IKEM

July 2018

# TRANSLATING GLOBAL CLIMATE CHANGE MITIGATION AMBITIONS AT LOCAL AND REGIONAL LEVELS: THE ROLE OF MUNICIPALITIES

**Kopernikus Projects Enavi**

**Working Package 4 | Task 7 "Technical-systemic analysis with a focus on energy efficiency in buildings"**


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KOPERNIKUS PROJEKTE
Die Zukunft unserer Energie

GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

## Forschungsinitiative Kopernikus

The Federal Ministry of Education and Research (BMBF) has allocated a total of EUR 400 million to fund the Kopernikus program until 2025. The objective of the program is to develop innovative technological and economic solutions that can facilitate the transition to a more sustainable energy system. Over a period of 10 years, more than 230 partners from science, business and civil society will conduct research in four subject areas: "New Network Structures", "Storage of Renewable Energies", "Reorientation of Industrial Processes" and "System Integration". Researchers are adopting a holistic approach to these four subprojects in order to examine specific issues relevant to the individuals and institutions that play key roles in energy generation, transmission, supply, and distribution. The program's 10-year lifespan ensures that the initiative will include a long-term interchange between theory and practice.

## System integration: ENavi

As a participant in the "ENavi" subproject, IKEM is partnering with roughly 90 institutions from the fields of science, business, and law to develop a navigation system that promotes the transition to sustainable energy. Because system integration is vital to the success of comprehensive energy reforms, the program partners' integrative approach includes research on heat, gas, and fuel use. IKEM plays a key role in ensuring that the findings from theoretical analyses can be applied in practice. From the outset, field tests are conducted to assess the concrete technical, economic, and legal implications of the energy transition. Test results can then be applied to other regions. Program partners intend to expand the initiative to include research on 50 municipally owned power generation and electricity distribution companies, or *Stadtwerke*.

## This report should be cited as

Novikova, A., Mace-Snaith, R. 2018. TRANSLATING GLOBAL CLIMATE CHANGE MITIGATION AMBITIONS AT LOCAL AND REGIONAL LEVELS: THE ROLE OF MUNICIPALITIES. Deliverable of Working Package 4, Task 7. Report of the BMF funded project Enavi. IKEM – Institute for Climate Protection, Energy and Mobility, July 2018.

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# Abbreviations and Acronyms

BARC - Building Adaptive & Resilient Communities program
BMZ - The Federal Ministry for Economic Cooperation and Development of Germany
CANM - Climate and Asset Management Network
CAP- Climate Action Plan
CCP - Cities for Climate Protection
CDP - Carbon Disclosure Project
CEMR - Council of European Municipalities and Regions
CoM SSA - The Covenant of Mayors in Sub-Saharan Africa
DST - Association of German Cities
ECTS- European Carbon Trading Scheme
FCM - Federation of Canadian Municipalities
FMDV - The Global Fund for Cities Development
GBCI - Green Business Certification Inc.
GHG – Greenhouse Gases
GIB - Global Infrastructure Basel Foundation
GLISPA - Global Islands Partnership
ICLEI- International Council for Local Environmental Initiatives
IPCC- Intergovernmental Panel on Climate Change ISCI – International Solar Cities Initiative
JRC- European Joint Research Council
LG – Local Government
MCIP - Municipalities for Climate Innovation Program
MLG- Multi-level Governance
NAP- National Action Plan
NDC - Nationally determined contributions
nrg4sd - The Network of Regional Governments for Sustainable Development
PA- 'Paris Agreement 2016'
PCP- Partnership for Climate Protection
RVR- Ruhr Regional Association
SDGs- Sustainable Development Goals
SuRe- Standard for Sustainable and Resilient Infrastructure
TUMI - Transformative Urban Mobility Initiative
WAEMU - West African Economic & Monetary Union
WRI - World Resources Institute
WWF – World Wildlife Fund

# Abstract

Recent research has suggested that strong and immediate climate mitigation action is needed to meet the 2°C target set as part of the Paris Agreement in 2015 (Millar et al. 2017). Climate change mitigation is viewed as a 'wicked' problem due to its nature of cutting 'horizontally across sectors and vertically across levels of government' (Casado-Asensio & Steurer, 2017). The UN, within the Sustainable Development Goals (SDGs) and the EU, in the European Commission's Investment Plan for Europe (the 'Juncker plan'), recognise that climate and energy related targets can only be achieved by triggering local-level action. What is not clear is how municipalities can facilitate climate mitigation actions at the local level to ensure we meet the 2°C target. This paper uses a systematic literature review to supply information that is missing and required by municipalities to understand their role and options in the battle against climate change. The research finds that multi-level governance supported by a global network or partnership is the best frameowork for cities to successfully create and meet local level mitigation targets that can support national and global climate ambitions. One particluar barrier to this framework is that at some stage regional and national support both policitcally and financially will be required to ensure municiaplities continue to progress.

# 1 Introduction

Climate change is seen by many as a challenge of the commons due to the need for global co-operation and action. The Paris Agreement (PA) set an ambitious, but vital goal to limit global warming to a maximum of 2°C, to prevent potentially catastrophic impacts on socio-ecological systems(UNFCCC, 2015). This goal was widely seen as near impossible to achieve under the current emissions pathway (Matthews & Caldeira, 2008), particularly as many countries that ratified the agreement appear to be heading on pathways, well off course from that required to meet their Nationally Determined Contributions (NDCs). Currently, a 'gap of 14 GtCO2e exists for 2030 between between the mitigation proposals submitted and a pathway compatible with holding temperature increase below 2°C' (UNEP, 2015; Graichen et al. 2016). Positively though, some recent research has suggested that strong and immediate climate mitigation action may allow us to meet the 2°C target within the set timeframe (Millar et al. 2017). The UN, within the Sustainable Development Goals (SDGs) and the EU, in the European Commission's Investment Plan for Europe (the 'Juncker plan'), recognise that climate and energy related targets can only be achieved by triggering local-level action. The difficulty we face is that climate change mitigation is viewed as a 'wicked' problem due to its nature of cutting 'horizontally across sectors and vertically across levels of government' (Casado-Asensio & Steurer, 2017). The requirement for strong coordination between national, regional and local level climate mitigation governance (Figure.1 shows a diagram of spatial scale actors) has been identified as vital in meeting large scale ambitions of reducing global greenhouse gas (GHG) emissions (Betsill & Bulkeley, 2006). Further, the EU (Melica et al. 2017) found that:

"*National policies could be better implemented if adapted to local situations and closer to citizens. At the same time local administrations should be aware of national (e.g. national incentives, efficiency requirements, etc.) when setting city targets and policies".*

