate and energy (e.g. Damsøe and Kjær, 2010); programs and regulation, which have to be implemented nationally and locally (Kern 2010). Part of the framework has a direct impact on the policies and planning processes in municipalities, while others are mediated by national implementation.

The European development has, for the last decades, been characterised by that main elements of climate policy have been shifted from national to EU-level – we have an Europeanization of local (climate and Energy) policies and practices (Kern 2010). Kern (2010) suggests, based on her studies of the role in climate change of pioneering major European cities, that we in the EU - local government relation makes a distinction between: 1) hierarchical Europeanization: cities as local sites of implementation of EU legislation and programs, a top-down perception, 2) cooperative Europeanization: cities as active political agents engaging in policy making, an interactive perception relating top-down and bottom-up processes, and 3) Horizontal Europeanization: building of European networks of pioneering cities for development and exchange of best practices, a bottom-up approach with EU-level policies and programs in a facilitating role. Kern (2010) in particular emphasises the building of transnational networks as an important new governance element, both enabling coalitions of cities/municipalities to voice their interest (ad 2), and forming a new independent constitutive governance element (ad 3). These networks of local authorities in Europe, she states, go beyond the task of representation – they form networks of development and diffusion of policies, programs and solutions (Dissemination of best practices and policy concepts). It also implies that within the individual national context this gives a development with a group of pioneers, and simultaneously a major group of indifferent local authorities. We observe a split, a polarized development with laggards (free riders) at the one hand and a small group of frontrunners at the other hand (Kern 2010: 14-15).

Studies of local climate governance (Kern, 2010, Corfee-Morlot 2009, Bulkeley 2010) indicate that local climate governance is emerging as part of reconfigured multilevel governance schemes. In a policy perspective we observe two simultaneous processes.

In a vertical relation, multilevel governance, as a set of processes, structures conditions of local climate governance (Bulkeley 2010:240). It is a top down perspective, where municipalities develop local climate governance as part of or in response to implementation of international (EU) and national regulation (EU)). The emerging local climate governance in this perspective can also be seen as responses to the failure of the multilateral negotiations on climate; municipalities/cities exploit opportunities developing in the vacuum of international and national agreements.

In a horizontal process we have a dual structuration process where EU- and national processes structure local climate governance, which on the other hand are evolving as sites reconfiguring the structures of authority and discourses; Municipalities form an independent political climate arena and municipalities/cities form networks providing an alternative institutional setting enabling development of competences and alternative
political agendas and discourses. We have a process of policy learning/dissemination: local climate policy and its wider relation to development of national policy can be seen as stages of agenda setting, policy formulation, implementation, evaluation and dissemination (to other municipalities/cities and nation level) (Corfee-Morlot et al 2009:31). It places municipalities as important innovative nuclei in a mutually interdependent policy learning process.

**Governance forms and capacity building in relation to local climate governance**

Climate policies and strategies have become part of local policy in municipalities not only due to mandatory obligations, but locally driven. Local drivers for adopting climate agendas are concerned actors (e.g. NGO’s and politicians), economic concern (facing rising oil prices) or options of integrating climate policies with other agendas (such as green growth – development of local jobs and business) (Corfee-Morlot 2009:32, Montin 2007:51ff, Späth and Rohracher 2010). Still, however, development of local climate strategies is in an initial stage, both in terms of development of local institutional and strategic capacity for undertaking climate mitigation efforts, and in terms of the provision of regulatory duties and resources by central government. The questions are, what are the governance forms available for municipalities and which new forms are emerging.

EU has established the covenant of Mayors programme as a framework of voluntary local climate action. Within this program 4 roles of municipalities are identified: 1) Consumer and service provider, 2) Planner, developer and regulator, 3) Advisor, motivator and a role-model, 4) Producer and supplier. The governance idea of the program builds on a rationalistic model of the planning process moving through stages of policy formulation, assessment, goal setting, planning, implementation, monitoring and evaluation (Toolbox of Covenant of Mayors), an instrumental process oriented towards a logic of reduction of GHG. Focus is here on shaping operational programs, but if we are going to understand climate governance as new policy field, there is a need to address the roles of local government more fundamentally to discuss the emerging new forms of governance directed towards climate mitigation.

Bulkeley and Kern (2006) made a categorization of municipal climate policies that distinguishes between self governing (e.g. greening the municipality, inter-sector coordination), governing by authority (e.g. energy planning, mandatory energy standards for dwellings), governing by provision (e.g. renewable energy service systems), and governing by enabling (e.g. campaigns and loans). They argued, that we should operate with multiple modes of governing, and for this reason claimed that great efforts have to be devoted to overcoming institutional ambiguity (related to the many agendas and interest related to the field of climate policy) and co-ordination. Although they assert all four roles of municipalities as important, they find that their studies indicate that ‘modes of governing based on enabling other actors are coming to the fore in local climate protection climate policy’ (ibid: 2251).

This conceptualisation of municipal climate policy, however, does not give sufficient attention to the radical challenges of climate mitigation. Local climate policy concerns an ability to curb GHG-emission, but obtaining substantial reductions demands an ability to master transition processes of infrastructures and of local production and consumption systems; fundamentally to build a capacity to shape transitions of socio-technical systems (e.g. the energy/housing system) to low carbon systems (Holm et al 2010). Thus it becomes important to perceive local climate policy as a question of how municipal policies and strategies address and influence the local socio-technical system and its actors. It implies that Bulkeley and Kern’s (2006) conceptualisation should be taken one step further. Municipalities are not just enablers, but are
strategic actors in the shaping of local configurations of networks of actors, agendas and technologies (of local socio-technical systems). Studies of climate actions of municipalities give evidence of the central role of municipalities in shaping local socio-technical networks, including the shaping of shared visions and goals of such networks (Holm et al 2010).

Newer studies have asserted this shift - that climate governance implies more radical changes in local policy. Municipalities have to go beyond traditional roles and expand the scope of local policy to transition of local socio-technical systems (Holm et al 2010, Bulkeley et al 2011, Geels 2011, Hodson and Marvin 2010, 2011) – a shift in perspective ‘from policy change to socio-technical change’ (Bulkeley et al 2011:30).

Accomplishing urban low carbon transitions becomes a matter not only of policy, or of ‘niche’ experimentation, but of the reconfiguration of socio-technical network – a process that is at once highly political and open to contestation and disruption (Bulkeley et al. 2011:30).

Studies of local climate governance should build on this understanding. The relevance and effectiveness of governance forms and new governance structures must be studied in relation to their possible impact on the objects they govern; that is, how they can perform and shape transition of socio-technical systems. It establishes a focus on the municipalities’ roles as enabling and strategic actors in transition and reconfiguration of socio-technical system. Simultaneously, it raises the question how local municipalities and local climate action may contribute to transition of socio-technical systems.

Local experimentation and transition

Studies in transition have addressed how we can understand the preconditions for the emerging of more sustainable transition processes and how we deliberately may conduct such processes (Kemp and Rotmans 2001, Voß & Kemp 2006). Scholars of transition have suggested a multi level model, where regime shift processes, as e.g. establishing renewable energy systems or low or energy-plus housing, are understood as interplay between socio-technical regimes, socio-political landscapes and niches (Geels 2004, Kemp and Rotmans 2001). The current socio-technical systems of the combined energy-housing-construction field can be characterised by dominant regimes, sustained and supported by predominant actors, institutions and regulation. These regimes are maintaining the technological trajectories as e.g. the dominant fossil energy regime, standardised refurbishment materials and methods, or the pre-fab fordistic single house construction.

The dominant regime may be changed by innovative processes performed by networks of the regime actors, driven by dynamics on the different dimensions of the regime, e.g. industry, policy, science, or markets. These processes may be influenced by changes in the landscape, such as rises in energy prices, creating new conditions for development and offering ”windows of opportunity” for new technology systems. Regime changes may be triggered by niches of emerging new technologies, niche technologies which may be included in a transformation of the regime or put the regime under tension by offering an alternative road. Processes of niche creation, learning processes, translation and transfer of ideas are as well as actions of innovative actors in as well as outside the dominant regime are all important elements of transition (Geels 2004).

