What about local climate governance? A review of promise and problems

Sippel, Maike and Jenssen, Till

IER - Institute of Energy Economics and Rational Energy Use, University Stuttgart

November 2009

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Discussion Paper
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Abstract

A large proportion of greenhouse gas emissions is produced in urban areas, particularly in high income countries. Cities are also vulnerable to the impacts of climate change, and particularly so in developing countries. Therefore, local climate policies for mitigation and adaptation have to play an important role in any effective global climate protection strategy. Based upon a systematic literature review, this article gives a comprehensive overview of motivation and challenges for local climate governance. A large part of the literature focuses on mitigation and cities in industrialized countries. The review also includes the smaller and emerging body of literature on adaptation and cities in developing or industrializing countries. Motivations and challenges we find fall into broad categories like 'economic', 'informational', 'institutional', 'liveability' or 'political/cultural'. We conclude that the mix of motivation and challenges is city-specific, and that the national framework conditions are important. It matters, whether cities engage in mitigation or adaptation policies, whether they are located in developing, industrializing or industrialized countries, and at which stage of climate policy-making cities are. For many cities, cost savings are a primary motivation for local mitigation policies, while perceived vulnerability and a commitment to development is the primary motivator for adaptation policies. The collective action problem of climate protection (also known as 'Tragedy of the Commons') and inappropriate legal frameworks are key barriers to mitigation policies. Challenges for adaptation include financial constraints, and a lack of expertise, cooperation, leadership and political support.

Understanding their specific motivation and challenges may support cities in developing appropriate local climate action plans. Furthermore, the understanding of motivation and challenges can inform other policy levels that want to help realize the local climate protection potential.

Keywords: Climate policy, local authorities, mitigation, adaptation, energy, cities, local climate governance

Maike Sippel [1], Till Jenssen [2]

[1] maike.sippel@ier.uni-stuttgart.de and maike.sippel@gmx.de

[2] till.jenssen@ier.uni-stuttgart.de

Both authors:

IER – Institute of Energy Economics and Rational Energy Use, Department System Analysis and Renewable Energies; University of Stuttgart

Hessbruehlstr. 49a, 70565 Stuttgart, Germany

1. Local policies for global problems?

Cities affected by climate change and cities producing greenhouse gas emissions

Climate protection is an urban issue in two ways: Firstly, people living in urban areas, and in developing country cities in particular, are vulnerable to the impacts of climate change. Large coastal cities such as Buenos Aires, Hamburg, London, Mumbai, New York, Shanghai, St Petersburg, and Tokyo are at risk from rising sea levels (Stern 2006). Loss of glaciers in the Himalayas or the Andes is putting the water supply of hundreds of millions in peril, including cities such as Calcutta, New Delhi, Quito, LaPaz, and Bogota (UNEP / World Glacier Monitoring Service 2008). Extreme weather events like the heat wave in Europe in the summer of 2003, may hit hardest on the urban population (Sippel 2008). Secondly, a high proportion of greenhouse gas emissions originates from urban activities, [1] particular in high income countries.

Relevance of the city level

Regardless of the urban dimension of climate change, so far the climate policy debate has focused primarily on the international level, and negotiations of the UNFCCC, Kyoto Protocol, and an agreement for the Post-Kyoto era. The debate has often neglected the implementation level of climate policies which is the local level. Emissions from energy use, transport, industrial processes or waste management are produced in cities, and urban planning, infrastructure and local emergency management are instrumental to build climate resilience. There is probably a need for national and international mitigation policies such as carbon taxes or emission trading schemes – and such policies can make the realization of local mitigation policies easier (Collier 1997). Local adaptation activities, too, may benefit from support of other policy levels (Mukheibir, Ziervogel 2007, p156). However, there are good arguments for climate governance on the local level: (1) Local authorities have responsibilities in relation to topics like land use planning or public transportation, which can help them to implement mitigation activities. (Dodman 2009, p198). (2) Cities are the policy level closest to the people. They may thus be best suited to mobilize people's support for the type of economic and societal transformation needed to achieve large emission reductions, and for inclusive adaptation policies (Jones et al. 2000, p210; Lutsey, Sperling, 2008, p674). (3) Climate protection needs localized mitigation and adaptation policies. The city level allows for tailored and specific actions that are based on local expertise (Lutsey, Sperling, 2008, p674). (4) The concentration of people and business as well as high settlement densities in large cities may provide the opportunity for technological innovations e.g. combined heat and power energy supply (Jenssen 2009, p183). Cities may also be a breeding ground for

[1] There is no universally accepted definition of which emissions should be attributed to a city, with some inventories based on emissions from urban production and others based on urban consumption (Dodman 2009, 194ff). Depending on the definition chosen, the share of urban greenhouse gas emissions worldwide is estimated to be between about 30 and 40% and up to 75 or 80% (Satterthwaite 2008, p539, 543).

policy innovations. They offer a 'test market' for creative and experimental climate policies (Alber, Kern 2009, p2; Lutsey, Sperling, 2008, p674; Dodman 2009, p198).

Stakeholders and modes of governing

A variety of local stakeholders may contribute to climate protection activities. Local authorities may involve citizens and civil society groups, local business, scientists, the media, and professionals e.g. in the building sector (Carmin et al. 2009, piii; Fleming, Webber, 2004, p765; Schröder, Bulkeley, 2009, p359; Tanner et al. 2009, p43). Bulkeley and Kern (2006, p2243) have identified different modes of climate governance for a local authority. These are:

- self-governing (e.g. measures targeting a local authority's own buildings and fleet, or green procurement),
- enabling (supporting other stakeholders, e.g. by information campaigns or subsidies for green buildings),
- provision of services (like energy supply, waste management and public transport), and
- authority (e.g. by establishing energy efficient building standards for new constructions or by introducing a congestion fee for motorized travel in the city center).

Achievements

While there is a significant potential for local climate protection, and various modes which can be instrumental in realizing it, the potential of local climate protection seems to be far from being realized. The number of cities engaging in adaptation activities is still very limited and mitigation achievements are rather poor – although local mitigation activities have become more common over the last two decades.

In the Asian mega-cities Tokyo, Beijing, Shanghai and Seoul, most local greenhouse gas policies seem to be reactive, short-term and ad-hoc, rather than proactive and long-term (Dhakal 2004, p82). In the United States, while more and more cities do adopt reduction targets, those cities' actual mitigation performance "falls far short of the much deeper long-term cuts that will be needed for global climate stabilization" (Lutsey, Sperling, 2008, p683). Cities in the United Kingdom seem to have moved forward in areas where they have direct control, while "more complex and strategic activities such as energy policy [...] and greenhouse gas emissions inventories and targets [...] show little progress." (Allman et al. 2004, p276). These findings are supported by Bulkeley and Kern (2006, p2242), who report that in Germany and in the UK the "majority of measures undertaken in relation to climate protection are concentrated in the self-governing mode and in the energy sector, in particular in the energy management of municipal properties." However, emissions from municipal buildings usually represent only a small share of a city's overall emissions, e.g. in the range of 2-5% in German cities (Kern et al. 2005, p83). In contrast to the limited achievements in most

countries, the example of Sweden between 1970 and 1990 shows that a 40% cut of CO_2 emissions over a 20 year period is possible – in the case of Sweden enabled by fiscal mechanisms like CO_2 and gasoline taxes, subsidies for renewable energy sources as well as energy conservation (Collier, Löfstedt 1997, p31).

It seems, that while there is a large urban climate protection potential – both for adaptation and mitigation, to date this potential is far from being realized. This is alarming in the light of IPCC reports which show that deep emission cuts will be required in order to limit the adverse effects of climate change. This leads us to two questions:

(1) What drives local climate governance?

(2) Which barriers do local climate policies face?

Based on a literature review on local climate protection activities, this article provides an overview of motivations and challenges for local climate policies. The review is based on more than 90 articles and other publications. The literature reviewed includes surveys of over 4,000 cities and case studies from all continents. The articles were selected by the authors in such a way as to cover different geographic regions, both mitigation and adaptation governance, and different research disciplines.

The article is structured as follows: (2) briefly describes the conceptual framework guiding the research, (3) and (4) discuss motivations and challenges for local climate policies, (5) provides results and (6) some conclusions.

2. Research design

Conceptual framework: motivation and challenges

This article analyses case studies, surveys and other academic literature on local climate governance by using the concept of motivation and challenges. On the one hand, cities and local policy makers may have a certain motivation to implement climate policies. On the other hand, the limited achievements of local climate protection activities suggest that local climate governance faces challenges or barriers. Motivations can be broadly categorised into 'economic', 'informational', 'liveability' and 'political/cultural'. Barriers can be classified as 'economic', 'institutional', 'informational', and 'political/cultural'. Motivations and barriers may belong to more than one of these categories. For example, one of the barriers identified is 'path dependency', which has both a political/cultural and an economic dimension. There may be a relationship between specific motivation and barriers. For instance, financial considerations play an important role, both when the 'cost-saving' argument serves as a motivator for local climate governance, or when climate action is hindered by costs of climate policies and limited financial resources. One would assume that cities with scarce financial resources are particularly keen on realizing cost-savings through their climate action.

However the relationship and interdependence between motivators and barriers is not always that clear.

Adaptation and mitigation, and low, middle and high income countries

Much of the literature focuses on local mitigation activities in high income countries. However, there is a growing body of studies that do include experiences from local adaptation policies, as well as local mitigation policies in low and middle income countries. This is partly a consequence of climate change impacts beginning to affect cities, and adaptation becomes ever more important for local policy-making. Furthermore, cities in rapidly developing countries such as Beijing or Shanghai in China already do have per-capita emissions that are as high as in cities in industrialized countries (Kennedy et al. 2009, table 3). Those cities will need to contribute to global mitigation efforts, soon. The article includes material on adaptation, and on mitigation in low and middle income countries. Due to the limited amount of research in these areas, the findings for adaptation and mitigation in low and middle income country cities are less robust than those for local mitigation activities in industrialized countries. Adaptation activities like flood protection may also be already taken by cities, without being declared and perceived as 'climate action'. Such adaptation activities may not be documented well in the body of literature on local climate governance.

Under a conceptual framework of motivation and barriers, one needs to differentiate between adaptation and mitigation: While results of adaptation activities benefit a city directly, the reduction of greenhouse gas emissions contributes to global efforts to stabilize emissions in the atmosphere. Therefore, one would expect to find different motivations and barriers for mitigation and adaptation policies of one and the same city. The development background of a city may matter, too. Probably, it makes a difference, whether a city is in a low, middle or high income country. Furthermore, there may be a difference between cities in an early stage of local climate governance and cities that are more advanced. The literature is somewhat biased towards the latter, i.e. more advanced cities, as they are more frequently subject to case studies.

3. Motivation of local governments

The following section summarizes motivators for local climate governance as identified in the literature on local climate policies. We follow a definition of Qi et al. who define the motivation of a local government as "the collective expression of the motivation of key government officials, that is, top leaders in the government." (Qi et al. 2008, p390). Of course, the motivation of local governments differs, and the mix of motivators is specific for each city. For example, it may depend on geographical and development background, economic structure, social setting, or preferences of individual key decision-makers. Differences in motivation may also depend on the given legislative framework in a country.

Take for example Germany, were government officials are elected by local citizens, and China, were government officals are selected by higher government levels. While German local politicians gain political (and thereby economic) rewards by meeting the wishes of their citizens, the careers of Chinese local politicians depend on how well they meet upper-level governments' demands.

A lot of the articles and studies reviewed do not elaborate on the motivation of cities explicitly. However, the narrative of a city's climate governance does often include hints on a city's motivation.

Table 1 provides an overview of the motivators identified. This list of motivators is not inclusive. The selection mainly followed the frequency of citations in the literature, and other motivators certainly exist. Other motivators include altruism, as reported from Toronto, Canada. City commissioners in Toronto said they were motivated by a concern over the general well-being of future generations for the next several centuries (Lambright et al. 1996, p467). Although altruism is not frequently cited in the literature, one may well imagine that altruism is a motivator for individual city officials to promote the climate issue on the urban agenda.

Table 1: Motivators for local climate governance – Overview

Economic	Liveability	Political / Cultural	Informational
Cost savings Revenues Smart growth	Air quality Traffic congestion Urban warming Social aspects	External pressure and trickle down Internal pressure Reputation Trend-setting	Perceived vulnerability

Source: Literature review

Adaptation – Mitigation

The analysis of motivators for local climate governance has to distinguish between mitigation and adaptation activities. Because the greenhouse effect of emissions occurs globally and independent of their place of origin, local mitigation measures lead to very small benefits for everybody in the world. Significant emission reductions can only be achieved by collective action of cities and nation states all over the world, and each city will benefit from such emission reductions – also if it refused to participate in the mitigation effort. In contrast, local adaptation activities address local climate change impacts like flooding, heat waves or heavy rainfall. These impacts are already affecting communities today. Therefore the benefit of adaptation activities can be direct.

Local Co-benefits

As explained above, mitigation policies are connected to a collective action problem (Tragedy of the Commons). It is therefore not surprising, that local co-benefits play an important role as motivators. According to Schreurs, "Local government climate change actions are usually framed to aid with achieving multiple goals at once (e.g. energy efficiency in China or job creation through retrofitting of buildings in German cities)." (Schreurs 2008, p353). The international city network ICLEI (Local Governments for Sustainability) has experience with climate governance in over 1,000 cities members to its Cities for Climate Protection Campaign (CCP). It concludes that co-benefits may often be the primary reason for taking emission reduction action (ICLEI 2008, p6). Similarly, and in the earlier years of research on local climate governance, Lambright et al. found that local mitigation policies had a greater constituency, when the city of Toronto, Canada began to take their co-benefits into consideration (Lambright et al. 1996, p469). Interestingly, the *perception* of co-benefits may be more important than their actual realization, as "local governments do not typically attempt to value or quantify them." (Kousky, Schneider 2003, p370).