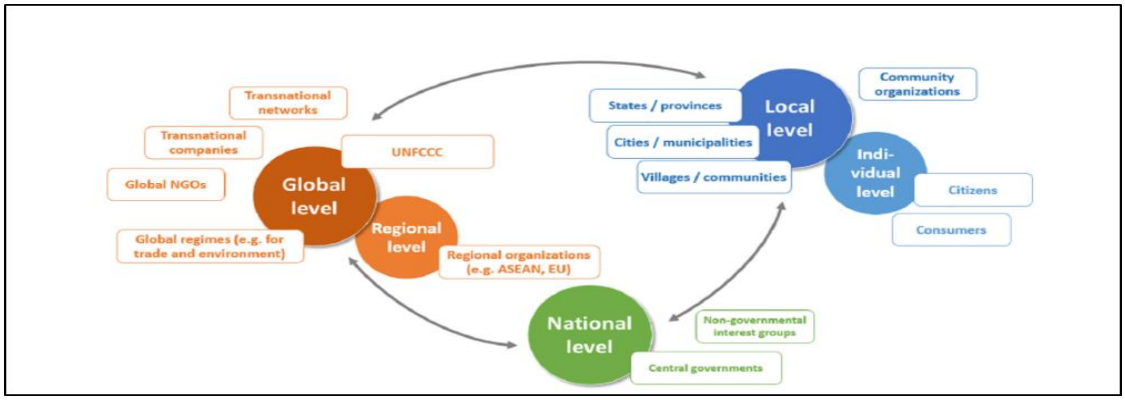


**Figure 1 Illustration of the Climate Mitigation Actors at different Spatial Levels**
**Diagram illustrating the interplay of different actors at global, national, local and individual levels (Marquardt, 2017).**

In that context there is a growing need to understand the role that regional and local level climate actors, specifically municipalities[1], can play in delivering climate mitigation that aligns with national and global ambitions (Bulkley et al. 2009). One of the key areas we need to understand is how LGs should intervene in climate mitigation efforts; should they implement higher level objectives such as NAPs and NDCs or should they work more autonomously? Or should they actually just act as the facilitator of private sector and individual climate mitigation action? (Aall 2009). As such the ambition of this research is to explore current practices and frameworks for translating the 2°C at the municipal level and assess the current state of coordination with regional and national levels. A scan of current mitigation models being practised and a systematic literature review will be undertaken, which will then be collated and presented. This information on the options available to municipalities is currently missing, but is required so that local-level actors can successfully implement climate mitigation actions. Without this local-level action, meeting the 2°C target will be extremely unlikely (Ingold & Fischer, 2014; Ringel, 2016).

### 1.1 Problem definition

Currently there is one majorly defined climate mitigation target globally that is the IPCC 2°C limit, as agreed in byt the PA. Various targets and actions, at different spatial and temporal scales are required to achieve this goal.

LGs have been highlighted as one actors to ensure we mee the PA target, due to their ability to coordinate and influence local level actions and in particular their ability to interact with other local level actors including the public and private sector (Ingold & Fischer, 2014; Fudge et al. 2015; Ringel, 2016). The current problem is that 'climate policy at the city-scale remains fragmented and basic tools to facilitate good decision-making are lacking' (Corfee-Morlot, et al. 2011). Furthemore, LGs cannot act in isolation from the national government as they are regulated by higher legal and institutional frameworks (Corfee-Morlot, 2009; Bulkeley; 2010 Bulkeley, 2013). This means Municipalities need to understand the current situation they face with regards to their climate mitigation responsibilities, and what frameworks can be used to successfully create mitigation policy and turn these into local level actions(Melica et al. 2017).

This research paper will assess and present the current state of play in climate mitigation governance with an emphasis on how and what can be achieved at the city-level. This exploratory research will give a better understanding of the current levels of integration of climate change

[1] Note: the terms municipality and LG are used synonymously throughout this paper to mean the level below regional/provincial.

governance across different spatial scales and how much of a role cities are playing and can play in achieving the PA target. This research is important to allow municipalities and other local actors to understand their roles in mitigating global climate change and what options and challenges they may face. Through a systematic review of primary literature, an analysis of some of the key frameworks will be made, which will in turn allow for a synthesis of the different climate policy and actions taking place, and how this relates to successful climate mitigation at the local level. Finally, this information will be summarised and presented, so as to inform LGs, that are yet to succseefully implement climate mitigation strategies on how they may do so.

## 1.2 Research question

**RQ1**: How can municiaplities effectively mitigate climate change and meet the actions needed to prevent global warming? What are the strategies currenly being used by some municiaplities globally that can be learnt from by other municipalites?

**RQ1.1**: What frameworks are being used?

**RQ1.2**: What opportunities and challenges do municipalities face to implement these strategies?

## 1.3 Limitations and scope

The scope has purposely been set at a broad level to encompass a global span of literature and mitigation efforts to offer a collective situational analysis of similarities and variances between municipalities of different countries. Where possible a range of countries have been reviewed, but of course many either do not have prominent literature or they could not all be covered in this paper. Where the scope is broad it also utilises case study examples from various cities to demonstrate achievements and difficulties in practice. This is then limited by the choice of these examples and these have been chosen through a criteria of access, relevance, age and respectability of the research. Due to logistical and limits of this research paper it was only realistic to undertake a literature review and no formal primary data was collected such as interviews etc.

Furthermore, the scope and aim of the research paper feeds in to research being undertaken by the Institute for Climate Protection, Energy and Mobility (IKEM) as part of their ongoing project under their ‘Kopernikus ENavi’ program.

## 1.4 Ethical considerations

This paper seeks to conduct all research appropriately under Lund University guidelines. All comments made in this paper are the authors opinions or are appropriately cited a referenced where relevant. No permissions were needed as no sensitive material has been deemed to be used in this research.

## 1.5 Audience

This research is anticipated to aid municipalities and other actors within and outside climate mitigation governance in their understanding of climate mitigation ambitions and actions. Stakeholders including the private sector and local communities may find this this research pertinent as it will address the role they play at the local level and their involvement in practices to achieve climate mitigation targets. Furthermore, academics from a broad background may also find this literature review and analysis beneficial to their understanding.

## 1.6 Disposition (outline)

Chapter 1 introduces the research problem that the paper seeks to address and conceptual framework.

Chapter 2 describes in detail the methodology of the research.

Chapter 3 offers the main presentation of the literature reviewed and an analysis of this in the context of the research problem and question.

Chapter 4 discusses the key themes established in the literature review analysis

Chapter 5 summarises final conclusions that explain how this research addresses the problem and presents key findings of relevance to the audience.

# 2 Method

The following section provides details on how this literature review was conducted and what were the main procedures.

The research consisted of two parts: (i) data collection and (ii) data analysis. This was done based on the existing literature about the main concepts underlying climate change adaption and mitigation, policies and initiatives tackling it, as well as the issue of governance in this matter.

**Collection**

Since there is a great abundance of literature about climate change mitigation, certain search criteria are needed to be defined to narrow down the collection and get as exact search results as possible. Among others, the following keywords were used while searching for literature: climate change mitigation/adaptation, multilevel governance, integrated strategies, local and national initiatives etc. It is apparent that using these keywords individually, one could get a wide range of search hits that might not be too relevant for this research, which is why combinations of keywords were used. It is important to note that not all data was gathered through web research, further literature was gained by exploring cited works.

Depending on the information acquired, sources of data differed. Literature published in scientific journals was obtained either from their respective websites via LUBSearch, Google Scholar or Researchgate. Various reports were collected directly from the organisation's websites, such as UN databases. While primary data was gained by observation and analysis of information presented on websites groups, NGOs, initiatives, forums e.g. Global Convent of Mayors, C40, ECLEI etc. A deliberate selection of peer-reviewed articles and organisational information was pursued to ensure data traingulation that offered the views of multiple perspectives.

**Analysis**

To further eliminate data that cannot be applied to this research, systematic review of relevance was done. First step included skimming through the literature to sort it according to relevanant critieria; direct link to climate mitigation, governance and actionable frameworks, before reading every piece in detail. Once only the relevant data was left, a matrix (Appendix 1) was utilised to enhance the review and allow for key points to be gained from sources of primary literature, this was complemented with further reading into the citations within these.