Niches are often driven by experimentation among social entrepreneurs (alternative construction actors, experimental housing communities ...), with reference to alternative value systems (e.g. organic farming, permaculture). But they can also be driven by deliberate niche management schemes, i.e. programs creating and supporting niches for experimentation and maturation of new construction, energy and mobility
technologies (Kemp et al. 1998), so they can be adopted by innovative mainstream companies and organisations and disseminated in the dominant regime (Kemp and Loorbach 2006).

Local project and initiatives within local climate governance schemes may play an important role as sites for niche development. Local projects and initiatives serve the function as socio-technical experimentations, where combinations of new technologies and living practices are unfolded and developed into alternative options. They can be described as situated transition places established as specific configurations (Holm et al 2011), where (if we take the energy/housing system as an example) cooperative housing communities, user driven eco-settlements, institutional funds eventually in interaction with municipalities and specific parts of construction industry define contextualised socio-technical experiments (Brown et al. 2004, Brown and Vergragt 2008). They form places of situated learning, enabled by and taking advantage of specific local context.

They are labelled situated to grasp that each of the emergent projects/initiatives on the one hand are developed in unique situations, on the other hand become particular situations of a broader social and technical learning and development. These ‘situations’ are emerging in a ‘clash’ between groups of actors, structural and institutional conditions of the sector and the local political and organisational (municipality) system. The ‘situated’ also includes the fact that the process takes place in specific local space. (Holm et al 2011). Situated transition places is seen as an analytic concept bridging between transition processes taking place in specific local context and transition processes of socio-technical systems. It calls for studies of how these local projects/initiatives are shaped and functions as situated transition places, on the one hand how they interplay with the dominant regime (a structuration relation), on the other hand how they materialise as localised interactions of actors.

Municipalities can play a decisive role in how (or whether) these situations develop and are utilised, and they may play a significant role in transition processes (also in the void of national strategies). The question is the role of municipalities in the constitutive processes.

Local climate action can be pursued for being the most efficient administrative and political level to implement climate program (delivering CO₂-reductions and transforming urban infrastructures) as local climate action can include the specific geographic, natural, structural, and cultural conditions (Corfee-Morlot et al 2009). Reduction of CO₂-emission and transformation of social-technical energy systems has a complexity and a dependency of local context (bio resources, companies, energy systems, technologies, build environment etc.) and of specific local actor constellations of transition (NGO’s, entrepreneurs, companies), which rules out climate strategies solely based on general (national) strategies and programs. Climate governance demands a ‘reflexive/adaptive’ local governance sensible to specific local context and capable of mobilising local resources.

In a transition perspective local municipalities and local climate action become interesting due to the specific constraints and opportunities laid down in the local fabric; the diversity in local context becomes a source of obtaining a variety of innovative concepts of local climate action and climate governance. The questions are: how the local projects and climate efforts can unfold as transition places of socio-technical experimention, how they transform local socio-technical systems, and how such local based configuration and transition places relates to national (general) transitional processes. It establishes a dual perspective on local climate governance and actions, looking at how they transform local socio-technical systems and (simultaneously) serve as situated transition places (bridging to broader socio-technical transition processes).
An important issue here is how experimentation and deliberation for new construction, energy utilities, standards etc. assists in the shaping and configuration of new actors, networks, institutions and settings, how they become sites of searching and learning in relation to new energy, construction & refurbishment technologies, to new building materials and processes. In their climate efforts, changing local systems and undertaking experiments, municipalities become situated and strategic arenas for innovative reconfiguration of socio-technical systems (Holm et al. 2011).

On a general level Geels (2011) acknowledges the role of the local level by incorporating the national/local interplay in the multilevel model “The multilevel perspective incorporates this pattern via the implicit ‘level’ of local practices for which niches, regimes and landscape provide structuration .... In particular, niches and regimes are always enacted and reproduced by actors who are situated in local practices.” (ibid:17). It implies that they also can be initial seedbeds for transition “In the transitions cities act as initial seedbeds for the creation of niches and the performance of entrepreneurial experiments with radical new technologies.” (ibid: 22)

Municipalities/cities may play a role in transition in many ways. Geels (2011) makes a distinction between the roles taken by municipalities/cities as primary actors enacting transition/transformations (e.g. taking local action as urban planer, planning of heat systems …), as seedbeds of transition (e.g. undertaking local experiments with energy technologies) and in a limited role (e.g. subordinated national plans, rolling out regulation and programs).

In this distinction the role of the municipalities thus becomes connected to the characteristics of the local conditions of the socio-technical system being studied. Geels draws on historical examples in his discussion. Today, it might be difficult to point to systems where the municipality unilateral can act as a primary actor. Socio-technical systems exist in a context of global markets, international as well as national regulations, influencing and being influenced by more than the local environment and local cultural values. The sharp distinction between the primary and limited role can rather be considered as a graduation that can be used in the characterization of the governance forms and how powerful the municipality can act.

The third role, however, raises the question in which way local transitions can act as seedbeds and influence the overall systems and how local governance forms can support such transitions? It parallels our perception of local projects as potential transition places.

In the studies, presented below, we focus on the development of local climate governance forms directed towards influencing the local socio-technical system, looking at mechanisms and driving forces driving local transition processes. Studies of the interaction of local efforts on (national) socio-technical systems (dissemination, translation), have not been the focus of this study, but has been addressed as one dimension in our assessment of the studies.

**Governance forms and socio-technical transformations**

The change of governance form and the redefinition of climate mitigation (and adaptation) as transitional processes of local socio-technical systems have to be seen as mutual interdependent processes (Holm et al 2010). New planning and governance forms have to be judged not only by their capacity to deliver reduction of GHG emission, but by their capacity to build and transform socio-technical networks (Holm et al 2010). Hodson and Marvin (2010) share the same line of argument: With purposive urban socio-technical transitions, therefore, the aim is to mutually transform both urban governance regimes and socio-technical regimes (2010:63).
Hodson and Marvin (2011, 2010) depict both the urban (municipal) governance structure and socio-technical system as obdurate and complex – for both systems they state that “… governance of these systems is increasingly polycentric, at multiple levels and scales of governance, and control is dispersed and distributed. It is in within this context that ‘new’ forms of governance are emerging, being designed and experimented with to intervene in and seeking to reconfigure regimes at an urban scale (2011: 63, 2010: 482). The challenge, from their perspective, is a mutual/concurrent reconfiguration of governance and socio-technical systems. To grasp with the inherent ‘lock in’ of both systems they suggest the creation of ‘intermediary organisations’, seen as necessary to ‘constitute a space outside the obduracy of both the existing urban governance networks and existing socio-technical regimes’ - organisational constructions set up ‘to intervene in a variety of ways in existing systems of producing and consuming resources’ (ibid 2011:63). Based on European studies they identify seven functions (issues) which have to be served by such local active and configurational intermediation organisations: 1) financial issues 2) staffing, 3) organisational structures, 4) cultures, 5) knowledge base, 6) communication, 7) credibility influence. (ibid 2011:64ff) – all elements that to be addressed ‘to build active capacity and necessary capability to translate a vision into social and material action’.

They operate with dual criteria for success of such organisations: a) outcome in terms of achieved objectives and b) integration in terms of ‘objectives and aspirations being embedded in social practices, integration of social actors and mediation social interest (formation of broad constituency of relevant actors). The latter point equals to some extend the requirement that reconfiguration of local socio-technical systems are the overall demand to local climate governance (Holm et al 2010).

Bulkeley et al (2011:33) too have adopted the socio-technological perspective, but links it to the urban infrastructure, perceiving low carbon efforts as transition of the socio-technical configurations of urban infrastructures and a further rescaling of local innovation to nation scale. Like other scholars (e.g. Hodson and Marvin 2011, Späth and Rohracher 2010), they have assigned central roles to ‘cities’ in transition processes.