3.1 Economic motivators

Cost-effectiveness of climate policies is an important criterion for city officials. While measures may lead to direct cost savings or even generate revenues, they may also have economic benefits that are more difficult to quantify – summarized in this section under 'smart growth'.

Cost savings

Local climate protection activities can result in cost savings. For example, energy efficiency measures can reduce operating and maintenance costs, and thus lead to considerable economic savings. Such cost savings seem to be a powerful motivator for local climate governance. According to Betsill "Cost-effectiveness is the ultimate criterion on which city councils [*in the US, note by the authors*] make budget decisions. It is thus important for city officials requesting money for climate related projects to demonstrate the economic benefits." (Betsill 2001, p401). The cost saving argument seems to motivate climate action in cities all over the world: It is reported for the Canadian city of Toronto, which has taken early climate action (Harvey 1993, p16; Lambright et al. 1996, p468), as well as for cities participating in ICLEI's Cities for Climate Protection Campaign in the US. For the latter Kousky and Schneider find that for 19 out of 23 cities analysed, cost savings were the reason to take climate action (Kousky, Schneider 2003, p365f.). Kern et al. analysed three German cities which are perceived as climate champions. They explain the success of these cities with the fact that they have consistently linked climate policies to cost-reductions (Kern et al. 2005, p88). Chinese local governments follow the same pattern when they strive for energy savings rather

than ghg emission reductions: According to Qi et al., "local governments show no sign of willingness to actually cut emissions to lower levels but rather simply to reduce the rate of growth in energy consumption." (Qi et al. 2008, p394).

Part of the measures that result in both emission reductions and cost savings do not require upfront investment. For example, municipal staff may be asked to switch off the light, when they leave their rooms, or a local authority may switch to another electricity tariff which provides electricity that produces fewer emissions at the same cost. Other cost saving mitigation measures require some upfront investment, and financial benefits are realized over the long-term, only. Evidence from US cities shows, that cities choose such measures, if they have short payback periods with typically no longer than 5 or 10 years (Kousky, Schneider 2993, p365f.).

Cost savings may also include costs avoided at a later stage, e.g. by "designing new buildings to minimize energy use rather than having to retrofit them at a later date." (Harvey 1993, p16). This is especially true for cities in rapidly developing countries, with mass construction taking place. In China for example, more than one half of the 2015 residential and commercial building stock is expected to be built after 2000, and the construction process may lock in energy waste for the future (World Bank 2001, p7ff). Bai assumes that inefficient buildings built in China today will require energy-efficiency-retrofittings in the future. Therefore local authorities and other stakeholders in China could realize significant cost savings if building energy efficiency measures are installed when the infrastructure is built today, rather than retrofitting them at a later stage (Bai 2007, p10).

Revenues

A local government may also see a possibility to increase its revenues by implementing climate policies. In the city of Toronto, increased tax revenue for the city was one of the primary motivators for the political level (Lambright et al. 1996, p468). Local governments in low and middle income countries may also be able to attract external funding from international and bilateral aiding agencies. For mitigation activities, they may need to show the global benefit of their policies (Bai 2007, p9). For adaptation activities, international public funding may be available from bilateral donors, or through the UNFCCC's Adaptation Fund. The flexible mechanisms of the Kyoto Protocol may offer opportunities for cities to generate revenues by implementing emission reduction projects. For example, Chinese cities are reported to see a market for profit in developing mitigation projects under the UNFCCC's Clean Development Mechanism (CDM) (Qi et al. 2008, p394).[2] Sippel and Michaelowa (2009) apply the concept of motivation and barriers as presented in this article to the CDM. They analyse how the CDM is taken up by local governments, and find that only about 1% of submitted CDM projects include municipalities as project partners. They conclude that the

[2] Under the Clean Development Mechanism (CDM) of the Kyoto Protocol emission reductions from projects in developing countries can be financed by industrialized countries. Industrialized countries can then subtract such emission reductions from their Kyoto targets. As a precondition, such projects must be 'additional' to a business as usual scenario.

financial incentive for municipalities may not be strong enough to overcome barriers like complexity and length of the CDM project cycle.

Smart growth

Local governments have also believed that climate policies enhance 'smart growth'. Some of them see direct employment opportunities, and the possibility to create jobs has been a motivator for energy efficiency projects (Betsill 2001, p397). More broadly, local governments have hoped to improve business competetiveness and enhance the local economy by pursuing an urban climate agenda (Fleming, Webber 2004, p763). The city Baoding, in Hebei Province in China believes new market opportunities are created by climate protection: "The mayor and his colleagues recognized that decarbonization of the world economy provides opportunities for the development of low-carbon industries. They decided to make manufacturing of renewable energy equipment a top priority of their industrial development." (Qi et al. 2008, p396).

Local adaptation activities can also be motivated by the conviction that they present a "secure development path" (Carmin et al. 2009, p19). In the adaptation context 'smart growth' is not primarily refering to economic development, but rather to the development of climate resilient settlement patterns and infrastructures.

3.2 Political motivators

Local government officials may receive political rewards for enacting climate policies – either because they meet external or internal pressure, or because they enhance a city's reputation or act as a trend-setter.

External pressure and trickle down

External pressure on local governments to adopt climate policies may take different forms on a scale from 'hard' to 'soft'. On the one hand, the legislative framework may directly require local governments to take climate action. On the other hand, pressure can also mean a process of norm diffusion via trickle down. Often the way external stakeholders influence a city's climate governance lies somewhere inbetween the two extremes.

Sometimes, national government action has provided an impetus for municipal governments to act on climate change. For example, Schreurs finds that in China "the establishment of local climate action strategies is largely a response to central government expectations and demands" (Schreurs 2008, p352). Bulkeley et al. find that the impetus from national government has created political space for local climate governance in South Korea and China in particular (Bulkeley et al. 2009, p74f.). Dhakal's findings for Tokyo go in the same direction: "direct and indirect pressure from the national government's Kyoto commitment [...] has created a favourable situation for local policy makers in Tokyo to act." (Dhakal 2004,

p86). In the UK, local governments responded to national legislation which requires them to prepare strategies to improve energy efficiency or to reduce fuel poverty (Fleming, Webber, 2004, p763).

Bulkeley et al. 2009 describe the 'trickle down' of policy targets, both from national targets and through transnational municipal networks such as ICLEI's Cities for Climate Protection Campaign, Climate Alliance or C40. Norm diffusion may also go from the local level via the national back to local governments: In China, the central government's demand for the preparation of local climate action strategies is believed to have been inspired by cities' climate protection activities all over the world (Schreurs 2008, p352).

Up to now, no external requirements are reported for cities to engage in adaptation activities. However, trickle down may also be effective in the case of adaptation: Analysing adaptation in ten Asian case study cities, Tanner et al. find that national engagement in international climate policies and mitigation activities may well be linked to local political support for adaptation activities (Tanner et al. 2009, p41).

Internal pressure

Internal pressure comes from stakeholders within a city. For example, public sensitivity is said to have supported local climate policies in Tokyo (Dhakal 2004, p86). For the US, Zahran et al. (2008, p559) observe that "well-educated, politically liberal, urban communities, with a strong record of environmental activities, appear more supportive of policies to mitigate the adverse consequences of climate change." Brody et al. identify the number of environmental NGOs to be an important motivator for joining the US Cities for Climate Protection Campaign: "[...] a county is alsmost 3 times more likely to join the CCP campaign for every additional environmental non-profit located within its jurisdictional boundaries." (Brody et al. 2008, p37). This is somehow contradicting findings by Kousky and Schneider, who studied the motivation for US cities to engage in local climate action about five years before Brody et al.: They found citizen and NGO pressure to be a relevant motivation in only 2 out of 23 US CCP cities interviewed (Kousky, Schneider, 2003, p361).[3]

For adaptation, local governments may also be motivated by internal pressure, as there is a "need to protect property and residents from natural disasters" (Carmin et al. 2009, piii). It may be assumed that the failure to take adaptation action will sooner or later lead to pressure by residents who fear for their well-being and property.

[3] The difference might be due to
a) changes in the composition of CCP cities over time, with more cities being motivated by NGO pressure today, than five years ago,
b) a difference between what city officials believe drove their climate activities, and the links between numbers of environmental NGOs and the adoption of climate policies that can be demonstrated in the statistics,
c) a difference between participation in the CCP on the one hand, which may well be motivated by environmental NGOs (and which does not necessarily come with emission reduction policies), and emission reduction policies on the other hand, which may well be motivated not by NGO pressure but by cost savings,
d) there may be more environmental NGOs in cities that are more likely to adopt climate policies anyway, without there being a causal effect of NGOs leading to stricter climate policies.

Trend-setting

The desire of cities to inspire and encourage activities by either their nation states or other cities can be referred to as 'trend-setting'. The ability of environmental trendsetters to influence agenda setting beyond their own borders is called the 'California effect'. The phenomenon has been wide-spread in the US, where several federal states and numerous local governments started to take climate action out of frustration about the Bush administration's withdrawal from the Kyoto Protocol (Schreurs 2008, p350). A core reason for them to get active was to "encourage or influence more widespread federal action" (Lutsey, Sperling 2008, p673). In Japan, local governments seem to have a tradition of acting as policy innovators. Accordingly, the Tokyo climate action plan explains that Tokyo must take the lead in light of the national government's failure to commit to medium and long-term reduction targets, or to implement effective measures (Schreurs 2008, p351).

The desire to show leadership in respect to peer cities has also been an important motivator for some local authorities. For example, the possibility for London to become a trend-setter in the C40 community is believed to have given strength to internal policy commitments to address climate change (Bulkeley et al. 2009, p14).

Reputation

The desire to create an attractive city environment can be a motivator for local climate action, too. The believe that local climate policies help to create a 'green' image, and may thereby draw people and business is reported e.g. from cities in Sweden or the US (Collier, Löfstedt, 1997, p36; Kousky, Schneider, 2003, p367). Experience from local adaptation policies by early adapters shows that they, too, had the desire to enhance their reputation, "by demonstrating climate leadership, and the commitment to local development goals and service provision priorities" (Carmin et al. 2009, piii). There is a close link between the motivators 'reputation' and 'trend-setting': Front runners in local climate action seem to be motivated partly by the believe, that they help improve the city's reputation.

3.3. Liveability

Local authorities may have also implemented climate action "because it helped to improve the quality of life of people living and working in their areas" (Fleming, Webber 2004, p763). Energy-related greenhouse gas emission reduction activities may produce quality of life benefits such as health improvements (by better air quality or higher comfort levels in buildings), reduced traffic congestion, or increase of disposable income. Adaptation activities also affect liveability as they reduce the vulnerability of cities and their citizens to the adverse impacts of climate change, such as flooding or heat waves.

Air quality

Local activities that produce greenhouse gas emissions may also produce other pollutants with direct effects on local air quality, including particulates, ozone, NOx, and SOx. Therefore, some policies to reduce greenhouse gas emissions can also reduce the production of local air pollutants and thereby improve local air quality as well. ICLEI's CCP cities report improved air quality (and better health) as positive side-effects of local climate policies (Betsill 2001, p398). The need to comply with ozone standards was even a primary motivator for Chicago to implement a CO_2 program in the early 1990s (Lambright et al. 1996, p472). The problem of air pollution seems to be particularly pressing in rapidly developing cities, and may serve as an entry point for mitigation measures: For example, the local authorities of Mexico City have started to "target air quality, the main local concern, and to relate it to climate change" (Romero Lankao 2007, p531). For Tokyo, Seoul, Shanghai and Beijing, Dhakal finds the integration of air pollution and greenhouse gas concerns at the local level to be an important policy, too (Dhakal 2004, p105).

However, the link between a reduction in local air pollutants and a reduction of greenhouse gas emissions is far from automatic: For example, a regulation that bans heavy polluters from the car fleet in a city may improve local air quality. However, banned cars would probably be sold to drivers outside of the city, and would thus continue to produce greenhouse gas emissions. Greenhouse gas emissions may even increase due to local pollution reduction policies. This is the case, where policies are implemented to achieve a shift from petrol use to diesel. Such policies reduce local air pollution, as gasoline produces fewer local pollutants than diesel. However, at the same time it increases greenhouse gas emisisons, as vehicles operated with gasoline produce more greenhouse gas emissions.

Traffic

To reduce the time people spend on congested roads may be another motivator for cities to take action that has climate benefits. A reduction in traffic congestion may be linked to improved air quality, because congestions produce more local air pollutants than flowing traffic. A prominent example of a measure that was introduced to both reduce traffic congestion and improve local air quality is the London congestion charge. The measure is considered to be a success. However its effect in terms of CO_2 emission reductions may be marginal (Bulkeley, Schröder 2009, p358f.). In Vienna, Austria, emission reductions in the transport and traffic sector are believed to come with increased pedestrian safety (Dodman 2009, p198). Although some good examples do exist, in general, policies that address greenhouse gas emissions in the transport sector are scarce in industrialized countries. In industrializing countries such policies are more common. They are often motivated by a desire to improve air quality and also to reduce traffic congestion (Bulkeley et al. 2009, p73).

Social aspects

More efficient homes and offices reduce the energy bills of their occupants, and thus increase their disposable income (Betsill 2001, p398). As the buildings' energy standards improve, people may also be able to afford to heat their houses more extensively. Energy-efficiency measures in buildings may thus increase comfort levels and help to alleviate fuel poverty (Fleming, Webber 2004, p769). Local governments may also take into consideration, that an "automobile-dependent society" disadvantages certain groups of the population (Lambright et al. 1996, p469), and that a decrease in car-use may come with an increase in physical activity and thereby improve public health (Bloomberg, Aggarwala 2008, p415f.).

Other liveability

Another benefit of local climate policies may be the reduction of the urban heat island effect. For example, Tokyo tries to combat both global and urban warming simultaneously in a comprehensive strategy (Dhakal 2004, p95). Depending on local government officials, there may also be very specific motivators, such as in the case of Toronto, where the mayor loved esthetics and thus launched a tree-planting program to protect the climate and make the city more beautiful (Lambright et al. 1996, p472).