A synthesis matrix was utilised to group analysis into themes (see Appendix 2), the main themes from this synthesis have been used in the literature review and analysis section, these are:

- Multi-level Governance
- Top-down approaches
- Bottom Up Approaches
- Networks and Initiatives

Within these sub-headings the other themes from the synthesis matrix have been divulged such as case-studies, challenges and CAPs.

# 3 Literature review and analysis

### 3.1.1 Municipal level action for a global problem

Climate change mitigation has been described as a 'wicked' problem in the literature, due to its nature of cutting 'horizontally across sectors and vertically across levels of government' (Casado-Asensio & Steurer, 2017). In this problem cities have been described by many as the emerging leaders of climate mitigation and local level action has been praised for showing the way to national and global actors in cutting GHG emissions (Bulkeley and Betsill, 2003; Kousky & Schneider, 2003; St-luis & Millard, 2016). A theory that argues against city level action is the 'Matching Principle', which states that geographic size of the problem should dictate scale of governance structure that should tackle it, this suggest climate change as a global problem thus should be conquered by international governance or at least nation states (St-luis & Millard, 2016; Butler and Macey, 1996). This is countered by some authors in that cities hold the best ability to tackle the problem due to their control of land-use, planning, transportation, industrial regulation, energy consumption, which are most of the main GHG emitters (Dodman, 2009; Lefevre, 2012; Rutherford & Jaglin, 2015). Wood and Thompson (2012) stated that 'local governments have been among the most active jurisdictions on the climate change front'.

Bulkeley (2010) highlights that cities could be responsible for up to 75% of global human $CO_2$ emissions e.g. London represented 8% (44 megatonnes) of the U.K.'s total GHG emissions in 2006, equivalent at the time to the whole of Greece or Portugal. Bulkeley explained that many cities operate a climate governance system where climate change mitigation only takes place within 'win-win' scenarios. This has been furthered emphasised since the economic crises in 2008, in which since we have seen many municipalities budgets reduced and many central governments such as the U.K. have utilised devolution as 'passing the buck' (Gillard et al., 2016). Thus this has placed greater emphasis on private actors, but this again adds to the complex levels of urban climate change mitigation, as these actors may operate across various networks and spatial scales (Bulkeley 2010).

Musco (2010) and Azevedo et al. (2013) recognise the importance of the city to influence global ambitions, discussing the privileged socio-economic position circumstance that cities find themselves, as the suitable level for taking climate mitigation action. Furthermore, Bulkley et al. (2009) and Azevedo et al. (2013) claimed cities have been propelled to the forefront of climate mitigation policy and action due to the increases in urbanisation, population and associated GHG, resulting in the need for cities to act. The authors concluded that cities are still not in

general acting at a fast enough pace to meet the needs of emission reductions, and highlighted that this may be due to lack of incentives, capacity and coordination.

In developing countries the IPCC (2014) reported that commonly cities do not have the political will, capacity or financial support to mitigate climate change. This has been similarly stated in other developing countries including India, China and most other Asian countries (Bulkeley 2010; Gouldson et al 2015). Surprisingly there is also this association in developed countries such as Canada (Gordon, 2015), the U.K. (Gillard et al., 2016) and Denmark (Berhtou & Ebbesen, 2015) where a lack of municipal political will power has been blamed for a lack of innovation and forward development of climate mitigation achievements at local levels. Both Altruistic Mayors and LGs are seen as a vital ingredient to achieve innovative and successful climate mitigation governance at the local level (Bulkely, 2010; St-luis & Millard, 2016). Much of the literature claims that where cities lack success, this may be rectified in some part by creating new governance structures to create local level response (Acuto, 2013; Betsil & Bulkely, 2006; Corfee-Morlot et al., 2009; Franzén, 2013; Matsumoto et al., 2014; OECD, 2010).

### 3.1.2 Top-Down Approaches

Traditionally top-down approaches have dominated climate mitigation agenda, this maybe in part to the concept that climate change is a problem of the commons and the Matching Theory discussed earlier (Butler and Macey, 1996; Lutsey and Sperling, 2007). This has been visible by how international governance such as the UN via the IPCC have led the climate change discussions. There is much recognition that climate governance in some way still predominatly follows this approach, particularly in more developing countries or state dominated governance systems (Gouldson et al. 2015). In much of Asia we still see the climate mitigation agenda set by central governments through energy targets and GDP, using aggregated models, in part due to the lack of unwillingness to decouple growth and GHG emissions. This aggregation framework is strongly linked to a national climate change mitigation approach that links the energy system and economy, with a tendency for longer-term targets to follow this model (IPCC 2001).

Gouldson et al. (2015) claim many of the big Asian megacities are in peril of becoming locked-in to costly and carbon intensive pathways. The authors highlight numerous countries in Asia that are following a singularly top-down model. India for example they say hold strongly linked mitigation targets with GDP determining the national level NAP, which sees a focus on development with climate change co-benefits. This leads to the state level CAPs being inadvertently mixed depending on their development status and limits to the control cities such as Mumbai, for example the electricity sector is influenced by the state policy or even greater the

international market, thus there is little private and public stakeholder cooperation, leading to lock-in. China and many of its cities seems to have some slight argument over their models for climate mitigation. Li and Song (2015) describe how central government control, sets the manner in which Chinese provinces and cities tackle climate mitigation through incentives to meet the national targets, meaning much of the regional and city plans are simple targets that follow the national lead of using GDP units. The authors state this means plans are generally not specific to the city and fail to address local mitigation issues. On the other hand, many authors seem to suggest China and its cities have made more progress through top-down incentives such as the Low Carbon Model Cities strategy; which aims to give cities ecolabel status for meeting mitigation targets or the Local Carbon Trading Schemes being piloted in 7 major cities to reduce the cities use of coal (Wen-Cheng et al 2016); or even shown by the recognition that Chinese cities make up 60% of all certified emission reduction units under the Clean Development Mechanism, setup under the Kyoto Protocol in 1998 (Gouldson et al. 2015; Schreurs 2017). Scheurs concluded that cities in China would be better placed to tackle climate mitigation if more of a MLG framework was implemented to ensure cities gain the support they need regional and nationally (MLG is discussed in detail in later sections).

Top-down approaches are not limited to the national level; regional/state level emission reduction policies are widespread such as CAPs. Though there is often a political reluctance, which increases as you move to lower levels of government, to enforce behavioural change through policies such as taxation or regulation (Ockwell et al. 2009). In the U.S.A state and city CAPs set mitigation targets that the federal government appear little concerned about. City and state targets set to reduce GHG levels by specific amounts in the future covered 53% of the US population and 43% of 2007 US GHG emissions. (Lutsey and Sperling 2007; St-luis & Millard-Ball 2016). Lutsey and Sperling (2007) stated though that many of these targets were not legally binding and went on to research what states and cities were doing to action these targets, they found these were predominantly bottom-up approaches such as energy efficiency funding mechanisms and emission standards for vehicles. They found that if all US states implemented vehicle standards as California then it would equate to 55% of the reductions needed to meet 1990 for the entire Country. In 2007 California had to postpone implementing these standards due to legal challenges and lack of federal backing. Furthermore, the authors concluded that interaction across jurisdictions e.g. states and sectors was enabling them to overcome the lack of national support, and that further multi-level governance and partnerships including the actions of the federal government would allow for greater success in tackling the global climate problem. Some questions of state CAPs which included cap and trade schemes were asked by St-luis & Millard-Ball (2016) claiming that many cities could be tied down by this cap

and trade basis and that cities are more altruistic, due to political and co-benefit motivations. They assessed cities with and without a state cap and trade system and found that it did not actually differ in the city level innovation, and that cities had to operate under state legalities (i.e. emissions targets tied to emissions trade cap, even if cities could reduce GHG emissions by more) did so but found other ways to operate outside of the state.