The building of intermediary organizations can be regarded as an example of widening the range of available governance forms, as intermediary organisations might overcome legal, economic, competency and other constraints and barriers for municipal initiatives. They are interesting focal points for the question about the types of institutional arrangements, the strategies and capacity conditions that take place among frontrunner municipalities when aiming at influencing local socio-technical systems.

The ability of climate and energy policies of municipalities to deliver energy saving and transition to renewable energy is important, but equally important is how local strategies on climate and energy are motivated and emerged, and furthermore how local strategies co-shape local (and national) socio-technical systems. Local policy agendas also have to be discussed and assessed in this perspective.

Part II: Studies of local governance experiences

Analyses of the emerging local climate action have taken many routes. One strand of investigation has focused on the city, tapping into the tradition of urban studies (Bulkeley et al 2011, Corfee-Morlot et al 2009), other studies have focused on horizontal networks of municipalities/cities as providing power and
institutional framing of local climate policy and action (Kern and Bulkeley 2009). Many of the studies of local climate governance have been biased towards ‘the city’ and focused on their infrastructures and subscribing to urban theories. This approach can be contested – carving out the city from its local context risk to miss important themes of establishing integrated metabolic interaction of urban and rural systems (in general obscure the resource and energy drain, the ecological footprint of cities).

The city as a unit of analysis lacks the diversity of different settings of cities and surrounding rural area that is held together by the local government structure in municipalities. Although municipalities normally have rather arbitrary geographical delimitations, they become spatial entities by having a common authority structure by the local government and share common conditions of cultural life, networks, infrastructure, natural resources, local markets and workplaces. In a Danish context a delimitation based on municipalities/regions makes sense when analyzing the local governance structure in a multilevel context.

In a governance perspective, municipalities have the privileged position of being the public authority operating in the junction of specific local condition and national (international) goals and policies, and being the public authority having the direct contact with the citizens. From a transition perspective we experience that while national climate mitigation strategies tend to fall into a systemic lock-in, local authorities and policy networks tend to show more willingness for performing experimentation in transition.

In this part of the paper, the role of municipalities in the Danish multilevel climate policy structure is presented, focusing on the roles in relation to the combined energy/housing system. Examples of emerging new roles and new governance structures in frontrunner municipalities taken from the KIBS project are presented and discussed.

The question is, which new climate policy related governance forms that can be identified among frontrunner municipalities aiming at influencing the combined energy/housing and construction system, and how they can they be characterised in view of as well their position in a multilevel climate policy, as their possible impact on the transition of the over all socio-technical system of energy/housing and construction?

The analysis and discussion is based on studies of Danish municipalities with focus on one of the 5 regions of Denmark, namely region Zealand, which contains 17 of the 98 municipalities in Denmark. The studies have focused on climate policies that include policies to contribute to reduced energy use in buildings and/or shifting of energy systems. We have selected a number of municipalities that have developed interesting new governance forms to serve as examples and studied these examples in more detail. The study thus has the character of explorative case-studies, aiming at revealing new knowledge of relationships between local governance forms in climate policy and modes of creating local spaces for influencing socio-technical systems.

The aim of the study is on the one hand to contribute to diffusion of experiences with new governance forms in climate policy, on the other hand to contribute to further development of policies aiming at transitions to a low carbon economy.

Municipalities as arena for emerging climate strategies – energy and housing
National central-local governance structures differ within the European Community, resulting in substantial differences in how local government inscribes into multilevel governance schemes (Kern 2010). We have central local relation ranging from compulsory relations (UK), relative autonomy (Germany, Sweden, Denmark). And we experience a parallel difference in central-local interplay in climate governance: mandatory obligations of UK-municipalities, regional and local autonomy in Germany, and local autonomy backed by capacity building central programs (Sweden) (Kern 2010).

Danish municipalities enjoy relatively autonomy on local matters. They are subject to financial steering and regulation from central government in terms of compulsory orders defining obligations (e.g. social care, education of children, spatial planning, waste handling, public service activities, energy provision, and environmental protection), but in many fields they are given discretionary power allowing for flexibility in fulfilling local ends.

Climate problems have in Denmark been addressed by the central government in Denmark within a cost-benefit approach, embedded in a neo-liberal perspective. The “Climate strategy” (Regeringen, 2003) focused on how market forces could be used to obtain the Danish CO₂ reduction obligations in an economic way, paying low attention to local development of low carbon societies. The program ‘The Business Strategy on Climate Change’ (Regeringen, 2009) represented a major change, but again focus was not on development of low carbon societies. Main issues in the strategy were to address climate as a driver of business and innovation and examining how climate (cleantech) clusters and partnerships could be identified and developed. Neither of the programs had a transition perspective or identified new roles for municipalities. The strategy paper also represents a lack of a coherent climate strategy, as only ad hoc adaptation efforts are sought for.

The need of a coherent climate strategy has to some extent been acknowledged by the Danish Government. March 2008 the government appointed a “Climate commission” (Regeringen, 2008) mandated to develop ‘energy and climate policy instruments’ enabling a phase out of fossil fuels in the Danish energy system. Their final report (Klimakommissionen 2010) identified a fossil-free Danish energy system in 2050 as a realistic goal, and forwarded recommendation for a number of policy instruments to reach that goal. These recommendations have only slightly been implemented in the government’s Energy Strategy 2050, a White Paper from late February 2011. Though some imperatives for, not transition, but incremental innovation is at place: The Energy provision utilities will meet increased mandatory green house gas savings targeted at residential housing areas. Requirements on insulation capacity are placed on new construction materials, also efficient for refurbishment. A transition push is though at stake: e.g. a ban on installation of oil boilers in new buildings from 2012 and in existing buildings from 2017, and a planned market promotion of RE-based alternatives to oil and gas. Finally for the local municipalities the government plan aims to promote the construction of buildings with very low energy consumption and increased energy conservation efforts for the public sector.

Despite growing concern on climate and energy issues on international and national level, central government has not defined a clear role of Danish municipalities in the development of low carbon societies. Municipalities have been given some specific obligations in relation to climate and energy issues (in most cases on the basis of EU-regulation), such as mandatory implementation of energy assessment schemes for municipal buildings, but on a general level no strategic visionary aims and no statutory duties on climate action have been issued from central government. This lack of centrally defined framework leaves the municipality in a situation, where they will have to re-orient existing instruments or invent new policies and instruments, if for some reason there are local drivers and motivations for innovative climate politics.
This means that the municipalities have not been given resources or legitimacy to hold expenditures or to put obligations on their citizens, businesses or institutions to pursue the goals of climate mitigation or adaptation. They must either seek local political accept to spend tax money on it, which can be difficult to argue against e.g. spending money programs of welfare. Alternatively they must integrate it in existing municipal tasks, seek to find local co-benefits or otherwise identify necessary or beneficial activities that can be twisted to a carbon-reducing activity. The lack of financial scope and mandates leads to an inclination for the use low-cost, “soft” instruments (e.g. Bulkeley 2010:248).

Local climate policy in Danish municipalities

A number of Danish municipalities have adopted high profiled goals and strategies for development of low carbon local societies (e.g. Frederikshavn, Samsø, Sønderborg, Albertslund, Lolland, Egedal) and in parallel municipalities have engaged in national trans-municipality co-operations (Dogme 2000 (now Green Cities ), Bycirklen) as well as international cooperation (e.g. Aalborg Commitment, ICLEI (International Council for Local Environmental Initiatives, Covenant of Mayors). Within the framework of Local Government Denmark (KL Kommunernes Landsforening) environmental planners (and the likes) have formed a professional network (practice community) on municipality planning on environment, energy and climate. These networks provide opportunities for enabling a collective development of knowledge and competences among the municipalities.