According to Bulkeley et al. local adaptation activities are often a side-benefit of activities that are designed to improve quality of life in a city. This includes "policies to address issues of water pollution, green space and urban development more broadly" (Bulkeley et al. 2009, p73).

3.4 Informational: Perceived vulnerability to climate change impacts

Vulnerability to the adverse effects of climate change is the primary motivation for cities that already started to take adaptation actitivities and to integrate climate adaptation into city planning (Carmin et al. 2009, p19; Tanner et al. 2009, p41). Interestingly, "adaptation measures often get adopted only in response to specific local or regional natural disasters, which may or may not be climate related" (Bulkeley et al. 2009, p74). For example, Roberts observed that political and administrative support for climate change-related work in the municipality of Durban improved when a series of extreme weather events during 2007 gave people an impression of the kind of impacts of climate change (Roberts 2008, p536). Section 3.6 deals with the importance of triggers for the implementation of climate policies in more detail.

While it is in the self-interest of cities that are affected by climate change to improve their climate-resilience, vulnerability to climate change impacts seems to be a motivator for local mitigation activities, too. In China, Western povinces are suffering more from climate change, because glaciers which provide their source of fresh water are melting. Facing immediate threats from climate change, Qi et al. find that they "have been keener to work to address

climate change than their eastern counterparts" (Qi et al. 2008, p394). Brody et al. present similar findings for cities in the US, where proximity to the coast and casualties from previous natural hazards such as flooding or hurricanes are strongly linked to a county's probability to join ICLEI's Cities for Climate Protection Campaign (Brody et al. 2008, p36).

Table 2: Motivators for local climate governance

Motivation	Specification	Authors
Economic	Cost savings	Bai 2007, p10; Betsill 2001, p397, 401; Bulkeley, Kern 2006, p2245; Collier, Löfstedt 1997, p27; Dodman 2009, p198; Fleming, Webber 2004, p763; Harvey 1993, p16; ICLEI 2008, p6; Kern et al. 2005, p14, 52f., 78f., 88; Kousky, Schneider 2003, p365ff, p397; Lambright et al. 1996, p468, 474; Qi et al. 2008, p393f.
	Revenues	Bai 2007, p9; Lambright et al. 1996, p468; Qi et al. 2008, p394
	Smart growth	Betsill 2001, p397f.; Carmin et al. 2009, p19; Fleming, Webber 2004, p763; Kousky, Schneider 2003, p367; Lambright et al. 1996, p468; Qi et al. 2008, p396
Political / cultural	External pressure and trickle down	Bai 2007, p8; Bulkeley et al. 2009, p11, 74; Dhakal 2004, p86; Fleming, Webber 2004, p763; Kern et al. 2005, p40, 44, 94; Schreurs 2008, p352; Tanner et al. 2009, p41
	Internal pressure	Brody et al. 2008, p37ff; Carmin et al. 2009, piii; Kousky, Schneider 2003, p361; Zahran et al. 2008, p559
	Reputation	Carmin et al. 2009, piii; Collier, Löfstedt 1997, p36; Kousky, Schneider 2003, p365, 367
	Trend-setting	Bulkeley et al. 2009, p14; ICLEI 2008, p6; Lutsey, Sperling 2008, p673f.; Schreurs 2008, p345, 350ff
Liveability	Air quality	Betsill 2001, p397f.; Dhakal 2004, p95, 105; Dodman 2009, p198; Fleming, Webber 2004, p769; Kousky, Schneider 2003, p367; Lambright et al. 1996, p472; Romero Lankao 2007, p351; Schröder, Bulkeley 2009, p358
	Traffic	Betsill 2001, p397; Bulkeley et al. 2009, p73; Kousky, Schneider 2003, p367; Schröder, Bulkeley, 2009, p358
	Social aspects	Betsill 2001, p398; Fleming, Webber 2004, p763, 769; Lambright et al. 1996, p469
	Other liveability	Bulkeley et al. 2009, p73; Dhakal 2004, p105; Lambright et al. 1996, p472
Informational	Perceived vulnerability	Alam, Rabbani 2007, p95; Alber, Kern 2008, p2; Brody et al. 2008, p36; Bulkeley et al. 2009, p74; Carmin et al. 2009, p19; Qi et al. 2008, p394; Roberts 2008, p536; Tanner et al. 2009, p41; Zahran et al. 2008, p558

Source: Literature review

3.5 Importance of triggers

Trigger events have provided the motivation for many local climate protection activities, both mitigation and adaptation (Bulkeley et al. 2009, p74). Cities have often used 'windows of opportunity' to start climate action or particular projects. City case studies are very helpful in revealing critical triggers. For example, in 1988, Canada experienced a long hot summer, when during the same period a NASA scientist declared before Congress that the greenhouse effect was evident. In the same year, a large international conference was held in the city of Toronto on the seriousness of climate change. Climate activities in Toronto started soon after, promoted by one individual member of the Toronto City Council, who was deeply impressed by the conference (Lambright et al. 1996, p466). Analysis of CCP participation in the US

reveals that casualties in extreme weather events are a powerful trigger that influences local authorities to join the CCP (Zahran et al. 2008, p558). Finally, trigger initiatives may be an instrument to achieve paradigm shifts, as in the context of Durban. Durban city officials have observed that trigger initiatives can provoke a change in the way people think, for example leading to "engineers thinking about social issues and environmental professionals thinking about economics" (ESMAP 2008, Durban representative).

4. Challenges for local climate governance

Section (3) asked what drives cities to take climate action. In contrast, this section analyses what hinders local climate governance. Table 3 shows the challenges identified and their classification as 'economic', 'institutional', 'informational' or 'political/cultural'. Table 4 further illustrates the challenges by providing exemplary quotations for each challenge.

Table 3: Challenges for local climate governance – Overview

Economic	Informational	Institutional	Political / Cultural
Tragedy of the Commons (mitigation)			
Costs Financial resources Human resources Accessibility of funds Path dependency Realizable benefits	Lack of expertise Public interest and participation Monitoring and evaluation Little localized information	Absence of national mandate Good local governance Internal integration and coordination problems Institutionalization Lack of cooperation Regulatory framework Limited control over utilities	Need for policy entrepreneurs Lack of political support Short time horizons Competitive policy issues Behavioural constraints

Source: Literature review

Tragedy of the Commons (*collective action problem)*

Local authorities are confronted with an 'overall' or 'systemic' challenge when they engage in mitigation policies: the benefits of local mitigation activities are non-excludable. Because the greenhouse effect of emissions occurs globally and independent of their place of origin, mitigation measures of a single municipality lead to very small benefits for everybody in the world. Betsill concludes that "it makes little sense for a city government to expend resources to control its GHG emissions, since it is not at all clear that action to control emissions in one particular place will have any measurable effect on the overall threat of global climate change" (Betsill 2001, p394).

Table 4: In-depth overview of challenges for local climate governance

	Challenge	Exemplary quotation
Economic	Tragedy of the Commons	"From a rational choice perspective, it makes little sense for a city government to expend resources to control its GHG emissions, since it is not at all clear that action to control emissions in one particular place will have any measurable effect on the overall threat of global climate change." (Betsill 2001, p394)
	Costs	"[...] many cities are not willing to invest financial resources in controlling GHG emissions, since doing so often requires significant up-front costs." (Betsill 2001, p399)
	Financial resources	"Just 4% of respondents in the survey felt they have enough resources to deliver their HECA [the UK's Home Energy Conservation Act] strategy." (Jones et al. 2000, p206)
	Human resources	"Of the 342 respondents who stated they do not have enough resources, […] the majority (81%) stated they need finance, with 58% stating that more staff are required" (Jones et al. 2000, p206)
	Accessibility of funds	"The ability to secure funding from external sources – from national governments, the European Union, or charitable foundations – has been shown to make a significant difference in the local capacity to address climate change." (Bulkeley et al. 2009, p17)
Informational	Path dependency	"Because some groups benefit from the stauts quo, they actively promote more of the same, and create obstacles to investment in alternatives." (Suzuki et al. 2009, p28)
	Realizable benefits	"Studies instead show that climate change is seldom the main driver behind initiatives but instead a potential positive by-product of activities aimed at addressing other local problems" (Storbjörk 2007, p468)
	Lack of expertise	"Issues such as low local human capacity to undertake this kind of planning, and the limited knowledge and understanding of climate issues at local and municipal level are some of the more obvious obstacles." (Mukheibir, Ziervogel 2007, p156)
	Public interest and participation	"[...] public sensibility to both environmental issues in general and climate change issues specifically is also important, in that local authorities are unlikely to get involved unless there is public and political support." (Collier 1997, p45)
	Limited monitoring and evaluation	"[...] many of the local governments do not have up-to-date emissions inventories to work with." (Sugiyama, Takeuchi 2008, p435)
	Little localized information	"Specifically, the findings suggest that adaptation efforts will be enhanced if cities […] obtain or generate information about local risks and locally-relevant adaptation measures." (Carmin et al. 2009, piii)
Institutional	Absence of national mandate	"However, in the absence of central government direction, specific 'climate protection' strategies have historically been rare." (Bulkeley, Kern 2006, p2239)
	Good local governance	"Good governance is a crucial determining factor of effective adaptation as the level of vulnerability to climate change, especially for the urban poor, is directly related to the quality of national and local government." (Satterthwaite 2007, p9)
	Internal integration and coordination problems	"[...] Correlating with this need to integrate energy and climate policy issues into other policy fields, new problems of horizontal coordination have become apparent in Berlin." (Monstadt 2007, p339)
	Institutionalization	"Translating political will into policy action thus requires that city governments institutionalise their efforts to control GHG emissions and designate responsibility for co-ordinating climate-related activities across city government." (Betsill 2001, p400)
	Lack of cooperation	*Local stakeholders:* "Specifically, the findings suggest that adaptation efforts will be enhanced if cities […] engage nongovernmental stakeholders, including NGOs, CBOs, consultants, and universities in planning and implementation." (Carmin et al. 2009, piii) *Regionally:* "Successful climate policy often depends on technical infrastructure which transcends city borders." (Alber, Kern 2008, p15) *Other policy levels:* "The role of national government, and of relations between local and national government, in shaping urban climate governance can therefore be critical." (Bulkeley et al. 2009, p15)
	Regulatory framework	"The cases of London and Los Angeles demonstrate that [...] their limitation to perform climate change policy is somewhat determined by legal frameworks at national or state levels." (Schröder, Bulkeley 2009, p358)
	Limited control over utilities	"The liberalization and privatization have diminished the control of the Bundesländer and municipalities over the prices, investments and corporate policies of the utilities." (Monstadt 2007, p327)
Political / Cultural	Need for policy entrepreneurs	"[...] in some cities the existence of an issue "champion" was essential to initiating climate policy [...]" (Kousky, Schneider 2003, p361)
	Lack of political support	"without strong support from the decision makers climate change will not be on the local government agenda" (Fleming, Webber 2004, p763)
	Short time horizons	"Indeed, climate change will most likely result in many damages at global, regional, and local levels, but these damages are less likely to make significant impacts on the local economy in the relatively short period of time that government officials are in office." (Qi et al. 2008, p393)
	Competitive policy issues	"Other issues take higher priority in the council." (Allman et al. 2004, p280)
	Behavioural constraints	"A new planning process that involves many planners and designers will certainly challenge the natural tendency of people – and professionals in particular – to resist change of any kind." (Suzuki et al. 2009, p29)

Source: Literature review

Local climate protection underlies the logic of the 'Tragedy of the Commons' (Roberts 2008, p536; Dhakal, Betsill 2007, p551; Gupta 2007, p132; Harrison, McIntosh Sundstrom 2007, p1; Lorenzoni et al 2007, p453; Davies 2005, p36; Kern et al. 2005, p11; Lambright et al. 1996, p464). Other authors find different names for this phenomenon, such as the "scale issue" (Dhakal, Betsill 2007, p551), "territorial trap" (Gupta 2007, p132); "spatial and temporal mismatch" (McEvoy et al. 2006, p187), "free riding" (Kousky, Schneider 2003, p360) or "paradoxical gulf" (Droege 2002, p87ff). Following economic rationality, implementing measures and spending communal budgets is not sensible if others do not take measures as well. Local officials may argue that their cities cannot tackle climate change effectively but in a joint effort with all other cities and nation states in the world. In the absence of an adequate global climate governance framework, this results in a lack of mitigation measures (Gupta 2007, p132; Droege 2002, p87).
However, Kousky and Schneider refer to the large number of cities that do have started climate action and argue "that at the local level, free-riding has been much less of an impediment than theorized. At a minimum, free riding has not prevented action for initial levels of abatement." (Kousky, Schneider 2003, p360).

4.1 Economic challenges

Economic challenges are sometimes considered as the 'hard facts'.Many authors believe them to be very influential factors for success or failure of local climate governance. To analyse the economic viability of measures, both costs and benefits would have to be considered, e.g. by doing a cost-benefit analysis. However, this type of analysis is highly complex, requires expert staff, and is seldomly reported from municipalities. Furthermore, many municipalities experience a lack of resources which manifests itself in financial constraints or insufficient number of staff. With limited possibilities to generate funds by themselves, or to access external funding, municipalities see little chance to improve their financial situation. Cost arguments (or more precisely the argument of sunk costs) may also serve to defend resource intensive pathways that were chosen in the past, and thereby hinder climate investments.

Costs
Costs are a crucial factor for explaining a lack of communal climate protection activities (ICLEI 2008, p6; Harrison, McIntosh Sundstrom 2007, p15). While some mitigation measures (especially energy saving) come with cost savings, other measures for example in the areas of energy-efficiency or renewable energies do involve additional costs, particularly upfront investment costs. Many mitigation activities (such as communal energy management) are taken by local authorities because they pay off soon. But even in the case of these so-called 'no-regret' measures, local authorities often decide against activities that have high up-front investment costs and long payback periods (Ürge-Vorsatz et al. 2007, p459). In particular, this applies to cities with little or decreasing financial resources, and cities in

developing countries are probably the most affected. (Bai 2007, p8; Rezssy et al. 2006 p233; Kern et al. 2005 p38). However, policy makers often have not implemented measures that do not require much funding, either (Dhakal 2004).