In Denmark CAPs have seen positive results at the local level in both rural and urban areas. Adoption was widespread by LGs but varied in context due to lack of national guidance, but did work in tangent relatively with national targets (Damso et al. 2015). Figures 2 and 3 illustrate how the majority of municipalities exceed the national mitigation targets.

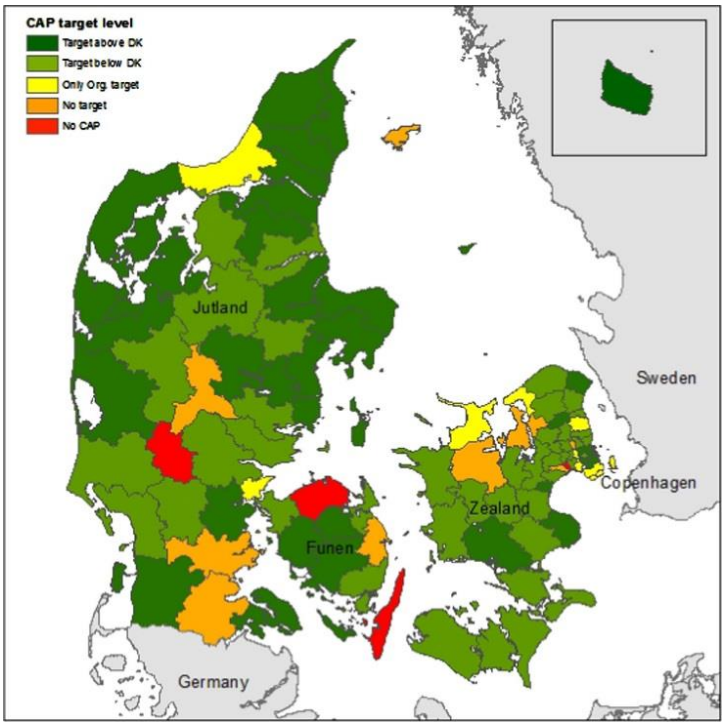


**Figure 2 CAP presence and target level in Danish municipalities.**
**Red: no CAP at all, Orange: no target, Yellow: only organisational target, Light Green: CAP but below national target, Dark green: CAP with target above the national one (Damso et al. 2015).**

Literature was found though that suggested the CAPs in Denmark were not beneficial on the individual level, casting citizens as consumers and reducing mitigation to just numbers and measurements of economic and environmental benefits (Berhtou and Ebbesen, 2015). The author's criticised the CAPs for losing value of social aspects of climate mitigation and seeing 'citizens merely as consumers that must be directed in their mitigation choices'. They concluded that LGs were limited by political will and the allocation of resources from higher levels, leading to activities that left no room for innovation.

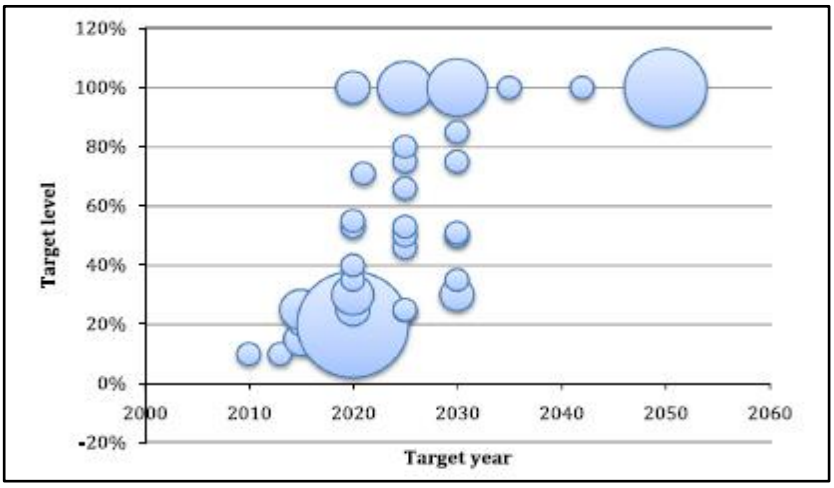


**Figure 3 Danish Municipality CAPs**
**CAP target levels, percentage reduction and the year for it to be achived. The larger the bubble the more municipalities share the target (Damso et al. 2015).**

National Mitigation Strategies (NMS) have been set-up in Europe (EU-15) to influence multi-sector mitigation efforts including energy and transport and encouraging climate policy integration (CPI). Casado-Asensio and Steurer (2017) found that NMS have ultimately become about the recording how much GHG has been reduced and not include consideration of land-planning and natural resource use. This they claimed was due to a long-term focus (2050) with little short and medium term 'steps'.

Building regulations can be seen as on top-down way to increase action on mitigation efforts Visscher et al 2016), in Tokyo for example, they have used a cap and trade system in the to ensure a reduction in energy consumption, but the manner in which it is done is up to the developer and then owners of how to meet the targets, linking design and ownership (In many other countries we see zero energy building policies being emplaced by municipalities, the mechanisms are different between countries like China, Denmark and states like California, but still aim to increase climate mitigation. Although some building regulations can be seen as more bottom-up such as financial incentives in Hong Kong to encourage developers to uptake green practices, offering better sale conditions, or the use of 'green leases' where there is a shared responsibility by landlords and tenants to achieve greater energy efficiency of a property. Literature describing more bottom-up approaches is discussed below.

### 3.1.3 Bottom-Up Approaches

Carney and Shackle (2009) stated that too much centralisation leads to defunct policies and that would be better conceived nearer to those that would benefit e.g. regional and local scale

focus with intiations from the bottom. Bottom-up (disaggregation) puts more emphasis on technology improvements and site-specific change such as behavioural consumption e.g. energy efficiency. Broto & Bulkeley (2013) investigated the roles played by actors in bottom-up initaitves and partnerships in climate mitigation actions. They found that predominantly LGs lead these intiatives, but that the private sector was most involved in partnerships, the results are shown in Figure.4

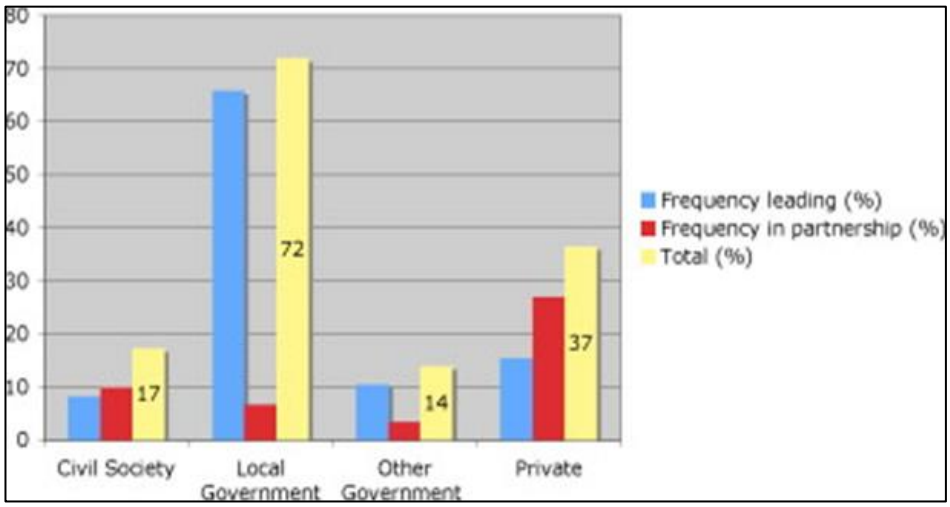


**Figure 4 Number of Mitigation Partnerships and the Roles played by Different Actors**
**Graph showing the number of mitigation partnerships in the study and the percentages lead by each actor and the amount they are involved in partnerships (Broto & Bulkeley, 2013).**