The main part of the Danish municipalities has been or is in the process of developing energy and climate policies and plans. A survey conducted early 2008 (Sperling et al 2010) gave as a result that 63 out of 93 responding municipalities were working actively with climate issues. Two years later, a survey conducted 2010 (Mandag morg 13.8.2010) gave as a result that 91 out of 98 municipalities were working actively with climate issues and had plans of GHG-emission-reduction. In parallel, 69 of the 98 Danish municipalities have signed a commitment to be a member of the ‘Climate Communities Club’ (klimakommuner) within the framework institutionalised by the Danish society of Nature Conversation (promising an annual reduction of CO₂ on 2 % or more)(www.DN.dk/klimakommuner (1.12.2010)).

A survey of the municipalities in Region Zealand (Stauning et al 2011) showed that more than half of them had or were in the process of elaborating climate plans with the objective to develop a platform for climate action. The Mayor Covenant is signed by 14 out of 17 of the municipalities in the Region of Zealand, committing the municipality to go beyond EU norms for enhancing sustainable energy action plans, networking with other cities and engaging local citizens and stakeholders. Most of them is in the process of mapping of local CO₂ emission and identification of reduction potentials, and further on definition of political goal and strategies, including building of local capacity.

The approaches of the municipalities have varied. In most cases development of basic data, plans and strategies has been quite rationalistic based on statistical mapping of emissions and identification of strategic potentials for CO₂ reduction. Often consultants have undertaken the first step in development of plans and strategies, but municipalities are in the process of building internal capacity, including undertaking internal elaboration of plans, and/or have adopted more bottom-up participatory processes involving local actors and citizens in identifying goals and actions.

Many of the activities in the local action plans are involving local socio-technical systems, e.g. energy, transportation, housing etc. The local socio-technical systems can be objects for a combined climate policy effort and development strategy. We experience in the frontrunner municipalities a willingness to search for possible co-benefits and options to integrate climate policies in local development strategies. We have
looked into the relationships between municipal climate strategies and the local housing-energy systems to identify such local transition strategies.

Local climate policy related to construction and refurbishment

Decisions regarding construction and renovation of buildings, public transport and spatial and sector planning for energy and construction, are by enactment partly made locally and have the potential to either promote or disregard climate friendly solutions. A structural reform in 2006 (kommunalreformen) created bigger and stronger municipalities given extended responsibilities in planning and regulation, but still national policies and planning for energy systems and for construction standards predominate.

Local communities and municipalities in Denmark have played a major role in the development and operation of local energy systems and its relation to housing; electricity, gas and/or heating has been supplied by public utilities (often run by municipalities) or by user owned societies (often incorporating municipality representatives). The new structure of the energy sector (Following EU’s energy market approach) has diminished the role of municipalities and user-owned energy companies; however, they still constitute major elements in many local energy systems (Sperling et al 2010). Looking at the Danish municipalities, however, we have a very scattered picture, with very high variety in the local structure of the energy sector and their interconnection with the housing sector; leaving the individual municipalities with different options for exercising local climate governance.

Municipalities are from the very outset, due to obligations and authority laid down in existing regulation, born main actors in climate policies and energy/GHG reduction. In fact, the municipalities are interacting with the energy and housing system on many levels and in a broad array of their administrative, regulatory and planning practices (see textbox 1 for an account of roles and relations). It leaves many options and platforms for exercising local climate governance in relation to construction, housing and energy.

Municipalities are both involved as operator and regulator of the energy system. As regulator, the municipalities hold the responsibility of heating planning (local discretionary power, however, is subject to the confines laid down in national heating planning reserving zones for district heating and the natural gas grid). Within the framework defined in the national regulation, municipalities have been involved in establishing district heating companies for mainly urban areas, leading to a heating system where CO2 efficient district heating system today covers 60% of Danish homes. Municipalities also have participated in promoting local combined heat and power plants, waste incineration (CHP) and also biogas power plants, and municipalities hold responsibility for spatial planning when it comes to locating such activities as power plants and district heating plants.

When it comes to the private housing sector and energy-climate aspects, municipalities have the overall planning mandate for spatial planning at municipal and local level, whereby authority is given to decide on
e.g. planning for dispersed single family homes or condensed cities with apartments, planning for car-parking space at dwellings, and often also on the type of heating system applied in the local districts. Construction codes and energy standards are nationally issued in the Building regulations, but in the implementation of low energy standard and alternative heating systems, both the capacity of municipalities, and the skills, traditions and cultures in the socio-technical systems of energy and housing have to be developed locally.

In their searching and experimentation, municipalities have worked with climate mitigation from different positions.

Many municipalities have build on their mandate as local planners and have developed local climate plans based on systematic sector mapping of local emission of CO₂ (and green house gasses), identification of reduction potentials and attempts to identify adequate instruments and programs. More specific municipalities have used their authority as spatial/urban planner to set demands to the infrastructure, energy supply, nature quality, build, or they have developed local plans ensuring low-energy houses (e.g. Egedal).

The municipality has obligations to make plans for heating, waste handling, water supply, transportation, and many municipalities are owners alternatively represented in the management of these infrastructural systems or are involved as operator in these systems of provision. Part of the energy system, such as electricity production and the electricity grid are operated by private or national actors, but still municipalities have a role as planning agent enabling them to influence the shaping of local energy systems.

Other municipalities have developed modes of self-governing in relation to their responsibilities for public buildings and institutions, e.g. developing their energy management capacity (e.g. Kolding). Central government have made energy labelling of public building mandatory and have placed an obligation on municipalities to perform all energy saving measures with a pay-back time less than 5 years.

Thus, the municipalities can relate many different roles in pursuing a climate agenda in relation to the combined building and energy socio-technical systems – that is the complex of energy supply within the building or from public supply units, energy consumption related to heating and household/service equipment dependent on the insulation, materials and construction. The municipalities are primary actors in many fields, such as energy management and (energy) refurbishment of public owned buildings, in their capacity as operator of public utilities and as planning authority. But in the main part of the energy and housing systems, they are not primary actor. Decisions of how to build and which materials and energy systems to use, level of energy management etc. in private estates are in the hands of private owners, building companies and energy suppliers. It implies that they have to use governance forms that motivate and influence the private actors to change their technology. They have to operate as enabler and strategic agent seeking to reorient and reconfigure local socio-technical systems; they have to perform modes of private-public cooperation and consensus-seeking approach, involving different local actors, building on tradition for participatory and mobilising activities developed in the Danish local government tradition through among other the Local Agenda 21-initiatives.

The climate policies in municipalities oriented towards transition of the socio-technical system of housing can take its point of departure in any of these governance forms, but in most cases municipalities seek to combine different roles/instrument, imitating, experimenting and learning from ‘best practice’. In the following part we will present some examples of municipalities that have taken an active strategic role in developing climate governance contributing to transitions in the housing system.
Case studies: Climate governance in Danish municipalities regarding construction and refurbishment

Taking a closer look at frontrunner municipalities regarding construction and refurbishment we have observed 3 main points:

1. The municipalities have not created totally new forms of governance, but they have expanded the forms available for them to be able to integrate some climate policy and sustainability goals. We have a level of lock-in to existing regimes of regulation and planning.
2. The municipalities often initiate or participate in creating new organisational structures directed towards undertaking climate governance and transition - so-called intermediary organisations (Hodson and Marvin 2011). New governance structures are developed, which are better fit to integrate climate policy and sustainability goals and to build up capacity. In some cases these organisations are made independent of the municipal economy to enable funding for activities going beyond the mandates of the municipality.
3. The initiatives and governance forms are rather different from municipality to municipality – although they learn from each other and have the same options, they choose different focal points and make different priorities.

In the following we will go through some examples and ask the question how climate policy goals are integrated and how they are aiming at influencing the local housing and energy system. In particular we focus on, how local climate governance from different positions enables municipalities to influence and reconfigure local socio-technical systems.

**Governance and transition strategies for achieving a zero-carbon energy consumption**

Several Danish municipalities have set a zero-carbon goal and made strategies for this, among others Copenhagen, Frederikshavn, Lolland, Samsø, and Sønderborg. These municipalities all have formulated extensive plans for how to achieve their goal. In Sønderborg a group of local stakeholders and the local municipality have formed a visionary plan for a local transition to a zero-carbon community.