Concerning adaptation measures, costs play an important role, too. However, adaptation is a more urgent issue as cities already face climate change impacts, and adaptation activities benefit a city directly. Therefore, the willingness to finance such activities is probably higher

Table 5: Economic Challenges for local climate governance

Challenges	**Relevance** (country context, phase, mitigation/adaptation)	**Authors**
Costs	- More important for mitigation, as adaptation serves city directly - Infrastructure backlog making adaptation in developing countries more difficult	Alber, Kern 2008; Bai 2007; Bulkeley et al. 2009, p42; Dhakal 2004; ESMAP 2009, p5; Harrison, McIntosh Sundstrom 2007; ICLEI 2008, p12; Kern et al. 2005; McCarney 2009, p38; Rezssy et al. 2006; Ürge-Vorsatz et al. 2007;
Financial resources	- probably mentioned most often	Alber, Kern 2008, p20; Allman et al. 2004, p280-281; Bai 2007, p8; Betsill 2001, p401; Bulkeley et al. 2009, p17; Bulkeley, Kern 2006, p2241Carmin et al. 2009, p3, p8; Collier 1997, p29, p39Davies 2005, p28, p36; Dhakal 2004, p77; Fleming, Webber, 2004, p770; Granberger, Elander 2007, p541; ICLEI, 2008, p12; Jones et al. 2000, p206; Kern et al. 2005, p3, p48; McCarney 2009, p39; Monstadt 2007, p333-334; Mukheibir, Ziervogel 2007, p156; Parker, Rowlands 2007, p512; Rezssy et al. 2006, p230-235; Romero Lankao 2007, p530; Sugiyama, Takeuchi, 2008, p428; Tanner et al. 2009, p43; Ürge-Vorsatz et al. 2007, p459
Human resources	-/-	Allman et al. 2004, p280; Betsill 2001, p399; Bulkeley et al. 2009, p16, 37; Collier, Löfstedt 1997, p28; Davies 2005, p30; Demeritt, Langdon 2004, p333; ESMAP, Mexico City representative 2008, p13; ICLEI 2008, p12; Jones et al. 2000, p206; Kern et al. 2005, p3, p39; Roberts 2008, p535; Romero Lankao 2007, p530;
Accessibility of funds	- External funding more difficult to access for cities in the initial phase of climate action (learning curve)	Bulkeley et al. 2009, p17, p37; Bulkeley, Kern 2006, p2241, p2252; Collier 1997, p39; Davies 2005, p28; Kern et al. 2005, p48; Fleming, Webber, 2004, p763-765; McCarney 2009, p39; Monstadt 2007, p331; Parker, Rowlands 2007, p512; Sugiyama, Takeuchi, 2008, p428; Tanner et al. 2009, p41-43;
Path dependency	-/-	Brody et al. 2008, p36; Droege 2002, p95; Suzuki et al. 2009, p28-29; Roberts 2008, p536;
Realizable benefits	-/-	Alber, Kern 2008; Betsilll 2001, p401; Bulkeley et al. 2009, p19; Collier 1997, p39Dhakal 2004, p81; ESMAP 2009, p5; Harrison, McIntosh Sundstrom 2007, p15; ICLEI 2008, p6; Kern et al. 2005, p52; Linstroth 2007; McEvoy et al. 2006, p186; Moser 2006, p8; Stobjörk 2007, p468; Ürge-Vorsatz et al 2007, p459;

Source: Literature review

than the willingness to finance mitigation. Cities in developing countries that are most vulnerable to the impacts of climate change must often start adaptation policy from a situation of 'infrastructure backlog' (Bulkeley et al. 2009, p42; ESMAP 2009, p5; McCarney 2009, p38). For example it is even more difficult to protect a settlement from the adverse effects of heavy rainfalls, where there is no sewage infrastructure in the first place.

Financial resources

Financial constraints are among the barriers mentioned most frequently. In the case of the UK a survey gives some empirical evidence: "Just 4% of respondents in the survey felt they have enough resources" (Jones et al. 2000, p206).

A lack of financial resources can have two main reasons. Firstly, many municipalities have a low and instable revenue base (e.g. Carmin et al. 2009, p3; Mukheibir, Ziervogel 2007, p156; Romero Lankao 2007, p530). Secondly, federal transfers are often perceived to be insufficient (e.g. McCarney 2009, p39; Sugiyama, Takeuchi 2008, p428; Granberger, Elander 2007, p541). A poor municipal creditworthiness, as in Bulgaria and Macedonia, can worsen a city's situation (Rezssy et al. 2006, p235).

A survey of local governments in England and Wales shows that both successful and less successful cities are confronted with a lack of financial resources (Fleming, Webber, 2004, p770). In cities in developing countries budget constraints may often be more drastical (Bai 2007, p8). Against this background, public-private-partnerships, fundraising and the combined use of different funding streams are believed to become more and more important for local climate action (Allman et al. 2004, p281).

H*uman resources*

Various scholars criticize insufficient staff numbers in local authorities as a barrier to local climate governance. A lack of human resources often results from a lack of financial resources. Based on a UK-wide survey, Jones et al. provide empirical evidence for this causality (Jones et al. 2000, p206). As a consequence of insufficient man-power, policies and programmes for controlling GHG emissions are often not adequately brought into realisation (Betsilll 2001, p399).

In Mexico City for example, two people struggled with the implementation of more than 20 seperate mitigation projects (ESMAP 2008, Mexico City representative, p13). In German municipalities, climate protection is often one of several tasks of members of the Environmental Department. Usually, there is no single person in German local administrations who dedicates his or her time to climate action exclusively. (Kern et al. 2005, p39). Bulkeley et al. cite a study by Holgate, which illustrates the impact of the quantity of local staff. The study compares the dedicated human resources and the success of local climate protection activities in the cities of Cape Town and Johannesburg. Bulkeley et al. summarize the results as follows: "In Cape Town, the comparatively well-resourced municipality was able […] to make significant advances in tackling the issues while in

Johannesburg one officer was responsible for addressing the range of environmental challenges facing the city, and, at least partly as a result, the response to climate change was minimal." (Bulkeley et al. 2009, p16)
The quantity of local staff dedicated to climate action is of course only one aspect. The expertise of this staff matters, too (Betsilll 2001, p400).

Accessibility of funds
The cost aspect is strongly interlinked with another economic challenge, namely 'limited opportunity to generate/access funds'. Insufficient access to funding may slow down measures, lead to cancellation of projects and local programmes or affect the quality of data and monitoring (McCarney 2009, p39). Funds can be provided externally, usually by public bodies from the national to the international level.
Where funding sources for local climate governance do exist, they should probably be transparent and easy to access. Fleming and Weber find that this is not the case in the United Kingdom: "There are a wide variety of different bodies and funding sources […]. The combination of different bodies, funding streams and changes in names presents a very complicated and confusing framework from within which local and regional energy management activities take place" (Fleming, Webber, 2004, p765). It is probalby due to these difficulties, that cities with experience in fundraising and respective capacities are more successful in generating funds (Bulkeley et al. 2009, p17f.). Furthermore, fundraising does require staff time in the first place, which then cannot be devoted to the actual implementation of measures (Allman et al. 2004, p281).
Cities like Durban, South Africa or Heidelberg, Germany have found ways to access funding. Durban was able to attract significant international funding for its adaptation activities (Carmin et al. 2009, p8). Heidelberg established a revolving fund, which is fed by cost savings from energy efficiency projects in municipal buildings. The environmental department administers this fund and can decide on investments relatively independently (Kern et. al 2005, p51f.). Additional funds can help to build capacity and knowledge for the implementation of climate strategies, programmes and measures (Tanner et al. 2009, p41; Bulkeley, Kern 2006, p2252). However, local authorities may also be successful without access to large amounts of funds: In the East Midlands, a region in the United Kingdom, a number of authorities developed comprehensive strategies with only little funding (Fleming, Webber 2004, p763).

Path dependency
Investments that have been made in the past to develop certain infrastructures and facilities can create a need to recover sunk costs and generate a return. Suzuki et al. describe this phenomenon, e.g. for an established centralized power supply system: "If someone proposes to invest in demand side management, or to meet the need for services in other ways, the effect is to reduce the flow of revenues below what was projected; as a consequence, the

existing facilities remain over-sized and may become economically unviable." (Suzuki et al. 2009, p28f.). Innovative approaches regarding less resource intensive energy and water supply or waste and waste water management can thus cause resistance by groups that make money from the current service infrastructure. The model of centralized supply systems was introduced in the 19th century, and the existence of centralized infrastructures narrows down the options of local decision makers (e.g. for decentralized power generation and supply)[4] (Droege 2002, p95).

Suzuki et al. find that "public-private partnerships, if not developed properly, are another common example of how cities can become locked-in to technologies by entering into contracts that guarantee a long-term demand for services of one type." (Suzuki et al. 2009, p29). In a study of climate action of cities in the US, Brody et al. discover that a greater percentage of people employed in carbon-intensive industries significantly decreases the odds of a city to adopt climate change policies (Brody et al. 2008, p37).

Dawson et al. show that path dependency does also apply for adaptation policies: "Failure to consider a range of possible impacts over extended timescales can lead to undesirable 'lock-in' to specific adaptation options. For example, construction of flood defence infrastructure can lead to intensification of floodplain development that subsequently commits floodplain managers to further flood defence infrastructure." (Dawson et al. 2009)

However, path dependency can also be observed in green policy making. The same study by Brody et al. finds that the existence of alternative transport increases the possiblity of a city to adopt climate policies (Brody et al. 2008, p36f.). Lambright et al. explained Toronto's early adoption of climate protection partly with its "long tradition of environmental consciousness" (Lambright et al. 1996, p469). And the fact that Durban is an early adopter of adaptation policies can probably also be explained by its prior engagement in a variety of environmental programs (Carmin et al. 2009, p10).

Realizable benefits

In the light of limited local budgets, the potential of local climate action to realize economic benefits is a critical issue. Based on the assumption that cost-effectiveness is the ultimate criterion for local government spending, Betsill concludes that "It is thus important for city officials requesting money for climate-related projects to demonstrate the economic benefits" (Betsilll 2001, p401). The cost-benefit-balance of many mitigation efforts, and energy efficiency measures in particular, strongly depends on energy prices for fossil fuels: The higher the energy prices, the sooner investments in energy saving or energy efficiency

[4] Part of the difficulty […] is that current design and planning practices for cities are rooted in patterns established in the 19th century, when an abundance of coal, combined with new manufacturing technologies, brought unprecedented increases in wealth and improvements in quality of life. By the beginning of the last century, millions of families in Europe and North America suddenly had access to clean water, sewage treatment, space heating, leighting, clean streets and public transit. This wave of societal progress and modernism was achieved through single-purpose, centralized, supply-oriented utilities that operated in silos, and capitalized on economies of scale, abundant resources, and open access to public goods like water and the atmosphere" (Suzuki et al. 2009, p29; see also Droege 2002, p87).

measures pay off. In contrast, low energy prices reduce the benefits of such mitigation measures. This means that low energy prices can be an important barrier to local climate governance (ESMAP 2009, p5).
Besides financial savings, benefits may also include other issues such as improved air quality or reduced traffic congestion. Further information on possible benefits of local climate governance has already been provided under section (3).

4.2 Informational challenges

In addition to economic barriers discussed in the previous section, informational challenges can help to explain why local climate governance is slowed down or not fully brought into practice. There may sometimes be a link between informational challenges and economic barriers. For instance, a lack of financial resources can not only result in a lack of human resources, but also in insufficient qualification of staff for complex tasks, like the organization and coordination of climate protection activities. Informational deficits also include a lack of public awareness on climate change issues, and associated to this, problems to realize public participation in climate activities. The high complexity of the climate change issue, and little

Table 6: Informational challenges for local climate governance

Challenges	**Relevance** (country context, phase, mitigation/adaptation)	**Authors**
Lack of expertise	More so in developing countries, and in combination with financial constraints	Bai 2007, p8; Beatley 2007, p40; Betsill 2001, p394-400; Collier, Löfstedt 1997, p26; Darier, Schüle 1999, p324; Demeritt, Langdon 2004, p333; Dhakal 2004, p107; Kern et al. 2005, p3; Jones et al. 2000, p206; Kallen 1996, p3; Kousky, Schneider 2003, p362; Mukheibir, Ziervogel 2007, p156; Storbjörk 2007, p464; Weber 2009, p16
Public interest and participation		Alber, Kern 2008, p4; Allman et al. 2004, p278; Bai 2007, p7; Carmin et al. 2009, p20; Darier; Schüle 1999, p325; Dhakal 2005, p77; Diagne 2007: p555; Harrison, McIntosh Sundstrom 2007, p6; Löfstedt 1997, p25, 38; Lorenzoni et al 2007, p447; McCarney 2009, p40; Moser 2006, p2, 6; Tanner et al. 2009, p41f.; Yarnal et al. 2003, p457, 464
Monitoring and evaluation	More so in developing countries, and in combination with financial constraints	Bennett, Newborough 2001, p127; Betsill 2001, p401; Bulkeley et al. 2009, p83; Demeritt, Langdon 2004, p330; Dhakal 2009, p11; Dhakal 2004, p81; Dodman 2009, p194; Fleming, Webber, 2004, p766, 769; Kern et al. 2005, p80; McKinsey 2008, p6; Satterthwaite 2008, p546; UN-Habitat 2008
Little localized information	More so in developing countries, and in combination with financial constraints	Bulkeley et al. 2009, p12f.; Bennett, Newborough 2001, p127; Demeritt, Langdon 2004, p330; Dhakal 2004, p77; Dodman 2009, p194; Fleming, Webber 2004, p766; Romero Lankao 2007, p531

Source: Literature review

localized information, be it about climate change impacts or about appropriate climate protection strategies, can add to these problems. Regarding monitoring and evaluation of policies, the absence of a universally applicable methodology for local emission inventories and poor access to relevant data can pose further challenges.