In a case study of Rotterdam and Hamburg, Huang- Lachmann & Lovett (2015) found two differing approaches being taken by the two cities (Figure 5). Rotterdam has committed to spending 13 billion euros by 2025 to reduce its emissions by 50% (from 1990 levels) and increase energy efficiency by 2% annually, as part of meeting the tagrtes in the 'Climate Agreement: Municipalities and Dutch government 2007-2011'. In contrast to Hamburg's (aiming for a 50% reduciton by 2020) top-down approach of stringent building regulations, that in-turn certifies buildings with ecolabels (70% of new buildings (300 000m$^2$)has met the gold eco-label standard, and it will rollout to cover all residential buildings too in the near future), Rotterdam took a more bottom up approach. It has aimed to create eco-innovation in the building sector by creating awareness task forces and subsidising things like living roofs, investing in iniatives to encourage private and public sector invention. The municiaplity merely sees themselves as facilitators and plans to not only attract citizens, developers, research institutes and buisness to increase economic development, it aims to genrate 4-5 billion euros from climate change buisness. It will do this by presenting itself as a world climate leader city and export its innovations.

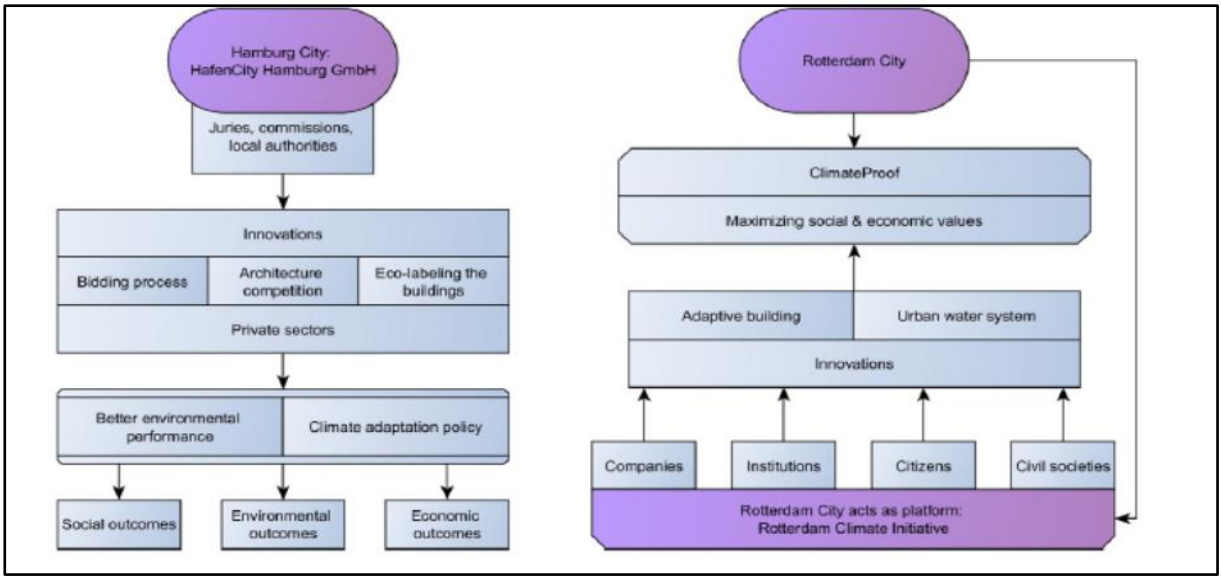


**Figure 5 Visual of both Hamburg and Rotterdam Governance Approaches**
**Comparison of top-down (Hamburg) verus bottom-up (Rotterdam) approaches (Huang- Lachmann & Lovett 2015).**

In the U.K. 26 cities recenlty gained greater power through the 'City Deals' aiming to increase public and private actor relations. Gillard et al (2016) reported that many of the departments in these cities don't have the capacity to consider climate mitigation strategies, due to ~51% cuts in funding. Even when there is suitable buisness cases e.g. energy efficiency combined with strong social benefits e.g. fuel poverty, many cities are not interested. The authors suggest that devolved power over climate mitigation, including national level devolution for Wales and Scotland, is merely a reliqnuishment of responsilibity by Westminister, due the incapacity for action on current budgets. The authors though did highlight some cities with ambitions that are utilising networks such as C40 and Core Cities (discussed in the next sub-section) to mobilise private capital to produce 'win-win' situations at the local level, during times of limited public spending. Another bottom-up approach is the 'Transition Towns' model, generally community led iniatives that gain support from LGs to retrofit buildings and promote behaviuoral change, linking the household and municaplity levels, but appears to only get so far without greater high-level support (Aiken et al. 2016). Walker (2011) explored community energy projects in the UK and found that the focus on technology was the best way to address behavioural barriers for municipalities. Memebers of the communitiy became more educated of climate mitigation through these communitity projects, which led the individual to undetake their own climate mitigation efforts, ranging from energy efficiency measures, consumption reducton to the fitting of solar panels etc. Furthermore, the involvement of the community meant there was predominatly less resisitance to the private sectors involvement in projects, due to the recognition of the projects benefits to the local area. Other examples of community scale projects were given such as; local owned wind farms in Denmark, Germany and Japan;

local biomass plants in Australia; Hydro plants in the UK and even the setup of locally owned ESCOs involving the LG, charities and shareholders. These bottom-up solutions have been found to be encouraged in their success and innovation by the use of expert intermediaries, who lobby to break down local adminstrative barriers and engage in face-to-face particiaption with stakeholders. Furthermore they can also aggregate knowledge, advocate for better practice and scale-up innovative climate mitigation interventions (Matschoss & Heiskanen, 2016).

### 3.1.4 The Multi-Level Governance (MLG) Framework

"MLG can be defined as "a set of general-purpose or functional jurisdictions that enjoy some degree of autonomy within a common governance arrangement and whose actors claim to engage in an enduring interaction in pursuit of a common good" (Enderlein et al. 2010; Harker et al. 2017).

Melica et al. 2017 argued that both top-down and bottom up approaches are needed to reach the climate mitigation of all actors, signifying the importance of MLG to achieve this. Much of the research points to the multi-level governance framework as the way forward to ensure cooperation through the different governance levels (global, national, regional and local) and actors through vertical and horizontal integration (Gouldson et al., 2015; Matsumoto et al., 2014; Paavola, Gouldson, & Kluvankova-Oravska, 2009, OECD 2010). Furthermore, many cite the need for such a framework when local action is often tailored by legislation and mechanisms at higher levels e.g. national action plans (NAPs), which are in turn a response to multilateral agreements made in intergovernmental and international setting (Anguelovski & Carmin, 2011; Franzén, 2013; Schreurs, 2010). Kern and Alber 2009 further argued of a need for 'different forms' of horizontal and vertical collaboration. They suggested national and 'transnational networking, practice sharing and best practice learning' (vertical) and national governments enabling lower level action through; 'funding schemes and authorative modes of governing'. Ingold and Fischer (2014) agreed in the need for mitigation policies that utilize 'vertical and horizontal interaction across the levels of governance and between public and non-public actors'.