**Sønderborg – ProjectZero – an intermediary organisation to achieve a local zero-carbon transition**

The Municipality of Sønderborg has, on top of many years of Local Agenda21-activities, together with local energy suppliers set the goal to be CO₂ neutral in 2029, and in cooperation with local stakeholders they have organised a public-private partnership ‘ProjectZero’ (2007) to fulfil this goal. Local industrial actors (e.g. Danfoss) and energy companies have engaged in the partnership as a strategic project, identifying the local transition to a low carbon society as an important platform for socio-technical learning, innovation and business development; for the municipality the vision is that the project of CO₂ neutrality can be a driver of local development.

ProjectZero can be characterised as a hybrid business-climate mitigation organisation involving and building on the resources of local stakeholders. It serves as an arena of local dialogue and thus contributes to the building of shared local visions. The hybrid organisation, operating with an independent funding, has paved

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2 The analysis in the following section build on data collected in the KIBS-project (Climate change and Innovation in the Building Sector), see [www.climatebuildings.dk](http://www.climatebuildings.dk) and (Stauning et al (2011))
the way for initiating and engaging in projects of development and experimentation, which otherwise would have been difficult to undertake by municipality organisations (due to restrictions laid on how municipalities may engage in projects involving business). ProjectZero has laid down a strong organisation, and staged a local capacity building. This has included cooperation with knowledge institutions; an outcome of this has been the development of a roadmap for local CO\textsubscript{2} reduction 2010-15 (Sønderborg 2009). For this work, the management scheme and ability to define projects and processes, the ProjectZero 2010 was awarded the European Commission prestigious award for the best sustainable energy solution (category "Sustainable Energy Communities").

The ProjectZero roadmap defines a holistic approach. Taking abatement of housing related CO\textsubscript{2}-emission as an example, reduction is to be obtained by a concurrent effort on substitution of fossil fuel, improved energy efficiency of energy infrastructure and – provision, energy refurbishing of the building stock and changed behaviour. In parallel, the municipality enforces low-energy standards for new buildings, also with the aim to spur the development of local construction industry. The program outlined in the roadmap and the cooperation of actors in ProjectZero serves to emphasize the need of concerted action, and stipulates roles and obligations/deliveries of local actors of the energy-housing system – a first step in establishing a reconfigured local socio-technical system.

The unique feature of ‘Project Zero’ has been the strong bond to and economic backing of local industrial actors, the radical vision, the high level of organisation and capacity-building. On the other hand, the municipality’s quite week role in the co-operative management regime may be criticized for leaving it too far for local business to set the agenda.

**Governance and transition initiatives related to management of municipal buildings.**

All municipalities are obliged to make an energy labeling procedure and perform projects with 5 years or less pay-back time. Some municipalities have chosen to manage their buildings in innovative ways, where they also may obtain further goals related to transition of the local building sector and the local market for refurbishment.

**Kolding – capacity building in own organisation, aiming at influencing energy use in the municipality**

The municipality of Kolding ([http://www.climatebuildings.dk/kolding.php](http://www.climatebuildings.dk/kolding.php)) took an early lead in energy management of its building stock and in the development of a local climate and energy strategy. By establishing management procedures and organisational capacity they have integrated a systematic efforts to obtain local energy savings by installing low energy consumer goods, integrating energy savings in refurbishing, developing user-adapted heating and lighting systems etc.. The work have been rooted in adopting to the Aalborg Commitment (1994), participation in Dogme 2000 network (now Green Cities ), and in ICLEI (International Council for Local Environmental Initiatives) - all commitments binding the municipality to define sustainability goals, monitor and report progress, and to root its work in local actors. More specifically, the municipality in cooperation with ‘Business Kolding’ has issued an energy plan, “Energy Kolding”, setting the goal of reducing CO\textsubscript{2} emissions by 75% per capita in 2021 (compared to 1990 = 100, Kyoto Protocol reference year) and has established an independent and strengthened environmental department (climate and sustainability) under the technical department. In 2008 they were appointed as ‘energy municipality’ within the campaign of the Ministry of energy and climate.

Kolding represents a long term building of local capacity in the internal organisation and in partnership relations, a competences and institutional capacity has been acquired in a long process starting with the local
and inter-municipality Agenda 21 work. In construction, Kolding was an early adopter of a general demand that all new constructions should meet the highest energy standards (Energy class 1).

Middelfart – building public-private partnerships and networking for energy renovation and capacity building in local construction and housing sector

Middelfart (http://www.climatebuildings.dk/middelfart.php) has become a frontrunner in examining how private-public partnership based on Energy Service Companies (ESCO) can be part of local energy and climate work. In cooperation with an ESCO-company the municipality defined investments ensuring a 20% reduction (operating with return of investment in 10 year) in energy consumption in the building stock of the municipality. The experiences in Middelfart (and from other ESCO-frontrunner municipalities) are used in a research project to develop concepts, roles and institutional framework for such Private-Public partnership (http://www.ebst.dk/escommuner). The municipality has extended the ESCO-approach to private residential homes, facilitating (as an experimental project) a packet solution of energy refurbishing to a local residential area. The packets involved a concerted action of energy companies (offering consultancy), financial institutions and construction firms offering a substantial discount if sufficient homeowners took advantage of their offer. Furthermore, the municipality initiated education programmes for local craftsmen and small companies and supported information activities about energy solutions for local home-owners.

Middelfart municipality represents a redefined division of work based on a new interface to market and in this respect a new path of capacity building in municipality organisations and consultant/construction sector. It is a specific capacity to define and manage ESCO-projects, both to be acquired by the municipalities and process consultants. Furthermore, they represent innovative governance initiatives to creating partnerships and networking among local enterprises and other actors and mobilise local markets for energy refurbishment.

Governance and transition initiatives in local planning

Many municipalities have tried to get a dialogue with building companies and entrepreneurs by making guidelines and lists of recommendations for green buildings, and have made local plans with green areas etc. to influence builders to include climate and environmental considerations. Egedal and Køge municipalities have been frontrunners in setting much stricter requirements than normally to local areas. Among others they demanded that the houses should meet low-energy standards, which was at that time not allowed to include in local plans. As a result of their pressure, the right to require low-energy standards was given by the government in 2009.

Egedal – sustainability requirements to builders in a local plan

In the municipality of Egedal (http://www.climatebuildings.dk/egedal-municipality-info.php) many years of search process for how to use local Agenda 21 tools and strategies for more substantial achievements, lead to the development of a catalogue of local municipal strategies for enhancing more sustainable construction and energy use. In the first place this was manifested in attempts to provide guidance on environmental issues in reviews of building licenses and in municipal buildings. This has facilitated that the municipality has been able to develop the necessary competences in environmental and energy technical issues, which at the time was only partly present in the construction industry.

By establishing an innovative and smart way for mandatory low energy requirements for new dwellings, on sites owned by the municipality, Egedal were a frontrunner in showing the window of opportunities for new
socio-technical systems of constructions. By lobbying with the central administration of the Danish government and by publishing reports on the issue, all municipalities were given the option of drafting district plans, which operated with above-the-standard, mandatory energy class demands to houses build in the district. These efforts resulted in planning for a sustainable construction housing area and guidelines for all new constructions to fulfil stricter energy class demands, manifested in the local Agenda-21 strategy from 2005 and in an integrated sustainable construction strategy in the municipality spatial district plan. This was regarded an experiment for how to plan and build new districts of the community. Specific plans for nature, waste water, energy supply and street lamps (diode light) were integrated into a large construction area for over 800 dwellings, with a set of specified demands to the constructors and owners of the buildings. Furthermore the planning of Denmark’s largest thermal heating system is under construction for supplying the area.

An immense search process of more sustainable technologies and constructions had taken place by staff members in the municipality, as explorative studies of how to enforce the green construction ideas in juridical binding contracts etc. The actual development of the areas required also deep technical discussions with constructors and entrepreneurs, encouraging companies to look for the alternative technical solutions that were at stake. There was an underlying wish to influence the building sector and the market, and especially to make a show case for normal families of the potentials in normal, but sustainable dwellings.