Lack of expertise

A lack of expertise of local administration staff is found to be a central bottleneck for local climate governance from early studies on climate governance (e.g. Collier, Löfstedt 1997, p26; Kallen 1996, p3) through to recent ones (e.g. Mukheibir, Ziervogel 2007, p156; Weber 2009, p16). Storbjörk reports that even "an experienced lack of capacity and competence" may be a hindrance for local officals to include climate change considerations (Storbjörk 2007, p464). Interestingly, Kousky and Schneider find that while local administration staff may lack even rudimental economic skills and methods, decision makers may come to quiet good decisions, economically speaking (Kousky, Schneider, 2003, p366).

Ineffective information flow in a local administration can add to the problem of limited expertise, especially when the cross-cutting nature of issues requires they are dealt with by several departments (Demeritt, Langdon 2004, p333f.). Again, the lack of expertise may be even more of a problem in cities in developing countries (Bai 2007, p8; Dhakal 2004, p82).

Collier and Löfstedt suggest that external consultancy which is financed by the national government (in the case of Sweden in the form of local energy advisers) can be very helpful in order to bring knowledge into local administration and climate protection into practice (Collier, Löfstedt 1997, p28).

Public interest and participation

The lack of expertise is not the only challenge in the field of knowledge and information. Public interest and public participation matter for successful local climate governance, too. If public interest is not existent or limited, the transmission of climate policies into concrete climate action may fail (Harrison, McIntosh Sundstrom 2007, p6). Several (empirical) studies from Ecuador, Germany, South Africa, Sweden, the United Kingdom,and the United States of America,show that public interest is often low or totally missing (Carmin et al. 2009, p20; Lorenzoni et al 2007, p447; Dhakal 2005, p77; Yarnal et al. 2003, p464; Darier; Schüle 1999, p325; Löfstedt 1997, p38). From a case study in Pennsylvania, US Yarnal et al. conclude: "When confronted with a list of many issues, Americans consistently place global warming at the bottom because they do not find it as pressing as other problems vying for their attention" (Yarnal et al. 2003, p457). The level of awareness and interest may differ between different groups and individuals, as they have different interests, habits and forms of organisation (Moser 2006, p2). When local officials do not care about climate change, this may be the most severe form of a lack in interest. Such a habit may be quite common among officials who are not directly and primarily involved with climate action. Alber and Kern observe that often "climate-related issues [are] not taken into account when climate-relevant decisions are taken

outside the environmental department" (Alber, Kern 2008, p4). And even where people are aware of the climate issue, this will not necessarily translate into consequent behavioural change – a phenomenon described as a 'value-action-gap' (Lorenzoni et al 2007, p447). More information on behavioural constraints follow in section 4.4 on political/cultural barriers. The existence of conflicting and seemingly more fundamental policy issues especially in developing country cities, may make it even more difficult to generate public interest for climate issues (Bai 2007, 7).

Public participation can play an important role for the realization of environmental targets, in that it can help to mobilize and activate people (Collier, Löfstedt 1997, p25). Therefore, public participation can enhance climate governance in particular Mobilization and activiation is important for climate protection in particular (McCarney 2009, p40; Moser 2006, p6). Public participation can support local climate action in a number of ways. Firstly, it can help to build awareness for the urgency of climate issues (Allman et al. 2004, p278). Secondly, it cansolve problems by integrating local people and taking into account their attitudes and needs (Diagne 2007, p555). In order to achieve climate resilient cities in the developing world, Tanner et al. find the integration of socially weaker groups to be important. Since they often live in settlements which lack fundamental service infrastructures, they are hit hardest by the effects of climate change. With little public funding available for adaptation activities in these settlements, there is a need to develop solutions together with communities. (Tanner et al. 2009, p41ff). Thirdly, public participation can improve the accountability of local authorities, and thereby help to realize good local governance (McCarney 2009, p40). As a matter of fact, public participation can not guarantee successful climate governance. Furthermore, it can also have adverse effects on climate programs, e.g. when participation processes it lead to delays or to the amplification of existing conflicts (Tanner et al. 2009, p41).

Monitoring and evaluation

Emission inventories help to understand a city's emission patterns, and local climate action plans can be based on knowledge created by emission inventories. Monitoring of the implementation of such action plans is a tool to evaluate the performance of climate policies and evaluation is a precondition to improve climate policy-making. Sugiyama and Takeuchi find that an understanding of regional and local anthropogenic GHG emissions and their sources is fundamental to the development of regional and local climate change policy. For Japan, they observe that "A problem for the regional and local governments, however, is that they often do not have very accurate information about local emissions." (Sugiyama, Takeuchi, 2008, p432). And cities may not measure the impact of their climate policies, too: From an analysis of three German cities, who are perceived to be advanced in climate policy-making, Kern et al. report that they do not evaluate success regularly (Kern et al. 2005, p80). Limited access to relevant monitoring data (e.g. data on energy consumption) may be a core

reason for so few cities having created localized GHG models (Bulkeley et al. 2009, p12). The issue of localized data will be further explored under 'localized information'.
Besides problems of data availability, there is also no universally applicable methodology for emission inventories (Dodman 2009, p194; Satterthwaite 2008, p.546). Methodologies differ, e.g. whether they are production or consumption based, and which sectors they include. The definition of these 'technical' parameters has a significant influence on an urban CO_2-balance and action plans that will be based on it. The combination of limited data availability and methodological incertainties make emission inventories overly time consuming and costly. Furthermore, the variety of approaches to profile emission inventories makes a comparison of local climate performance very difficult. Obviously, cities may also be reluctant to evaluate their climate policies when they fear negative evaluation.
While monitoring and the evaluation of policies is important, Bulkeley et al. find that "the emphasis on emissions inventories as the first step for climate change strategies and action locally may be misplaced" as "the actions required to reduce emissions of GHG locally – increasing energy efficiency, switching energy sources, and reducing demand for energy (in both buildings and for travel) – are well known" (Bulkeley et al. 2009, p13).

Little localized information
Many scholars report a lack of local information, both regarding emissions, and the impacts of climate change. Limited access to relevant emission data is reported from cities all over the world, be it the UK (Fleming, Webber 2004, p769), Germany (Kern et al. 2005, p80), or Asian mega-cities (Dhakal 2004, p77). Bulkeley et al. conclude that "the challenges of gathering this sort of data at the community-wide level have been regarded as intractable by the majority of municipalities", and add "Even where data is collected, much of it is not available in the public realm as it is held by private utility companies who regard it as commercially sensitive" (Bulkeley et al. 2009, p12f.). The deregulation of energy supply companies in the 1990s has added to this problem: In the turn of deregulation, "electricity and gas consumption data for some local areas became less readily available" (Fleming/Webber, 2004, p766).While access to emission data seems to be difficult in cities all over the world, cities in developing and industrializing countries are facing this challenge to a much higher degree (Dhakal 2009, p11; Dhakal 2004, p81).
In the context of adaptation, local data on the direct and indirect effects of climate change on a city and individual urban areas is important. Often this data is not available, which requires cities to conduct their own assessments of risk and vulnerability in order to design appropriate adaptation measures (Satterthwaite 2007, p13ff). Although local data helps to design climate policies, Demeritt and Langdon do not find a simple link between accurate data and successful climate governance (Demeritt, Langdon 2004, p330). This shows that other aspects matter, too. For example, knowledge about local processes and policies may help to implement climate policies, too.

4.3 Institutional challenges

Inappropriate institutional structures and mindsets are believed to be among the greatest challenges for the implementation of integrated economic and environmental policies on the local level (Suzuki et al. 2009, p28). Firstly, institutional barriers include problems which occur on the city level, like a failure to institutionalize local climate policy-making, a lack of coordination between different government departments, insufficient cooperation with local stakeholders or a lack of good governance. Secondly, a city's relationship to other policy levels matter, including its competences under a given legal framework. The following provides some details on institutional barriers, and Table 7 gives an overview of institutional challenges.

Absence of national mandate

For local authorities in the UK, Bulkeley and Kern describe a "lack of an explicit statuatory duty to address climate change" (Bulkeley, Kern 2006, p2238). The UK is not an exemption. According to Alber and Kern, mandatory provisions for local climate policies are rather rare or fully lacking in most countries (Alber, Kern 2008, p15). There are numerous reports of negative effects which are believed to result from the absence of federal mandates, for example from the US (Betsill 2001, p394), the UK (Allmann et al. 2004, p280; Fleming, Webber 2004, p770; Jones et al. 2000, p209), Germany (Kern et al. 2005, p48), or South Africa (Carmin et al. 2009, p7). By contrast, the national government of Japan triggered local climate action by expressing expectations about what regional and local governments should do (Sugiyama, Takeuchi 2008, p426, 429). For many countries, a link between 'external pressure' as motivating local climate governance and a concrete form of external pressure, namely the absence of a national mandate, as hampering local climate policies, has been observed.

As a matter of fact, local climate policy-making remains a voluntary task for municipalities in most countries. Schröder and Bulkeley explain local governments' reluctance to implement regulatory climate policies by the absence of control and compliance measures taken by national and international levels (Schröder, Bulkeley 2009, p359). Local authorities may feel that the lack of a national mandate undermines their authority for climate governance. This may render them particularly hesitant to govern by regulation (e.g. by implementing building energy efficiency standards or traffic restrictions). For example, in the UK, local government officials are believed to neglect the mode of 'governing by authority' because they are concerned about the "consequences of going beyond the criteria stipulated in national planning policy statements" (Bulkeley, Kern 2006, p2247).

Table 7: Institutional challenges for local climate governance

Challenges	Relevance (country context, phase, mitigation/adaptation)	Authors	
Absence of national mandate	- Probably more important for less ambitious cities	Alber, Kern 2005, p15; Betsill 2001, p394; Allman et al. 2004, p278, 280; Bulkeley, Kern 2006, p2239, 2247; Carmin et al. 2009, p7; Collier 1997, p39; Dhakal 2004, p78; ESMAP, Quezon City representative 2008, p14; Fleming, Webber 2004, p770; Jones et al. 2000, p209; Kern et al. 2005, p48; Mukheibir, Ziervogel 2007, p156; Schröder, Bulkeley 2009, p359; Sugiyama, Takeuchi 2008, p426, 429	
Good local governance	- Developing countries specifically - Adaptation more than mitigation	Bulkeley et al. 2009, p36; Huq et al. 2007, p10; McCarney 2009, p38; Romero Lankao 2007, p530, 532; Satterthwaite 2008, p11; Tanner et al. 2009, p41, f.	
Internal integration and coordination problems	-/-	Adger et al. 2005, p79; Alber, Kern 2008, p24; Allman et al. 2004, p280; Betsill 2001, p400; Bulkeley et al. 2009, p23, 38; Bulkeley, Kern 2006, p2247; Carmin et al. 2009, p11; ICLEI 2008, p12; Kern et al. 2005, p9f., 38; McCarney 2009, p38ff; Monstadt 2007, p339; Romero Lankao 2007, p529f.; Suzuki et al. 2009, p28; Tanner et al. 2009, p41	
Institutionalization	- After early phase	Betsill 2001, p399f.; Bulkeley, Kern 2006, p2253; Collier 1997, p53; Davies 2005, p27; ICLEI 2008, p12; Kern et al. 2005, p80	
Cooperation	- More important where local government has less resources and capacities	local stakeholders	Adger, et al. 2005, p79; Bulkeley et al. 2009, p16, 27; Carmin et al. 2009, piii; Fleming, Webber 2004, p765; Jones et al. 2000, p204f.; Kern et al. 2005, p10; Schröder, Bulkeley 2009, p359; Tanner et al. 2009, p43
	-/-	regionally	Alber, Kern 2008, p15; Allman et al. 2004, p280; Betsill 2001, p403; Bulkeley et al. 2009, p22; ICLEI 2008, p12; McCarney 2009, p40; Romero Lankao 2007, p529
	-/-	Other policy levels	Adger, et al. 2005, p79; Bulkeley et al. 2009, p38 (quote from Adger et al. 2005); Bulkeley et al. 2009, p15, 21f., 38f., 74; Davies 2005, p27; Dhakal 2004, p89; Tanner et al. 2009, p41
	-/-	City-networks	Alber, Kern 2008, p17ff; Bentley 2007, p5; Fay 2007, p7ff; Jones et al. 2000, p205f; Kern et al. 2005, p94
Regulatory framework	- country-specific	Alber, Kern 2008, p2; Allman et al. 2004, p280; Bulkeley et al. 2009, p14; Bulkeley, Kern 2006, p2238; Collier 1997, p43; Collier, Löfstedt, 1997, p26; Davies 2005, p26; Dhakal 2004, p82; ESMAP 2009, p5; Harvey 1993, p18; Jones et al. 2000, p207; McCarney 2009, p38; Qi et al. 2008, p391; Schreurs 2008, p353; Schröder, Bulkeley 2009, p358; Sugiyama, Takeuchi, 2008, p425ff;	
Limited control over utilities	- Mitigation probably more than adaptation	Alber, Kern 2008, p10; Betsill 2001, p403; Bulkeley, Kern 2006, p2242ff; Collier 1997, p43; Collier, Löfstedt 1997, p29; Jones et al. 2000, p209; Kallen 1996, p3; Kern et al. 2005, p16; McCarney 2009, p38; Monstadt 2007, p327ff; Romero Lankao 2007, p531; Schröder, Bulkeley 2009, p359; Sperling 2008, p15; Weimer-Jehle et al. 2001, p61ff	

Source: Literature review

Overall, scholars agree that the absence of a national mandate presents a great challenge for local governments affected. Often climate change is not a priority for these local authorities. This is particularly true for mitigation activities, as they are not automatically in the self-interest of cities. But adaptation planning, too, may be constrained where there are no national legislative frameworks in place that require local authorities to take action (Mukheibir, Ziervogel 2007, p156).