A strong effective MLG example was found in the Sweden, namely Kista Science City (KSC), the largest buisness in district in Sweden located in Stockholm (100 ICT companies, 69 000 workers and 120 000 residents; an increase of 32% since 2004). Here Robert (2015) reported that the multi-level cooperation between the Swedish Transport Administration (STA), the City of Stockholm, Stockholm public transport authority (SL) and the County administration Board (CAB) were able to launch the project 'Kista Commute'. The project's aim was to while address the increasing travel demand that was about to exceed capacity, while reducing GHG emis-

sions, air pollution, congestion and the associated loss of productivity for buisnesses and increasing customer accessibility. In turn it would also mean meeting Swedish legisaltion of 40% $CO_2$ reductions by 2030. Five of the biggest companies (Ericsson, IBM, Microsoft, Atea and Oracle) in the district were inivted on to the project board, incentivised by their mutual needs. The CERO backcasting process (see Figure 6) was used to aid the companies in setting up internal mitigation targets and a regional action plan. The project was unique as it allowed buisnesses to influence planning and shape infrastrucutre for their needs, while highlighting what they could do with out municipal support, while making a profit e.g. buisness case and what the municiaplity needed to to e.g. public relations, taxes, parking regulations. Furthermore it dramtacially encouraged companies to reach their targets, by using backcasting fropm where they wanted to be in the future to the present situation. The project is also due ot be rolled out to small to medium sized buisnesses in the future and will continue to utilise an operator platform between public, private and resident actors to further develop action plans

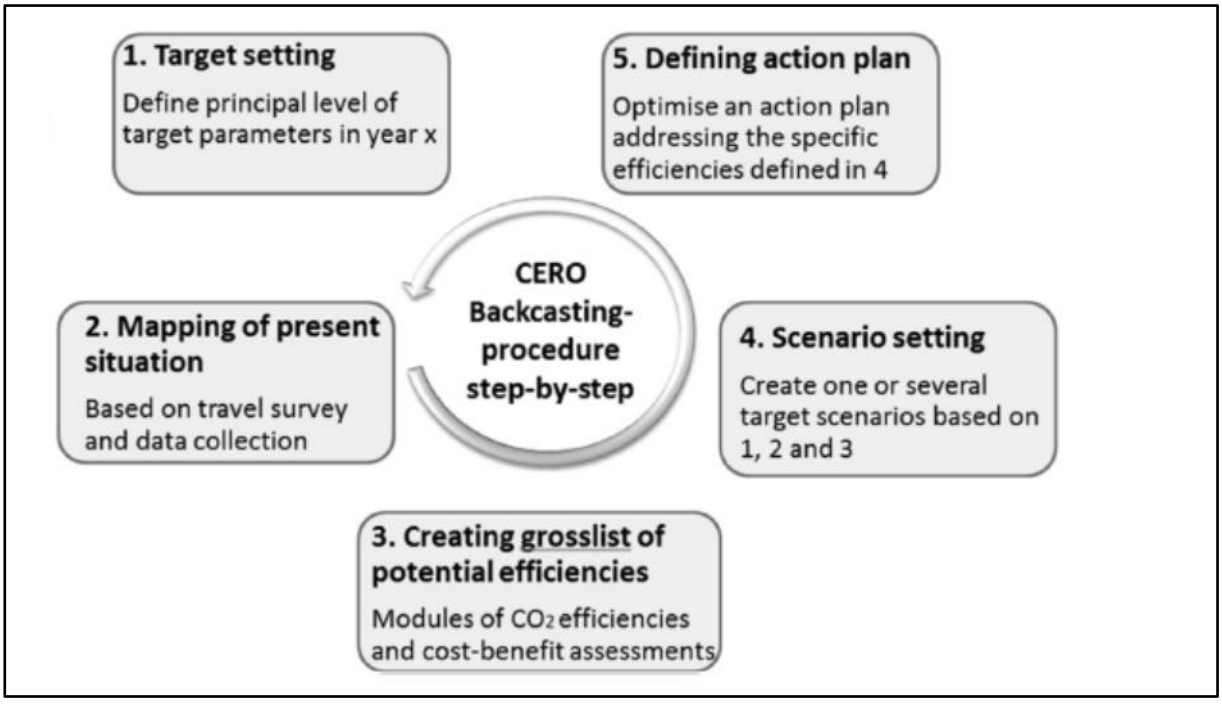


Figure 6 CERO Backcasting Process

In Germany Ringel (2016) undertook an analysis of MLG for energy efficiency and pointed to the need for greater coordination mechanism between the levels and also 'horizontal exchanges of best practice'

Melica et al. 2017 analysed the European Covenant of Mayors (now the Global Covenant of Mayors) and claimed it to show a successful implemenation of bottom-up led, MLG approach. The Covenant of Mayors for Climate & Energy framework has gained the signatures of over

7,000 municipalities and local governments to EU wide agreement (CoM 2017). The covenant sees individual pledges of action on climate mitigation by each signatory in the form of a Sustainable Energy and Climate Action Plan (SEAP), which is assessed and approved by the European Commission Directorate General Joint Research Centre (JRC). These pledges fall in line with the EU target of reducing GHG emissions by 20% by 2020 and has recently been extended by the CoM signatories to adopt the EU's 2030 target of 40%; in addition local governments will in the future consider climate change adaption actions as part of the covenant (CoM 2017). Recent assessments by the JRC, show that municipalities have committed to well over the 20% EU GHG reduction target, with municipalities and local government's planned action translating to a 27% reduction in their GHG emissions by 2020; current implementation data suggests a 23% reduction has already been met (Kona et al 2016).

The CoM model not only offers translation of national goals on a local level, but is implemented with a strong emphasis on regional/provincial level involvement; affording an excellent example of multi-level coordination. Melica et al. (2017) describes how the CoM structure prescribes public authorities at the provisional/regional level to act as Covenant Territorial Coordinators (CTCs), which support local governments in meeting the aims of the CoM through knowledge and capacity sharing, direct or in-direct support financially and technical assistance. The authors highlight the particular importance of the role played by CTCs in aiding local administrations with a population less than 10,000 to produce a SEAP, without this backing these less populated municipalities are unlikely to produce and implement an SEAP (Melica et al. 2017). This can be epitomised by the ability of the local governments to secure greater access to funding through the regional involvement, such as the European Regional Development Fund (ERDF) or support for applications to nonprofit long-term lending institution such as the European Investment Bank. One of the key reasons why regional actors are attracted to taking on the role as a CTC is because it offers a tool to meet their own, regional, climate goals.