**Køge – experimenting local area: “Houses of the future” – low-energy, Swan labelled houses**

Køge municipality has a long tradition for Agenda-21 activities, and an organisation was built with local NGO’s and stakeholders as members in the 90’ties. It was supported by the municipality, but acted independently. It has its own house as a centre for the activities, among others an advisory service for energy savings (Energitjenesten). This Agenda-21 organisation had the idea to make a kind of show case exhibiting how to build sustainable houses of the future. The municipality was the owner of a land area and formed a mandatory registration of requirements to the builders, that the houses all should be different and that they should fulfil the Nordic eco-label, the Swan, requirements and apply to low-energy standards.

The Agenda 21 organisation took the role to governance the architects and entrepreneurs wanting to participate with drawings on the show case area and later on to build their houses in the area. They also communicated with the Swan label organisation on which criteria should be set to labelling house elements, and discussed various technical ways of interpreting the norms with the construction companies. Thus they acted as an intermediate between the municipality, the Swan label agency and the many construction companies. In this way they built a local capacity in their own organisation as well as in the involved companies on green requirements.

Unfortunately, the houses where to be built just as the financial crisis started, so the building and selling went slower than expected. But nevertheless the involved companies started learning processes about which requirements that would be relevant for future environmentally aware customers, and the activities around the exhibition also gave a lot of public interest. Other municipalities have also learned from the experiences of setting strict green requirements to a housing area. Guldborgsund has e.g. made local plans for a housing area with strict green requirements. However, the requirements of Swan-labelled houses have not been followed in other municipal plans. But they have been used in private building plans, and some of the criteria are today common elements in public tenders with eco-requirements and green architecture tenders, e.g. avoiding PVC etc. This means that companies that might have learnt to include such requirements in the Køge-experiment, can benefit from it in other building projects.
Governance and transition initiatives related to the role as provider of energy and heating

Many municipalities are involved in plans for transition of the energy sector. Outside our research case region, Samsø municipality can show very interesting results as a net Zero Carbon island. They were appointed as ‘energy island’ by the Government in 1997 and received support for some of their activities. They have during 10 years reached their goal of becoming CO₂-neutral. Here also an intermediary organisation, The Energy Academy, was responsible for information and activities to reach the goal, supported by the municipality, but also building their own economy from different sources (Jørgensen 2007).

Lolland – zero-carbon energy supply and experimental zone for renewable energy as development strategy

Lolland is a municipality characterised by a large rural sector, few educational institutions and a diminishing industrial sector. Several big enterprises had moved their production in recent years, leaving skilled and unskilled workers out of job. The idea of an offensive strategy to attract enterprises and innovative entrepreneurs was developed in the municipality: as Lolland was not obliged by national plans to use natural gas, they had the opportunity to decide a plan for making Lolland a carbon-free community, oriented towards facilitating experimentation and development of renewable energy. They started a centre for Green energy to perform and attract projects in biomass energy and they paved the way for a big windturbine company to start wing production in the municipal area. Furthermore, they restructured their internal organisation so it would be more flexible to participate in projects and networks, and they created an independent organisation, BASS, that would be able to engage in development projects and attract funding. The municipality has been active participator and facilitator of a number of energy projects in a strategic plan of being a “Test Facility Community”. Their strategic goal is to attract high-tech companies and research institutions to establish test facilities on Lolland in renewable energy systems, thereby creating development and projects that might lead to employment and high skilled residents. The municipality, although not a primary actor in energy supply, has succeeded to create visions for carbon-free energy supply, to establish networks and funding for innovative and experimental projects on energy technologies as off-shore wind power, biomass energy, algae energy, hydrogen energy, and to engage in regional, national and international networks and policy projects on low-carbon strategies, among others in the Baltic region and in region Zealand.

The energy supply projects are not being coupled to low-energy projects in households or to low-energy building requirements. There is a project of using hydrogen technology in private houses in the village Vestenskov, which is an element in the testing of hydrogen energy components. But there have not been initiatives oriented towards the construction sector or low energy housing, until a project of “energy village”, described below, started in Horslunde village in 2010. This indicates that municipal climate policy is closely linked to the specific conditions of the local area – Lolland has good specific conditions for biomass and wind energy, but not for innovative new building and investments in refurbishment as it is a low income area.

Governance and transition initiatives related to the role as enabler

Municipal experiences with Local Agenda 21 entrepreneurial cultures, strategic co-operative management regimes, and niche experimentation on energy-, organic food, eco-housing, urban ecology etc. have paved the way for current climate mitigation initiatives among the frontrunner municipalities we have investigated. A tradition characterised by public participation in local planning and reflexive regulation of environmental control and standards for companies, has also prepared a socio-technical regime among local authorities for addressing socio-technical system actors.
The examples given above, show that the enabling role is a part of the other governance roles that the municipalities have taken. The examples below show some activities, where the enabling role is in focus for the municipal activities.

Næstved – enabling activities in the local area to promote capacity building and experimentation in greening the housing sector

Næstved municipality has a long tradition for local Agenda 21 activities. They have participated in building local LA21-organisations that make arrangements about eco-food, health, living conditions, housing, and local debates. The municipality support these activities with employees devoted to participate in local agenda 21-activities. Green buildings have been a central part in these activities. They have participated in local green building projects, among others in plans for building the first passive house in Denmark. The municipality has a number of architect and consultancy firms, of whom many participate in innovative green projects and cooperate with the municipality. The municipality has made a comprehensive set of guidelines for green building, where some of them are requirements for new municipal buildings, while others are meant as advices for municipal buildings as well as for private builders. Initiatives to promote energy refurbishment and low-energy buildings are also a central element in their climate plan.

There is a large sector of small enterprises involved in construction as architects, advisors, craftsmen and building equipment producers and sellers, and the municipality has recently engaged in activities to promote education and training in “Sustainable buildings of the future” and have made a plan for establishing a centre for sustainable buildings in Næstved.

Climate villages – facilitating climate policy activities and low-energy refurbishment in villages

The region of Zealand has identified a common interest for the municipalities in supporting local communities to engage in climate policy and to renovate buildings both regarding energy supply and energy refurbishment. Three villages have been established as experimental zones for promoting local engagement in climate transition, namely Herringløse in Roskilde, Toxværd in Næstved and Horslunde in Lolland. The region and the involved municipalities have supported an organisation Energi klynge center Sjælland, which have facilitated community based processes of energy refurbishment in the 3 villages by informing and motivating citizens to change their energy supply from oil to renewable energy forms and to refurbish their housing. Local craftsmen, energy advisers and financial institutions are integrated in the activities in efforts to make it easier for citizens to decide and to try to create combined solutions for the local area.

The aim of these climate villages is to make experiences on how to engage rural areas and small villages in climate policies and at the same time make experiments with cooperation and partnerships among craftsmen, advisers, finance, and energy companies on energy and refurbishment projects.

Discussion – climate governance forms in municipalities

Climate governance – shaped in local policy and contexts

The cases give evidence of municipalities taking different approaches in their climate- and energy work leading to different concepts of local climate governance.

One part of the differences relates to policy process and policy contingency; as an outcome of specific political processes in the individual municipality affected by such aspects as a) Grade of lock-in in existing administrative/planning regimes and governance structure, b) Differences in interpretation of climate change
and different vision (images) of low carbon societies – low carbon future, c) Attachment of specific meaning to the climate challenge implying differences in how climate policy is translated to and linked to other local political projects, d) Strategies developed/adopted vis-à-vis local opportunities and interest (positions) of local actors/stakeholders, and e) Transition strategies adopted in implementation of local reduction of GHG emissions. In terms of governance structures, outcome contains shallow add-on climate governance in terms of single issue projects or weak departments of climate undertaking climate governance within the confines of the existing administrative and planning regime (climate policy is adopted but no real integration has taken place). But outcome ranges all the way up to the development of radical new local governance structures designed to integrate local actors in deliberate transition processes (climate policy adopted as core policy and being integrated in policy fields, and guiding a reflexive restructuring of both governance forms and local socio-technical systems (construction of intermediary organizations).