Good local governance

Local governments may play an important role in providing key local infrastructures e.g. for water, sanitation, drainage or waste collection. They are often responsible for fire, other emergency services and some health care facilities, as well. And at least in theory they play a key role in urban planning. The quality of local governance in these areas has very large implications for the adaptive capacity of a city, particularly in urban areas of low- and middle-income nations (Satterthwaite 2007, p11). For example, substantial lacks in infrastructure provision and the existence of large informal housing developments add to the vulnerability of communities, and "often reflect local governments that are unrepresentative, unaccountable and anti-poor" (Satterthwaite 2007, p11). For the case of Mexico, the legal regime seems to allow corruption and "weak or deviated enforcement of carbon-relevant measures" (Romero Lankao 2007, p530). In addition, high turnover rates in local government staff lead to institutional instability and make technical trainings ineffective.

In the context of good local climate governance, the literature highlights the importance of transparency, accountability, and participation. McCarney finds citizens' access to information and a relationship of accountability between local governments and their citizens to be essential (McCarney 2009, p40). Tanner et al. agree that accountability mechanisms are crucial, along with participation in urban planning. As climate change impacts may lead to the emergence of new problems and increased frequency and/or severity of disasters, they further argue for "flexible agencies and management systems, suited to responding to and anticipating these surprises" (Tanner et al. 2009, p41f.).

The lack of good local governance also includes 'inadequate planning and design methods'. Satterthwaite notes that the application of imported models of urban planning and government in cities of the global South is often not appropriate in the light of local context and possibilities (Satterthwaite 2007, p12). The World Bank's Energy Efficient Cities Initiative identified inadequate planning and design methods as policy and regulatory barriers to energy efficiency in cities in low and middle income cities (ESMAP 2009, p5).

Internal integration and coordination problems

Climate protection is a complex and multi-disciplinary subject. It requires cooperation between city officials occupied with issues such as waste management, transportation, urban planning, utilities and air quality. However, local government departments usually have seperate budgets, timelines and goals (Suzuki et al. 2009, p28) and local officials tend to

"focus on their narrow tasks, often with little interaction with individuals in other divisions or departments" (Betsill 2000, p400). According to Alber and Kern, the fact that competences for climate policies are often located at the environmental department, may increase integration and coordination problems. This is the case where environmental departments are marginalized within municipal bureaucracies, and therefore lack the competences to coordinate and implement comprehensive climate policies (Bulkeley et al. 2009, p23).

In short, the cross-cutting nature of climate change does not fit the way local governments organize themselves. Furthermore, being a new issue area, climate change is often surrounded by institutional ambiguity (Bulkeley, Kern 2006, p2251). This presents a challenge for local climate governance present in local authorities all over the world. Scholars have analysed how cities try to meet this challenge. Romero Lankao shows that Mexico City has set up a carbon-relevant coordinating commission – a measure which has not resulted in much coordination so far (Romero Lankao 2007, p529). Kern et al. recommend better intergovernmental integration for German local authorities. They highlight the importance of political support from top government officials for such integration efforts (Kern et al. 2005, p9).
While the aforementioned authors draw conclusions from local mitigation policies, Bulkeley et al. report that "the implementation of adaptation measures is likely to encounter greater institutional complexity than is the case even for climate mitigation" (Bulkeley et al. 2009, p38). Successful adaptation policies may therefore require even more integration and coordination efforts than mitigation policies. Informal networks between individuals from different municipal departments may be helpful to achieve this, like in the cases of Durban and Quito, where such networks provided a basis for adaptation planning (Carmin et al. 2009, p11).

Institutionalization
Betsill finds that in US cities, "There is often no institutional home for climate change policy making" (Betsill 2001, p399). Davies presents similar findings from Ireland (Davies 2005, p27). A situation, where responsibilities for climate-related activities are not defined properly, will not produce effective climate activities. Institutionalization is essential in order to overcome "party politics and political timetables" as well as "resistance and inertia within the administration" (Bulkeley, Kern 2006, p2253). Furthermore, institutionalization helps to survive the loss of particular committed individuals, which play an important role in initiating local climate policy-making. For all these reasons, ICLEI supports member cities in "developing the policy, staff and funding structures" that support their internal commitment to climate change action (ICLEI 2008, p12).

Lack of cooperation

→ *with local stakeholders*

Many organisations and individuals are involved in the implementation of greenhouse gas reduction strategies on the local level. Therefore, Fleming and Webber ask for a partnership approach (Fleming, Webber 2004, p765). Local stakeholders may be important to "build a local support base and develop context-specific solutions" (Schröder, Bulkeley 2009, p359). This experience was made in cities in many countries, e.g. in Germany, Mexico, South Africa, the UK, or the US. Bulkeley et al. 2009 conclude that "partnerships between state and non-state actors have proved to be critical in building the resources and capacities of municipal governments to address climate change" (Bulkeley et al. 2009, p27). This applies to both, mitigation and adaptation activities. Findings by Carmin et al. on adaptation in Quito and Durban suggest that "adaptation efforts will be enhanced if cities […] engage nongovernmental stakeholders, including NGOs, CBOs, consultants, and universities in planning and implementation." (Carmin et al. 2009, piii) Table 8 gives an overview of local stakeholders as presented in the literature.

Table 8: Local stakeholders with relevance for climate protection activities (in alphabetical order)

Mitigation	Adaptation
- Academic institutions, scientists - Banks - Building societies - Business sector and organizations - Charities - Civil society groups (incl. environmental and transport groups, political parties, religious groups, trade unions) - Consumer counseling - Energy efficiency professionals (architects, chimney sweepers, heating installers, construction industry) - Energy suppliers - Housing associations - Media - Public facilities - Schools, further education - Transport utilities - Waste, wastewater utilities - Water suppliers	- Building and planning professionals (e.g. architects, building engineers, civil engineers, city planners) - Community-based groups - Consultants - Firms - Health facilities - Meteorologists - NGOs, civil society - Police, Fire brigade, Emergency services - Research organisations / universities - Tourism industry - Water, waste water, waste management utilities

Source: Carmin et al. 2009, piii; Fischer, Kallen 1997, p82; Fleming, Webber 2004, p765; Jones et al. 2000, p205; Kern et al. 2005, p10; Schröder, Bulkeley 2009, p359; Tanner et al. 2009, p43

Lack of cooperation

→ *regional cooperation*

There is often a spatial mismatch between institutional responsibilities and jurisdictional boundaries of a city on the one hand, and the required greenhouse gas reduction or adaptation activities on the other hand. Often, formal city boundaries seem to be too narrow, be it for land, transport and energy policies, that aim at emission reductions, or for improved infrastructure and emergency preparedness to enhance climate-resilience in a city. McCarney describes a horizontal fragmentation of government structures as "multiple jurisdictional and electoral boundaries [...] span the territories of vast metropolitan areas" (McCarney 2009,

p40). Regional fragmentation of governance arrangements seems to be particularly strong in rapidly growing cities, mostly located in industrializing and developing countries. In these cities traditional city limits and governing structures are becoming increasingly outdated (McCarney 2009, p38f.). Mexico City, for example, is managed "by diverse federal, state and local tiers of government", so that the boundaries and functioning do not fit (Romero Lankao 2007, p259). Regional fragmentation may also lead to "competition between local authorities within one metro-region to attract developers and investors" (Alber, Kern 2008, p16). Such a situation may result in a race-to-the-bottom concerning environmental standards.
Dodman and Satterthwaite describe another phenomenon: Many activities that serve a city are producing greenhouse gases outside the jurisdiction of municipal boundaries (e.g. electricity production and provision, food production or refinery of transport fuels) – and cities may be completely unable to alter the practices of these services (Dodman 2009, p194ff; Satterthwaite 2009, p541ff).

Lack of cooperation

→ *with other policy levels*

The need for cooperation also includes other policy levels. Bulkeley et al. point out that key sectors for adaptation, "such as coastal management and agriculture – are rarely within the direct remit of city governments" (Bulkeley et al. 2009, p38f.). They assume that national adaptation strategies which proactively engage with local issues can foster adaptation within municipalities. Tanner et al. further find that local adaptation benefits from situations, "where national, state and city ruling parties can work together quickly and effectively to implement policies and programs" (Tanner et al. 2009, p41). For mitigation, such cooperation seems equally important, and particularly so, where cities' climate protection activities are voluntary. For example, in China the national government designs policies to stimulate private vehicle use, which make it very difficult for local governments to design effective climate policies in the transport sector (Dhakal 2004, p89).
Cooperation may also include other cities, e.g. by city-networking. There is a variety of city networks on climate protection, like ICLEI's Cities for Climate Protection Campaign, Climate Alliance, C40 Cities, Energie Cités or the Covenant of Mayors. There may be a link between a local government's city networking activities and the success of local climate governance. For example, membership to more than one city-network on climate change was found to be an indicator of successful urban climate governance in Germany (Kern et al. 2005, p94). In the UK, during implementation of the Home Energy Conservation Act, some authorities would liaise with other authorities, to share experiences and best practice and even work together. Interestingly, "the analysis showed that those liaising with more than 10 other authorities produced significantly better reports than those liaising with none." (Jones et al. 2000, p205f.).

Regulatory framework

The degree to which a city can implement local climate policies also depends on "a city's competences and authority to regulate climate-relevant issue areas" (Alber, Kern 2008, p2). City governments may only have "limited power and responsibility over key public services, including planning, housing, roads and transit, water, land-use, drainage, waste management and building standards" (McCarney 2009, p38). Furthermore they are usually not able to act "in such important areas as the establishment of energy and eco taxes, the establishment of fuel efficiency standards, and the formulation of broad energy policies" (Schreurs 2008, p353).

The level of local competences in climate-relevant issue areas may vary from country to country (Collier, Löfstedt 1997, p26). The World Bank's 'Energy Efficient Cities Initiative' in low and middle income countries identified "limited autonomy vis-à-vis national/state bodies" as a policy and regulatory barrier to energy efficiency in cities (ESMAP 2009, p5). In their survey of cities' climate policies in the UK, Allman et al. observe "insufficient local authority powers" as a barrier (Allman et al. 2004, p280). Cities in Ireland are reported to lack significant tax-raising powers, and are therefore limited in their ability to innovate in policy development and implementation (Davies 2005, p26). In Japan, local governments' competences to independently formulate climate change, energy or traffic policies are limited, too. They are more or less restricted to the 'enabling' mode of governance. This did not change with the national 'Global Warming Law': while the new law sets an expectation for local climate policies, it does not provide the required legal competences (Sugiyama, Takeuchi, 2008, p425, 428).

Limited control over utilities

Traditionally, and particularly in industrialized countries, local governments have often provided certain services for their population, among them energy supply, public transport, housing, and water, waste water and waste management. These sectors hold a substantial potential for local climate protection activities. Municipalities that have control over these issues, "can have significant capacity to address climate change that other local authorities lack" (Bulkeley et al. 2009, p15). However, in Europe, pressure of market-liberalisation has led municipalities to "withdraw from the provision of public utilities, particularly in relation to energy and transport" (Bulkeley, Kern 2006, p2242). This process is known as 'new public management' in the UK. It follows the concept of liberalisation and privatisation that coined political thinking around the world from the early 1990s onwards. With limited control over their utilities, local governments have little control "over the prices, investments and corporate policies of the utilities" (Monstadt 2007, p327). Take energy provision as an example, where investment and pricing can induce a shift to decentralized and renewable energy infrastructures (Collier 1997, p43). Furthermore, where the liberalisation of energy markets has come with a reduction in energy prices (which is not always the case), this may

help to alleviate fuel poverty on the hand, and lead to an increase in carbon emssions as low energy prices reduce consumer interest in energy efficiency (Jones et al. 2000, p208f.).
Scholars report that limited control over key public services is a barrier for climate policies in cities all over the world. For the US, Betsill observes that limited control over local utilities renders cities unable to implement policies and measures directed at energy conservation or fuel switching (Betsill 2001, p403). In Germany "numerous municipal utilities have been, or are being, privatized" (Monstadt 2007, p327). In the course of their privatization, "demand-side management programmes, which where popular among local utilities, have been almost completely phased out" (Alber, Kern 2008, p9). It is therefore not surprising, that those German municipalities that still own their utilities are reported to be more successful in the field of climate change policy (Kern et al. 2005, p16; Weimer-Jehle et al. 2001, p4). In Mexico city public transportation was deregulated. Romero Lankao finds that this contributed to a growth in carbon emissions, as it resulted in a growth in car ownership and use, a vacuum in the provision of high-capacity modes of transportation and a modal shift from Metro and buses to minibuses (Romero Lankao 2007, p531).

4.4 Political and cultural challenges

There is another kind of challenges for local climate policy, that may be categorized as 'political' or 'cultural'. Among them are support for a local climate agenda, be it from chief politicians or from less prominent but highly motivated policy entrepreneurs in the administration or the city council. The short-term perspective of decision-makers and the existence of a broad range of competitive policy issues may both lead local authorities to set aside the climate change issue. Effective local climate governance would also include policies that address target groups on the local level, such as homeowners or businesses. Behaviour constraints like human reluctance to change and the profit-making culture of local businesses may lead these target groups to offer resistance to local climate policies. Table 9 provides an overview of political and cultural challenges.