### 3.1.5 Networks and Initiatives

In 2016 the CoM became a global framework for integrated multi-level action on climate change by joining the Compact of Mayors, a similar initiative operating outside of Europe, to create the Global Covenant of Mayors for Climate and Energy (GCoM). This covenant will aim to continue in the aims and requirements 9 (Figure 7) of the CoM on a global scale and working alongside the UN's 2030 Sustainable Development Goals (GCoM 2017). It is clear the GCoM benefits from a combination of networking and the MLG framework and many of the other networks and intiatives take some of their attributes from the bottom-up,top-up or MLG approaches.

| Phase | Badge | Description | Timeframe |
|---|---|---|---|
| Commitment |  | Commit to reducing GHG emissions and adapting to the impacts of climate change | |
| Phase 1: Inventory |  | Measure city-wide GHG emissions using the GPC | Within 1 year of commitment |
| | | Identify climate hazards | |
| Phase 2: Target |  | Set a GHG reduction target(s) | Within 2 years of commitment |
| | | Assess climate vulnerabilities | |
| Phase 3: Plan |  | Develop climate action plans to deliver on their targets | Within 3 years of commitment |
| | | Develop climate adaptation plan | |

**Figure 7 Requirements of Global Covenant of Mayors for Climate and Energy**

**(C40a 2017)**

Graichen et al. (2016) evaluated GHG mitigation contribution of global, regional and national initiatives in relation to nationally determined contributions (NDCs) using a bottom-up approach. First, the identified about 180 initiatives and screened them against their topic area, scope, expected impact, participants and setup (Figure.7).. Second, as a result of the screening, the authors developed nine criteria to filter only those initiatives, for which further quantitative and qualitative analysis is possible. Third, the authors assessed the GHG mitigation impact, which could be delivered by these selected initiatives versus the GHG emission pathway assuming the implementation of all INDCs. The overlaps of the impacts at a national level and at a sector level were calculated and the results were corrected for these numbers.

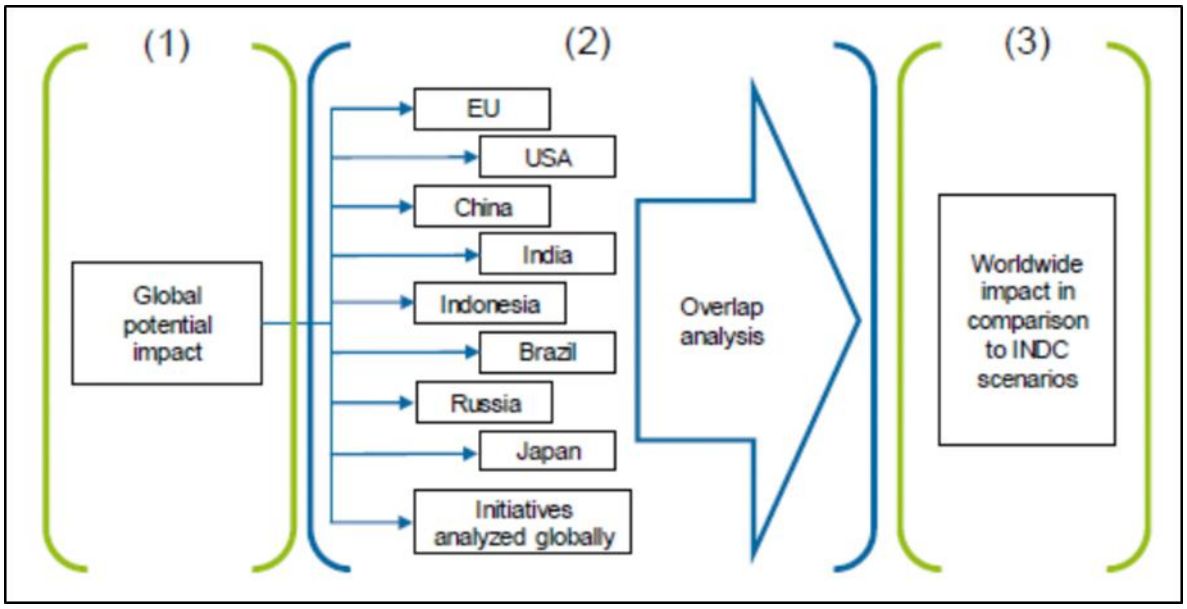


**Figure 8 Graichen et al. Methodological steps:**
**(1) The calculation of the potential impact of each initiative in absolute terms; (2) the disaggregation of these impacts to a country-level and the analysis of their contribution relative to countries' INDCs and the overlaps between initiatives; (3) the re-aggregation of these results to the global level, resulting in the impact of initiatives relative to worldwide INDC trajectories Graichen et al. (2016).**

Fourth, the authors aggregated the impact of these initiatives to answer the question on how much the initiatives can contribute to the emission reduction target beyond current pledges. Initiatives can play an important role in the transition to a low carbon economy. The authors concluded that the 19 initiatives for which the impact was estimated could deliver additional ca. 6-11 GtCO2eq. reduction as compared to the GHG emission pathway assuming the implementation of all INDCs in 2030 (see Figure.8).

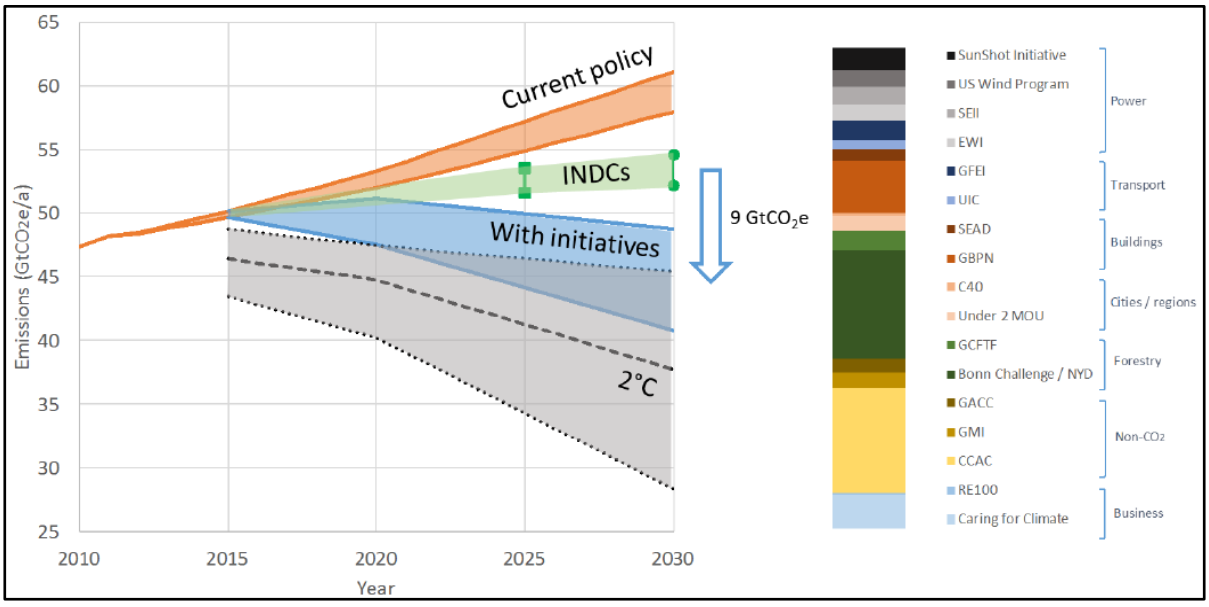


**Figure 9 Global emission (incl. LULUCF) and emissions reduction from initiatives**

"Global emission levels incl. LULUCF (historic, future under current policies, and future under INDC levels) along with the potential overachievement of INDC levels by the analysed initiatives scaled up to the global level. The dashed (dotted) lines indicate the median (10th/90th percentile values) of global 2°C compatible pathways ). Right: Disaggregation of the contribution of initiatives overachieving INDCs by initiative in 2030 (average number shown). Initiatives with less than 10 MtCO2 expected contribution (ABAOCP and ULCOS) are not in the legend as they are not visible in the graph" (Source: Graichen et al. 2016).