The other side of the differences relates to specific local context, where municipalities take advantage of (are restricted) by specific local configuration of actors, competences/technologies, local culture, local natural resources, infrastructures, etc.

Subject to such differences in local policy processes and local context, municipal climate governance and action evolves as situated transition places (Holm et al 2010) and as a source of variety both of governance forms and reconfigured socio-technical systems, a variety which can be seen as an innovative contributing to an overall transition process towards a low carbon societies.

**Climate governance – as local political projects**

Local climate governance is political projects for municipalities. In obtaining local support for climate programs municipalities in most cases have to engage in strategic projects for linking climate initiatives to other political projects and agendas and to local interest. The cases show how local climate efforts in different ways have been inscribed in other political fields.

First of all, it is obvious that energy savings also imply economic savings. When the municipality as part of their climate strategy examines their own buildings with the objective to reduce energy consumption, they also serve the goal of improving the municipal budgets. Some of the differences in municipal strategies can be explained by the differences in economic benefits from refurbishment (e.g. while Kolding has had a steady energy improvement policy, which means that there are few “low-hanging fruits” to find for an ESCO-company, the opposite was the case for Middelfart, where the buildings were in a rather bad conditions in need of refurbishment and with potentials for high energy savings).

Another local benefit from implementing climate policy goals can be that an active green policy might attract young, innovative, wealthy inhabitants. This can be the case for Egedal municipality, where the new local districts with high green requirements have had no problems in attracting inhabitants. In Sønderborg municipality, the brand of being a high-profiled climate community was expected to attract tourists and innovative high-skilled workers. In Lolland, the strategy of becoming a CO2-neutral island and to pave the way for companies to experiment and test their equipment in energy is an explicit strategy for development of the predominantly rural and low-income area.

Differences in strategies and motives would be interesting to pursue in further analyses. It is obvious from the cases that the local conditions play a dominant role for which strategic policies that are pursued. The intermediary organisation in Sønderborg is created in a strong interaction with local companies led by Danfoss (international producer), while Middelfart with only small companies takes another route. Køge has
a long cultural tradition for many active NGO’s and a vivid Agenda-21 prehistory, while other municipalities have to build new capacities and new organisations.

Also differences in conditions of availability of natural resources and infrastructural conditions play a huge role: Samsø and Lolland are islands with a lot of wind and biomass resources, and have the option to declare themselves CO2-neutral, while other municipalities have much less resources and are dependent on the energy they can receive from other areas.

In this way a great variety of innovative ideas are developed and pursued in the frontrunner municipalities. The ideas of how to obtain local synergies and twist the governance structures to fulfil climate policies can be used and transferred to other communities and to other policy levels. This happened for instance with the requirements of low-energy standards in local district plans, which was legalized by the government and taken up in several municipalities after Egedal had shown the way.

However, as Bulkeley (2010) notes, this also points to the limitations in following a policy strategy based on frontrunner municipalities. Firstly, it is only climate mitigations options, which have a kind of positive synergy effect in the local community, that are pursued. As we can see from the examples, the municipalities are selectively taking up certain climate policies; they are not addressing all the available options. Furthermore, the strategies may not be sufficient attractive for the so-called laggards, so they will never reach the standards of the frontrunner municipalities. Secondly, many of the innovative projects rely on ‘first-mover’ funding, that is given to these project, because they are new, which means that the next municipalities wanting to do the same project, cannot find funding! The frontrunners so to speak compete on the available funding from EU and national funds.

The other policy levels thus cannot rely on these frontrunner municipalities alone to develop climate policy, but they can learn from the experiences and based on the experiences create frameworks to support further experimentation and diffusion of the governance forms.

**Climate governance – capacities for mobilising local actors**

The cases show how the frontrunner municipalities strive to expand the governance forms available to them in order to obtain climate policy goals. Municipalities undertake an enabling and strategic role in relation to a reconfiguration of local socio-technical systems, often in a way where they build on and expand their traditional roles in relation to planning, provision of services, administration, etc. This use of and expanding the scope the different municipal roles in climate governance is in accordance with the findings by Bulkeley (2011) and in studies of experimental construction (Holm et al 2011).

The cases furthermore show new forms of inclusion of the energy-, housing and construction sectors: as partners in networks, as co-operators, as dialogue partners in communal (joint) development plans, but also by involving them in the process of creating shared visions of future development and requirements, and in this way formulate directions for innovations and planning, both in companies and among other stakeholders.

Climate and energy efforts and the new governance forms of municipalities developed in the energy – housing field can be seen as part of a transitional process, where local socio-technical systems are reconfigured; new combinations of actors, institutions and technologies are developed as an effect of specific local projects or strategies/programs or as deliberate redefined local structures. In a transition perspective, development of new governance does not only concern the capacity building of the municipalities as political and administrative entities, but also concerns the development of capacities in the local energy- and housing
systems as such. A capacity building bringing local actors and stakeholders together in networks structured by new agendas and new technology platforms.

An essential part of municipality climate governance is such deliberate, strategic efforts to shape new local configurations of actors (new forms of local business techno-systems, intermediary organisations) capable to carry through local transition processes to low carbon communities. Taking this extended perspective on municipalities as experimental arenas of new governance forms in relation to climate and energy, and on the capacity building, four major modes of governance for public-private interface on socio-technical systems can be outlined:

1. Building local competences and institutional capacity in the municipality: Building up knowledge and organizational space of manoeuvre for setting strict eco- and energy requirements in rules, tenders, plans and technical performance demands to: Construction, energy supply, materials, insulation, energy use, water supply etc. This is done in order to put a pressure on the main stream development of business and technology and facilitate experimentation.

2. Networking for market based experimentation: Building up negotiation capabilities for flexibility and governance in dialogue with large companies or housing co-operations. Companies, cooperative housing societies and public building owners may by this networking urge the creation niches for socio-technical experiments. The municipal administration may give regulatory space of manoeuvre to unfold the experimentation.

3. Enabling corporations and finances to create a new market on well-known technologies: By campaigns and cooperation with construction businesses, and by dialogues with finance sectors this strategy is an effort of leave-it-up-to-the-market, but by deliberately forming focussed campaigns and services on e.g. refurbishment. This may be urged by CO₂ emissions mappings, climate surveys, purchase of energy saving services and equipment etc. from consultancies and industries (E.g. ESCO concepts).

4. Participatory strategies for the shaping of shared visions: Discursive strategies with use of positive storylines about a new envisioned community, where all sectors contribute to create a more harmonious nature-energy-community balance. A lot of efforts are used in creating voluntary climate policy groups, incorporating business communities in deliberation. The strategies also covers public-private initiated CO₂ management regimes among companies, the making of a certain local climate brand of the municipality as a pioneer in renewable energy, energy efficiency, or in energy savings in institutions, constructions etc..

Acting from these positions, municipalities as a strategic actor co-shape local and national socio-technical networks. They are not to be seen as mutual exclusive forms, they can co-exist and often they need to be combined: networking for market based experimentation would also take some efforts on shaping a shared vision of the included stakeholders.

Climate governance – Building of local capacities and new governance structures

The cases give evidence of municipalities taking innovative different approaches in their climate- and energy work. The sample of cases documents that (besides inclusion of external actors) development of hybrid forms of organisations, and building of new capacities and competence in the organisation, are essential elements in implementing local, municipal climate policies. Local climate governance takes development of new local governance structures. It involves:
• Building capacities in their political-administrative organisation and reshaping the organisation to become flexible and ready to participate in projects with other actors in network activities
• Building intermediary organisations to perform activities, attract funding and involve stakeholders in decisions. In some municipalities these organisations are built mainly by local NGO’s in a LA21-tradition (e.g. Køge), in other municipalities they are built by strong local stakeholders to fulfil local development goals (e.g. Sønderborg), and other types of organisations are also seen dependent of local actors and options (e.g. Lolland).
• Enabling the building of capacities in local networks among e.g. energy advisers, attracting companies and experts to the area, supporting local engaged citizens and innovative ideas and projects (e.g. Næstved).