Need for policy entrepreneurs
A broad range of case studies report the existence of a more or less influential proponent for the local climate agenda. It seems that committed personalities from the political sphere, in the administration, or in the local energy company can influence the level of local involvement significanlty (Collier 1997, p54). Policy entrepreneurs are particularly important for the process of persuasion within a municipality and can give an impetus for local climate governance (Bulkeley, Kern 2006, p2252). For 10 out of 23 cities from the ICLEI CCP program in the US, Kousky and Schneider found the existence of such an "issue champion" was essential to initiating climate policy (Kousky, Schneider 2003, p361). Policy

entrepreneurs or issue champions seem to be particularly important in the early stage of local climate governance. Longterm effectiveness of local climate protection may however largely depend on whether an issue champion is successful in building a broader institutional capacity for climate policies – not least in order to make climate activities survive the loss of particular individiuals like him or herself (Bulkeley, Kern 2006, p2253; Bulkeley et al. 2009, p14).
Policy entrepreneurs seem to be important in cities all over the world, and for both mitigation and adaptation. For local authorities in the UK and Sweden, Collier and Löfstedt report a link between a high level of involvement in climate protection on the one hand and the existence of one or two particularly committed individuals in the municipality on the other hand (Collier, Löfstedt 1997, p36). In Toronto, Canada, it was also an issue champion who first put climate change on the political agenda. Interestingly, he is believed to have been especially

Table 9: Relevance of political and cultural challenges for local climate governance

Challenges	**Relevance** Country context, Phase, Relevance	**Authors**
Need for policy entrepreneurs	Especially relevant for early phase of local climate governance	Betsill 2001, p399; Bulkeley et al. 2009, p14, 36; Bulkeley, Kern 2006, p2252f.; Carmin et al. 2009, p8, 19, 22; Collier 1997, p54; Collier, Löfstedt 1997, p36; Kousky, Schneider 2003, p361; Lambright et al. 1996, p469ff; McCarney 2009, p39; Qi et al. 2008, p396; Sugiyama, Takeuchi 2008, p425
Lack of political support		Alber, Kern 2008, p12; Allmann et al. 2004, p280; Betsill 2001, p398; Bulkeley, Kern 2006, 2240, 2247; Carmin et al. 2009, p22; Darier, Schüle 1999, p324; ESMAP 2008, p12; Fleming, Webber 2004, p763; Jones et al. 2000, p206f.; Kern et al. 2005, p3, 42, 89ff; Roberts 2008, p536; Schreurs 2008, p352; Tanner et al. 2009, p41
Short time horizons		ESMAP 2008, p12; ESMAP 2009, p5; McEvoy 2006, p5, p187; Mukheibir, Ziervogel, 2007, p156; Qi et al. 2008, p384, 393; Romero Lankao 2007, p530)
Competitive policy issues	Even more so in developing countries, and where municipal budgets are decreasing or already small	Alber, Kern 2008, p2, 24; Allman et al. 2004, p280; Bai 2007, p3, 7; Betsill 2001, p400f.; Bulkeley et al. 2009, p18, 33; Carmin et al. 2009, p11; Dhakal 2004, p85; ESMAP 2008, p11; Granberg, Elander 2007, p546; Huq et al. 2007, p13; Jones et al. 2000, p209; Kern et al. 2005, p88; Monstadt 2007, p339; Mukheibir, Ziervogel, 2007, p156 ; Roberts 2008, p523; Schreurs 2008, p351; Storbjörk 2007, p462; Suzuki et al. 2009, p28
Behavioural constraints		Allman et al. 2004, p280; Betsill 2001, p401; Bulkeley, Kern 2006, p2247; Collier, Löfstedt 1997, p32; Darier, Schüle 1999, p323; Dhakal 2004, p87; Harrison, McIntosch Sundstrom 2007, p7f.; Harvey 1993, p21; Kern et al. 2005, p3, 11f.; Lorenzoni et al. 2007, p447; Moser 2006, p7; Suzuki et al. 2009, p29; Ürge-Vorsatz et al. 2007, p459

Source: Literature Review

credible because he was from the conservative side of the ideological spectrum (Lambright et al. 1996, p469). For local adaptation policy-making, Carmin et al. identify a "public official as champion" for the city of Quito in Peru. For the city of Durban in South Africa, they find a "government employee as champion", "who was committed to the cause and willing to explore unfamiliar terrain" (Carmin et al. 2009, p19, p8).

Of course, the issue champion starting the process of local climate policy-making may also be the mayor him- or herself. In that case, the policy entrepreneur is also able to lend political support to the climate agenda (see next section). Japanese cities with such "activist" mayors and governors have been particularly likely to make global warming one of their top political priorities (Sugiyama, Takeuchi 2008, p425). The Chinese city of Baoding in Hebei Province has implemented policies to transform production and consumption in the city to a low-carbon system – a process which Qi et al. attribute to the mayor's vision and leadership (Qi et al. 2008, p396).

Lack of political support

Where the issue champion is not incidentally also the mayor or another high-ranking politician, the support offered by issue champions may have to be complemented by equivalent political champions (e.g. Roberts 2008, p536). From experience with local authorities' mitigation policies in the UK, Fleming and Webber conclude that "without strong support from the decision makers climate change will not be on the local government agenda" (Fleming, Webber 2004, p763). Key politicians can support climate policies by helping to secure project funding, raising awareness, or establishing a political vision for climate protection throughout all departments and bodies of a local authority (Jones et al. 2000, p206f.; Kern et al. 2005, p89).

Political support is probably particularly important when a city wants to use its competences of regulation for climate governance, or where highly debated climate protection policies are to be implemented (Bulkeley, Kern 2006, p2247; Kern et al. 2005, p91). Political support for local climate policies may depend on party politics, like in Germany. German local authorities experienced more difficulties in implementing climate policies, when the liberal conservative party (Christian Democratic Union) and the liberal party (Free Democratic Party) were in power, than under the rule of the social democratic party (Social Democratic Party of Germany) and the green party (Alliance '90/the Greens) (Kern et al. 2005, p42). The support of mayors is reported to be important in cities in China, Japan or Ukraine (ESMAP 2008, p12, Lviv city representative; Qi et al. 2008, p396; Sugiyama, Takeuchi 2008, p425).

For adaptation, political support is important, too. Carmin et al. find in their two case studies of early adapters Durban and Quito, that "The support of public officials [...] determined whether adaptation was viewed as a legitimate issue and affected the rate at which planning and implementation took place" (Carmin et al. 2009, p22). This is confirmed by Tanner et al. who observe that the integration of adaptation issues into development plans is i.a. influenced

by "levels of motivation among elected representatives and government departments" (Tanner et al. 2009, p41).

Short time horizons

Climate change is a long-term phenomenon. Because of the long residence periods of greenhouse gases in the atmosphere, results of climate change mitigation implemented today will only be seen in the long-term. And while climate change already affects us today, some significant changes to our climate will occur in the distant future of 2050 or even after 2100 (IPCC 2007, p14ff). McEvoy finds that these time scales are seldom in the vision of English local policy-makers. Even planning strategies which shall consider long-term spatial planning issues are limited to forward horizons of only 15-20 years (McEvoy 2007, p5). In Cape Town, South Africa, adaptation planning "projects that don't fit into the short political life of decision makers are not implemented." (Mukheibir, Ziervogel 2007, p156)

The World Bank's Energy Efficient Cities Initiative under the Energy Sector Management Assistance Program identifies election cycles as an underlying cause for short-term thinking of decision makers (ESMAP 2009, p5). The problem may increase, where local politicians are restricted to serve only one election period. For example, in Mexico City, governors and the president serve for a single six-year term, and municipal presidents and 'delegados' for a single three-year period – a situation which is believed to prevent longterm accountability in policy-making (Romero Lankao 2007, p530).

In China, there are no election cycles. However, top political leaders tend to be concerned about their career advancement, too. They used to be evaluated for their promotion of economic development. Climate change was not an issue to them as mitigation actions were believed to slow down economic growth and as the damages caused by climate change on global, regional and local levels "are less likely to make significant impacts on the local economy in the relatively short period of time that government officials are in office" (Qi et al. 2008, p393). Lately, however, climate change has become a factor in the performance evaluation system and hence motivates local politicians to develop local climate strategies.[5]

Moreover, the temporal disconnect between climate protection measures and reduced climate change impacts makes it difficult for people to understand and accept political decisions. In contrast, the effects of adaptation policies are immediate. Therefore they may be more attractive for decision-makers (McEvoy et al. 2006, p187).

Competitive policy issues

Climate protection has become an issue for an increasing number of local authorities. However, where climate protection is on a city's agenda, it has to compete with key areas of urban governance, such as social issues, public health, economic growth and a city's thrive for

[5] The nationwide 20% reduction target in energy intensity from 2005 to 2010 has been hierarchically handed down to local government levels, and government officials are evaluated based on their progress towards reaching the target (Qi et al. 2008, p384).

competitiveness (Alber, Kern 2008, p24). Bai is probably right, when he states that "for the majority of cities in the world, addressing global change does not top their agenda." (Bai 2007, p3). He illustrates the specific problems of developing country cities: "Why bother with the global issue, when people are dying from local environmental problems such as bad sanitation and pollution? How do we justify it?" (Bai 2007, p7). As billions of people have difficulty meeting their food needs and lack basic services, cities face immediate and severe challenges (Huq et al. 2007, p13). These challenges are aggravated by rapid urbanization. Furthermore, the resources of cities in developing countries are often very limited: Many cities face significant administrative, technical and financial capacity constraints. Last but not least, historic responsibility for climate change is low in developing country cities (Bulkeley et al. 2009, p18).

Durban, South Africa, has 43% unemployed, an estimated housing backlog of 190,000 units, and high levels of HIV/Aids infection. Therefore it is "hardly surprising that climate change (an issue that appears more remote and global in nature) has remained – until relatively recently – a low priority on the municipality's agenda" (Roberts 2008, p523). Or take the city of Quezon in the Philippines, where immediate needs, such as employment creation, slum eradication and safety, have higher priority than global environmental issues such as climate change, too (ESMAP 2008, p11, Quezon City representative). Chinese local governments' priorities were dominated by economic growth concerns, which made even the implementation of existing environmental laws challenging (Schreurs 2008, p351). With day-to-day and sector-to-sector problems piled on their front counter, city administrators in developing countries find no time to take on long-term plans or cross-cutting agendas which would be necessary for a transformation to energy efficient cities (Suzuki et al. 2009, p28).

In Cape Town, South Africa, adaptation planning is challenging, too: Often medium- to long-term planning is sidelined because of limited financial resources and competing priorities (Mukheibier, Ziervogel, 2007, p156). Areas of conflict may also arise between adaptation and economic development, e.g. where low lying coastal areas shall be developed in order to attract tourism – irrespective of sea level rise and its impacts (Carmin et al. 2009, p11).

While the existence of competitive policy issues is obvious in low and middle income countries, they are a challenge in cities in industrialized countries, as well. Dhakal finds that most cities in Japan suffer from local air pollution through particulate matter and nitrogen oxide emissions. As a consequence, it is not greenhouse gas problems, but control of diesel vehicles that is of highest priority in Tokyo, with the risk that policies to control diesel vehicles may lead to an increase of other emissions, e.g. by promoting a shift of drivers from diesel to less CO_2-efficient gasoline vehicles (Dhakal 2004, p85). In Sweden, Granberg and Elander observed a conflict between municipal ambitions to become "a node in a web of ever increasing land transport, on one hand, and a city tending towards ecologically sustainable transport on the other" (Granberg, Elander 2007, p546). And Storbjörk finds that Swedish cities' adaptation activities come after core issues such as schools, eldercare, medical services

(Storbjörk 2007, p462). This is the case in Germany, too. According to German jurisdiction, climate protection is a 'voluntary' task for local authorities. It automatically ranks behind 'mandatory' tasks such as urban land-use planning, waste water management, or building and maintenance of kindergartens and schools. And when it comes to the voluntary tasks, there is also a range of other voluntary tasks, that are given priority by many German cities, be it theatres, libraries or sport facilities (Kern et al. 2005, p88). For the city of Berlin, Germany, Monstadt further observed a competition between economic, financial, housing and building policy – instead of an integrated approach to tackle climate and energy issues (Monstadt 2007, p339). The competition between policy issues ususally increases, where the available budget of a city is small or decreases. This has been shown above for cities in developing countries. However, it also applies to cities in industrialized countries. For example, experience from the US shows, that when there is a budget shortfall, environemtnal programs, which are seen as luxury expenditures, are often hit first (Betsill 2001, p400).

Behavioural constraints

Local climate governance often addresses local stakeholders, like citizens, businesses and community groups (Allman et al. 2004, p280). Behavioural constraints may cause disinterest or resistance by these groups against local climate policies. Such resistance is not limited to a particular issue: Ürge-Vorsatz et al. report that behavioural constraints of both individuals and companies, hinder the adoption of energy-efficiency technologies and practices (Ürge-Vorsatz et al. 2007, p459). Beatley experienced scepticism towards the quality of solar energy home design (Beatley 2006, p37), and Betsill finds that city budget officials in the US have been sceptical towards performance contracting (Betsill 2001, p401).

Consumer behaviour may be one of the problems, local authorities face. As consumers people take decisions in their everyday life that have significant greenhouse gas impacts, e.g. by their choice of food, homes and mode of transport. Consumer behaviour may be difficult to influence for local authorities. Lorenzoni et al. find that even where public awareness and concern are widespread there is limited behavioural response to climate change – a situation they call an 'attitude-behaviour' or 'value-action' gap (Lorenzoni et al. 2007, p447). This may be due to a natural tendency of people to resist change. Suzuki et al. call this phenomenon "human inertia" (Suzuki et al. 2009, p29). Furthermore, the motivation for our behaviours may be manifold. Most of them "are convenient and easy, they do not hurt most of us too badly in the pocket book, and […] they give us a particular social status and identity" (Moser 2006, p7). Moser concludes that these underlying motivations must be kept in mind when trying to introduce new habits.

Some examples shall illustrate the challenge: In the city of Uppsala, Sweden, local officials perceived the conservative culture of the municipal government as the biggest constraint to local climate policies, as it has prevented more innovative ideas from being realized (Collier, Löfstedt 1997, p32). In the UK, the conservative culture of the construction industry may

present a particular challenge for local climate governance (Bulkeley, Kern 2006, p2247). Kern et al. observe that local climate protection projects often fail in German cities because they do not succeed in changing consumer behaviour. Furthermore, the conservative culture makes regulatory policies particularly difficult to implement. Politicians fear they are difficult to legitimate and may result in resistance by citizens (Kern et al. 2005, p3, 11f.).

Several scholars report that engineers may be reluctant to change, too. World Bank experience from the Eco2City Program is that "If conservative engineers are hired to consider a type of system they have never previously designed, they will invariably condemn the idea. While conservative engineers are in most respects the best kind to have, the process of preliminary engineering, or concept design, requires a much more open and innovative mindset […]" (Suzuki et al. 2009, p29).

Specific schemes may be particularly likely to meet local resistance. Yarnal et al. find that in the US, the "public does not support programmes that jeopardise automobile use or domestic heating and cooling" (Yarnal et al. 2003, p457). Private car use is a 'sacred cow' in Germany, too. Local climate policies that touch upon the free use of private automobiles are highly debated and often meet local resistance. This makes politicians reluctant to implement climate policies that address the transport secto. (Kern et al. 2005, p40, 81).

The profit-seeking culture of the corporate sector is highlighted by Darier and Schüle as a barrier to local climate governance in Manchester, UK and Frankfurt, Germany (Darier, Schüle 1999, p323). It may hinder local climate policies that depend on the corporate social responsibility of companies.

5. Discussion

The literature presents a variety of challenges for local climate governance. Interestingly, only a very limited number of studies do evaluate the relevance of the challenges identified in great detail. The studies by Allmann et al. 2004 and Jones et al. 2001 present exemptions in that they provide quantitative information on specific barriers in their respective surveys on communal climate and energy action in the UK (Allmann et al. 2004, p. 280; Jones et al. 2001, p207). The frequency of citations of certain motivators and challenges in the literature analysed may provide some indication of their relevance. Although table 2 and tables 6 to 9 do not include every single notion of a challenge in the literature analysed, they may allow for some conclusions. Table 2 shows that 'cost savings', 'vulnerability' and 'air quality' are among the key motivators for local climate governance. From tables 6 to 9 we conclude that 'financial resources', 'cooperation', and 'competitive policy issues' are among the most important challenges for local climate policy-making. However, this does not differentiate between mitigation and adaptation, accurately.

In an effort to gather more information on the relevance of the challenges and motivators, and to also include the difference between adaptation and mitigation, an analysis of the abstracts

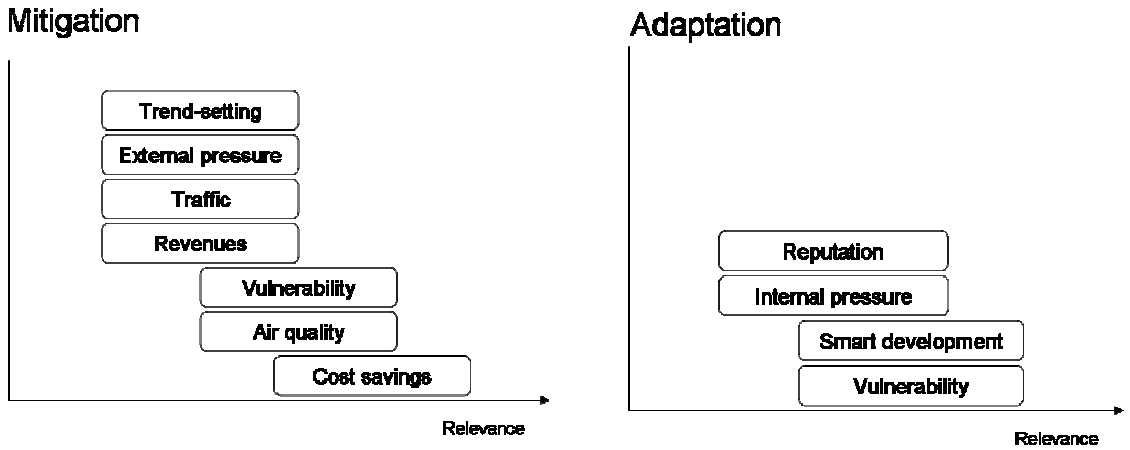
of the literature used was done. This was based on the assumption, that authors, while elaborating on a range of challenges in the body of their articles, would name only the seemingly most important ones in their abstracts. In order to differentiate between mitigation and adaptation, the analysis includes only abstracts of articles which elaborate on either mitigation or adaptation.[6]

Graph 1 and Graph 2 are based on this 'abstract-analysis'. As the analysis included more studies of mitigation than of adaptation, the results for mitigation are probably more robust. A complete table of the analysis can be found in the annex.

Three key motivators for local mitigation policies are the possibility to achieve 'cost savings' and improve 'air quality', and the perceived 'vulnerability' to climate change impacts. 'Vulnerability' is a primary motivator for local adaptation policies, too. Key motivators for adaptation further include a desire for 'smart growth', which in the case of developing countries can be interpreted as a commitment to social development, internal pressure and the hope to improve a city's reputation by the activity. The surprise here may be that vulnerability to climate change is not only a key motivator for adaptation, but also for mitigation. This may be due to the fact, that if climate change becomes an obvious problem for a city, the necessity for mitigation policies becomes also more evident.

Barriers to local climate governance also differ between mitigation and adaptation policies. The collective action problem (Tragedy of the Commons) is among the key challenges for cities' emission reduction policies. As a consequence, co-benefits of local climate policies become important motivators for cities' mitigation activities. Mitigation policies are

Graph 1: Relevance of motivators



Source: literature review, motivators as cited in abstracts

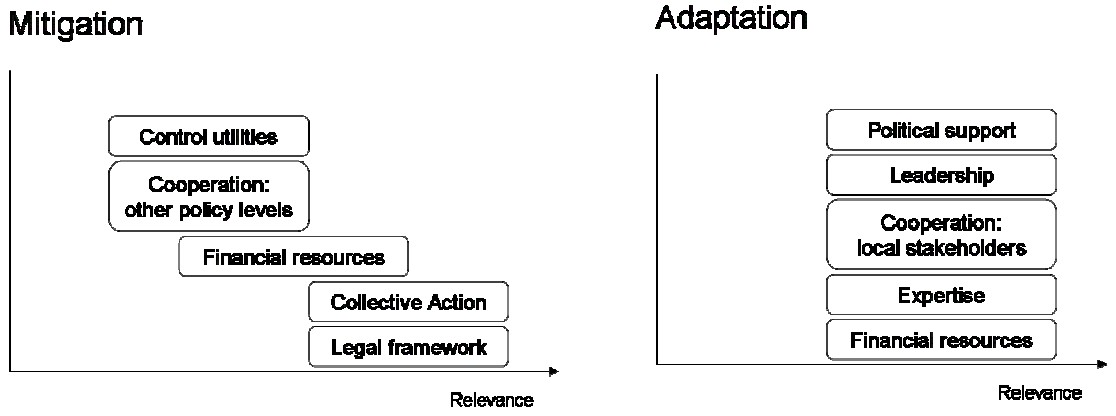
[6] Of course, this reduces the number of abstracts that entered the analysis. On the one hand, this may make the results of the abstract-analysis less robust. On the other hand, a clear distinction between adaptation and mitigation may add to the quality of the results, as it allows for a better understanding.

frequently constrained by inappropriate legal frameworks and a lack of effective cooperation between the city government and other policy levels. Furthermore, local governments often lack the financial resources which would be necessary for more ambitious mitigation policies. Control over local utilities is found to be another decisive factor for the success of local mitigation policies. Cities with control over their utilities are reported to be more successful in local climate governance. Financial resources matter for adaptation policies, too. In addition, key barriers for adaptation include the lack of leadership persons, of political support, of expertise and of cooperation with local stakeholders.

One can conclude that financial considerations play an important role in local climate policy-making. This includes the hope of local governments to achieve cost savings by energy efficiency measures, and budget constraints as a barrier to more costly climate action. When adaptation is motivated by a desire to reduce vulnerability, this includes a financial aspect, too: Climate change impacts are associated with high financial and social costs. Another obvious connection is between the high relevance of the collective action problem for mitigation policies, and the importance of co-benefits as motivating such policies. This is not new to practitioners like ICLEI, who count on the interest of cities in co-benefits as an important motivator for climate action (ICLEI 2008, p6).

However, the importance of co-benefits for local mitigation activities raises some questions. Firstly, measures that are implemented for their co-benefits may not be most effective in reducing greenhouse gas emissions. For example, the London congestion charge was introduced to reduce air pollution and traffic congestion. While it also has climate effects, these effects are rather marginal (Bulkeley, Schröder 2009, p358f.). Secondly, if costs and benefits play such an important role, why aren't all cost-effective measures realized? And why is the expertise for cost-benefit analysis in local authorities rather limited? Thirdly, if co-benefits are the single and most important reason for local governments to take climate action,

Graph 2: Relevance of barriers



Source: literature review, barriers as cited in abstracts

mitigation activities which do not generate co-benefits may just not happen. However, mitigation opportunities that come without costs will probably not be sufficient to achieve emission reductions in the range of IPCC requirements (- 80% until 2050 for industrialized countries).

Concerning barriers for local climate governance, it can be concluded that it often seems to be a combination of challenges which cities have to meet. Or, put the other way around, one finds that successful cities have overcome not only one, but a mixture of barriers. For example, political support is obviously important. However, it is not a guarantee for effective local climate governance. Rather it seems that it needs to be paired with other factors, such as some financial resources, increased public awareness, concentration of competences in the city administration, and willingness to evaluate climate policies (Fleming, Webber 2004, p770; Kern et al. 2005, p78).

This article provides an overview of the international literature on local climate governance, and the barriers and motivations presented in this literature. It includes case studies and country surveys from all contintents. Therefore, the results show a mixed picture, and cannot necessarily be transferred to any specific national context. Challenges and motivators seem to be highly case-specific. They seem to depend on a variety of issues. An obvious one is the respective legal framework and the national culture. Further issues that seem to matter are whether a city is a front-runner in climate policy or not, where it is located (e.g. on the coast-line and thereby affected by climate change directly), if there is energy-intensive industry in a city or whether cities are based in high, middle or low income countries (Allmann et al. 2004, p280; Brody 2009, p33; Zahran 2009, p544). The perspective of scholars studying a city, and the methodologies they use may also have an impact on how they rate the relevance of challenges they find.

Furthermore, the information in this analysis is aggregated. Thus the article did not elaborate on the interdependence between motivation/barriers and other factors in more detail. Future reasearch might want to (1) break down the scheme of motivation/barriers to specific national contexts, (2) find out whether motivation and barriers are different for different climate protection measures, or whether and how they depend on a city's history of climate action, (3) collect best practice examples on how cities have overcome barriers and (4) develop a tool for analysis of policy instruments targeting local climate governance.

6. Conclusion

A large percentage of greenhouse gas emissions originiates from cities, and adaptation action is naturally a local issue, too. In order to achieve emission reductions in the range of 60% until 2050 and to build climate resilience, nation states will have to lay more emphasis on the local level as the implementation level of climate action. While an ambitious and binding

international agreement is crucial to achieve emission reductions and advance adaptation, the transfer of such an agreement into concrete mitigation and adaptation activities needs to include local governments as important partners.

This article tries to improve the understanding of local climate governance. It provides an overview of reasons, why cities take or do not take climate action. On the one hand, it can inform local authorities, and possibly help them to overcome certain barriers or make better use of their motivators. Further research may elaborate on whether specific sets of motivation and barriers call for specific bundles of climate protection measures – and thereby provide further guidance for local governments in their climate policy-making: For example, cities motivated by cost savings could improve their policy-making if they knew which measures can actually deliver cost savings. Local officials in cities that do not have strong political support for climate action, could refrain from sensitive measures like ones touching private car use. Furthermore, once being aware of the importance of political support, they could also focus on building such political support by building capacity among their policy-makers.

A better understanding of local climate governance may also benefit other policy levels, that want to support climate action on the city level. On the one hand, it may inform the design of policy instruments targeting the local climate protection potential. Such policy instruments would probably have to touch certain barriers or motivations in order to change the behaviour of local authorities. The evaluation of such policy instruments could partly be based on the concept of motivation and barriers. On the other hand, the concept of motivation and barriers provides a basis for the analysis of existing policy instruments that may or may not have an influence on local governments. As the reach of such policy instruments is probably regional or national, here again, a more thorough understanding of motivation and barriers for local climate governance in the national context becomes important.

Acknowledgements

We are grateful for comments by Ludger Eltrop and Doruk Özdemir on earlier versions of this paper, and to participants of the Deparment System Analysis and Renewable Energies annualy workshop for helpful inputs. Any remaining errors are solely our own responsibility.

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Annex

Results of the analysis of abstracts of the articles studied.

Note that the category 'mitigation' includes only articles that limited themselves to mitigation, without considering adaptation. The same applies for the category 'adaptation', which includes articles on adaptation only. This definition was applied in order to distinguish clearly between citations of motivations/barriers to adaptation and those that apply to mitigation. In an article on both mitigation and adaptation, the abstract may include obstacles and constraints for local climate governance in general, not specifying between adaptation and mitigation.

		Mitigation	Adaptation
Motivation	Cost savings	4	0
	Revenues	1	0
	Smart growth / local development	0	1
	Air quality	3	1
	Traffic congestion	1	0
	Urban warming	0	0
	Social aspects	0	0
	External pressure & trickle down	1	0
	Internal pressure / incentives	0	1
	Reputation	0	1
	Trend-setting	1	0
	Perceived vulnerability	3	2
Barriers	Costs of climate policies	0	0
	Infrastructure backlog	1	0
	Lack of financial resources	6	2
	Lack of human resources	2	1
	Opportunities generate/access $	1	0
	Path dependency	0	0
	Small benefits of climate policies	1	0
	Lack of expertise	2	2
	Public interest & participation	1	1
	Limited monitoring and evaluation	1	0
	Little localized information on cc	1	1
	Absence of national mandate	0	0
	Inappropriate regulatory framework and limited competences	7	1
	Good local governance	1	0
	Internal integration & coordination	3	0
	Cooperation: local stake-holders	2	2
	Cooperation: regionally	2	0
	Cooperation: other policy levels	5	0
	Cooperation: city-networks	3	0
	Limited control over utilities	5	0
	Competitive policy issues	2	0
	Conservative culture, consumber behaviour, sacred cows	2	0
	Leadership	2	2
	Political support	1	2
	Short time horizons of decision-making	0	0
	Availability and reliability of technologies	0	0
	Tragedy of the Commons / Collective action dilemma	7	0