In the individual municipality we may have a concurrent development in all three dimensions, experiencing a parallel and corresponding development of internal capacity in the municipality, building of intermediary organisations, and reconfigured local networks and socio-technical system. Sønderborg is an example of such an attempt to shape new local governance structures and division of work, designed to carry through local transitional processes.

New governance forms in a transition perspective

In the studies of municipality climate and energy efforts and the new governance forms in the energy – building/housing/construction field, we have seen the efforts as becoming part of a transitional process, where local socio-technical systems are reconfigured; new combinations of actors, institutions and technologies are developed as an effect of specific local projects or strategies/programs. The ability of climate and energy policies of municipalities to deliver energy saving and transition to renewable energy is important, but equally important is how local strategies on climate and energy co-shape local (and national) socio-technical systems. Policy agendas also have to be discussed and assessed in this perspective.

In this perspective, development of new governance does not only concern the capacity building of the municipalities as political and administrative entities, but also concerns the development of capacities in the local energy- and housing systems as such. A capacity building bringing local actors and stakeholders together in networks structured by new agendas and new technology platforms. These local configurations have to be seen in a dual perspective: a) as local transitions both in terms of new technologies and reconfigured and developed local socio-technical systems, and b) as configurations serving as situated transition places fuelling an overall transition of socio-technical systems.

In some cases the municipality is mainly oriented towards a transition of the local industry to support their capacity building and innovation in order to prepare them for future local and global demands on more energy-efficient methods and products. This is explicitly the case for Næstved and Middelfart. In other cases the municipality is not specifically oriented towards the local industry, but more towards creating capacities in the municipality and among other building owners to make green specifications and thereby influence the construction sector in general by influencing the market, as e.g. Køge and Egedal.

Other ways to influence the construction and housing sector is seen in the spectacular and innovative building projects that are established, and where the municipality often takes an enabling and supporting role. Here the municipality of Køge with the “houses of the future-project” is an example of a project that may serve as experimenting zone, creating niches for development of new technologies. Also Næstved and Sønderborg can show innovative passive house building projects. In this way the municipalities support experimentation that may influence the socio-technical system in general.
Climate governance – the multi-level perspective

Municipalities are embedded in and are acting within multilevel structures; it provides both obligations/opportunities and restrictions on local climate action. Part of the building of local capacity for climate governance is related to implementation of programs laid down in national or international (EU) regulation and programs. In parallel, development of a local municipality capacity to reconfigure local socio-technical systems and transform of local infrastructure requires that national and international policies provide frameworks and mandates municipality to act on local socio-technical system (e.g. are mandated to perform strategic energy planning).

Here the cases show that municipalities need support from other policy levels in their efforts to contribute to transition of the construction sector. National policy could enforce and develop policy instruments that could support the possibilities for local municipalities to contribute to transition, e.g. by creating incitements for building owners to initiate energy-renovation, setting stricter demands in the building regulations, raising obligations for energy companies to save energy in private houses, demanding energy-certifications for construction workers etc.

In parallel national and international regulations could provide strategic programs on low-carbon transition (as intended in the work of ‘Klimakommissionen’ and in the ‘plan 2050). Stronger programs could both provide means of coordinated local efforts (avoiding a diffuse process of uncorrelated local projects) and it could stage a more active use of the local arenas for experimentation and cooperation and support dissemination of good ideas and methods among municipalities. There is a need of policies that could multiply and target the efforts and promote initiatives, innovations and investments in transitions to low-carbon-technology

Conclusion: Role of municipalities in climate governance for transition

All the described examples show an important aspect of the strategic role of municipalities, both in regard to the local and general socio-technical system, namely that the municipality has a unique position as the local authority and democratic institution, which can coordinate and facilitate a formulation of visions and shared goals for future development. We have seen how a main part of the Danish municipalities at least make efforts to formulate goals and strategies for a transition to low-energy housing and energy-renovation as part of climate strategies and thereby set up goals for the future construction industry and the development of the combined energy housing/construction system. The frontrunner municipalities show examples of how the municipalities can take a lead in expressing and disseminating guidelines and requirements to sustainable and low-carbon building, thus supporting visions and experimenting in future building techniques.

The roles of municipalities in the low-carbon transition in relation to the energy, construction and housing sectors can be summarised in 3 main points:

1. The municipalities may play active roles in the climate governance as transition agents in transition of local socio-technical systems as e.g. the construction-housing sector. The role can be characterised as a strategic actor role, on the one hand in creating climate governance forms that in a synergistic way combine several political aims and mobilise specific local cultural, economic and natural conditions. On the other hand municipalities have a role in its effort to influence local and/or over-all socio-technical systems.
2. The municipalities expand the available governance forms to include climate policy goals and by including local actors in governance structures, with the aim to facilitate that they participate and contribute to the shaping and achievement of climate policy goals. Furthermore, municipalities in their organisations and governance develop capacities and resources to initiate climate related activities and create local networks capable to participate in transition processes. Municipalities are in the process of capacity building and development of governance structures, either in their own organisation or by supporting and participating in intermediary organisations that can attract resources and perform transition activities.

3. The municipalities can play a role in the shaping of local transition places. These places can influence the local as well as the overall socio-technical systems by exploring different governance forms, technical solutions, or reconfiguration of socio-technical systems: Municipalities may facilitate the formation of such arenas in many ways: supporting market demands, influencing companies, creating spaces for local experimentation, or promoting the formulation of shared visions and future goals for the socio-technical transition.

**Concluding remarks**

We have argued that local climate policy, including energy saving and implementation of alternative energy, has become a new main local policy field, a policy field which places important obligations and challenges on local government. Throughout the paper we have examined how municipalities develop new local governance efforts for climate mitigation and analysed how these efforts contributes to the development of local transition places; local climate policies are seen as in a stage of experimenting and learning both in relation to develop efficient climate governance and in relation to, how it can be linked to local growth and development.

Development of local climate governance has been addressed in a dual perspective, as a concurrent reconfiguration of (multi-level) governance structures and local socio-economic systems. In this we have assigned an independent role as climate agents to local agents and municipalities in both in relation to development of climate governance concepts and performing of transition to low-carbon societies.

We have emphasised the role of municipalities as strategic transition agents, asserting that they are more than mere places of implementation of transitional policies and more than locations for transitional experimentation. Local efforts for climate mitigation can be seen as a strategic terrain for development of policies, solutions and transitional processes.

Reduction of CO₂-emission and transformation of social-technical energy systems has a complexity and a dependency of local context (bio resources, companies, energy systems, technologies, build environment etc.) and of specific local actor constellations of transition (NGO’s, entrepreneurs, companies), which imply that there can be high potentials in defining and implementing local transition strategies.

Local climate governance has been perceived and analysed in a transition perspective, defining local climate policy as a policy field aimed at building local capacity for shaping and reconfiguration of local socio-technical systems. Based on this perception we have argued that local climate governance demands a reconfigured regulation and governance structure. We call for a policy aiming of supporting and utilising local climate actions and projects as transition arenas, taking advantages of the diversity and learning in local socio-technical projects and experimentations; a deliberate transition policy capable of facilitating local experimentation and its interaction with overall transition projects.
In the studies of Danish municipalities, we have experienced a diversity of local governance structures ranging from intermediary organisations (Sønderborg) to embedded capacities in the municipal organisation. Part of these differences can be ascribed to competing discourses of climate governance ranging from rationalistic planning approaches to transition strategies shaping local coalitions and socio-technical system. The studies, however, also indicate limitations in local climate and transition governance due to lacking or mismatched national (and European) framework – still structuring scope of local transition places.

In a research perspective local climate governance is recognised as an important field for future studies, both to understand the dynamics of reconfiguring governance forms and socio-technical systems. It concerns a contemporary redefinition of fundamental production and consumption structures, our ability to conduct necessary transformation processes and obtain a low carbon future.

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