There thousands of intiatives and networks globally that involve municipalities and aid them to undertake climate mitigation under a mixture of frameworks. Some of the most influential and most noteworthy networks and iniatives are highlighed in the table below (a more comprehenisive list can be found in appendix 1):

Table 1

| Name | Approach (Top-down (TD), Bottom-up (BU) or MLG) | Description and Achievments |
|---|---|---|
| **C40** | BU | • Over 92 affiliated cities, accouting for 1 in 12 people globally (650 million).<br>• 3 memberships: megacities (pop. >3million), Innovator city (not a megacity but shows 'clear leadership'), observer city (initial status)<br>• Economies of cities account for one-quarter of world gdp.<br>• Established 17 networks for peer-to-peer exchange on mitigation and adaptation strategies.<br>• Developed a knowledge sharing online platform and hold over 100 workshops and webinars yearly. C40 networks are communication links between cities.<br>• Cities have so far committed to reducing their emmissions by 2.4Gt of CO2 or more by 2030.<br>• Cities required to commit to plans that limit temperature rise of no more than 1.5ºC.<br>• Provide cities with direct technical assistance.<br>• Maintain a comprehensive database on literature and actions concerning climate change resilience, mitigation and adaption in cities.<br>• Conduct research on how are city governments reducing emissions to facilitate future planning and monitoring.<br>• Partners with CoM as measurement tool for its affli- |

| | | |
|---|---|---|
| | | ate cities.<br>• Developed with the World Resources Insittute and ICLEI[2] the 'Global Protocol for Community-scale Greenhouse Gas Emission Inventories' (GPC) which is offers a global measurement system of city actioned climate mitigation to allow for comparison and aggregation.<br><br>(C40b, 2017). |
| **ICLEI – Cities for Climate Protection (CCP) network** | MLG<br><br>(Nation state funding contributions e.g. EU for EU Members) | • Established in 1993 by ICLEI .<br>• Transnational governance network.<br>• Focuses on helping local governments to reduce emissions.<br>• Developed a framework for action, a five milestone methodology, consisting of measurement, commitment, planning, implementing and monitoring.<br>• More than 650 local municipalities are participating in the programme and have pledged to reducing their GHG emissions.<br>• City benefits from exchange of knowledge, access to funding and political gains, international recognition for cities.<br>• Example: Denver, US: CCP helped LG to invest $1.6 million in LED lights, leading to $5 million savings.<br>• Barriers: bureaucracy, finance, capacity<br><br>(Bulkeley, 2009; Fay, 2007; ICLEIa, 2017). |
| **US Mayors Climate Protection Agreement** | TD | • Established as a way of advancing the goals of the Kyoto Protocol through leadership and action of American cities.<br>• Signatories are committed to taking three actions:<br>○ aiming at reaching or beating targets set out by the Kyoto Protocol in their own communities by taking local action,<br>○ pressure their state and federal governments to implement policies and programmes to reach or beat GHG reduction targets and<br>○ urge the US congress to pass a GHG legislation to establish a national emission trading system.<br>• 1060 US City Mayors have signed<br><br>(The United States Conference of Mayors, 2017). |

[2] ICLEI - Local Governments for Sustainability is a global network of more than 1,500 cities, towns and regions committed to building a sustainable future.

| | | |
|---|---|---|
| **The World Mayors and Local Governments Climate Protection Agreement** | TD | • Agreement launched by a coalition of local governments by UNFCCC in 2007.<br>• Declaration by Mayors and other locally elected leaders from the world that furher expands climate change commitments by calling for reduction of GHG emissions by 60% from 1990 levels worldwide, and by 80% from 1990 levels in industrialised countries by 2050.<br>• ~80 members<br>• Partnered with ICLEI<br><br>(ICLEI, 2017b). |
| **International Solar Cities Initiative (ISCI)** | BU | • International non-profit organisation founded in 2003.<br>• Promotes urban policies, planning and practices that are reducing GHG emissions to levels defined by the IPCC.<br>• Their main focus is on the use of renewable sources of energy in urban areas, which they aim to increase by bringing policy makers and scientists together and facilitating knowledge sharing about practical ways of transitioning to a sustainable society.<br>• Members: Oxford, UK; Dezhou, China; Adelaide, Australia; Daegu, Korea; Buenos Aires, Argentina.<br><br>(ISCI, 2017). |
| **Partnership for Climate Protection – Federation of Canadian Municipalities, ICLEI Canada** | MLG | • Part of the ICLEI CCP Network,<br>• Combines political commitments to act on climate change with capacity building support.<br>• The programme offers municipalities the five-milestone methodology as a tool for taking action against climate change and helps them in setting realistic GHG reduction targets, developing local action plans, implementing those plans and monitoring their results.<br>• 340 municipalities, that account for more than 65% of the Canadian population.<br>• 'New initiatives resulting from PCP include ICLEI Canada's Building Adaptive & Resilient Communities (BARC) program, and FCM's Municipalities for Climate Innovation Program (MCIP), which includes the Transition 2050 network and the Climate and Asset Management Network (CANM)'<br><br>(FCM, 2017). |

| | | |
|---|---|---|
| **Under 2 MOU**<br><br>**(Under2 Coalition)** | Sub-national TD | • Coalition of governments around the world committed to combat climate change, developed prior to PA 2015.<br>• It is based on an agreement, so called Memorandum of Understanding (hence MOU) which has been signed by 205 jurisdictions from 43 countries so far (cities, regional goverments and subnational governments).<br>• Central to the agreement is the signatories' commitment to reduce GHG emissions to 2 metric tons of CO2 per capita by 2050.<br>• The coalition serves as a global platform for supporting governments in their decarbonization pathway planning, sharing innovative policy solutions and facilitating reporting and tracking progress.<br>• Ensures recognition of members work outside of national government.<br><br>(Under2 Coalition, 2017). |

# 4 Discussion

The literature review and analysis has identified numerous mechanisms that local municipalities can use to implement climate change mitigation actions at a local level. Both TD and BU apporaches have been shown to be effective in cities including Rotterdam and Hamburg. What is clear though, is that some cities are clearly making good progress while others seem to stagnate and this appears to happen with both BU and TD frameworks. With TD approaches such as CAPs and NAPs there still needs to be strong implementation, without which many cities seem to have unachievable targets and little interest in meeting these. This may be down to a loss of political will due to changes in local leadership or low capacity to take on measures. Local governments (LGs) cannot act in isolation from the national government as they are regulated by higher legal and institutional frameworks and thus are instrinsically tied to the support they receive from above. Although we have seen in the US that states such as California appear to be driving their national mitigation efforts, there still appears to be conflicts when there is no clear regional and local level relationship and mitigation efforts do not align with each other e.g. the cap and trade system whereby cities are limited in their reduction potential by the cap limit. BU approaches such as community led initatives have the added benefits of educating citizens, which could be vital in changing behaviour. We have seen by the example of Rotterdam how a city can facilitate private sector action on climate mitigation, without TD tactics of regulation in construction sector. The city also plans to generate economic benefits from these approaches by exporting its knowledge and solutions to other cities, while many cities are looking to reap the benefits of being seen as climate change pioneers through using the global networks such as C40 and GCoM. This opens up questions of the motivation of cities taking on these high-profile policies and plans e.g. the commitments they lay down under many of the iniatives. We must still assess in time whether these targets are actually to be met in many cases.

MLG appears to offer the benefits of both TD and BU and as seen in the Stockholm KSC example it can also bring on board residents and the private sector, which strengthens any buisness case. The barrier to success by following the MLG approach is likely to come from a lack of coordination between the different governance levels or horizontal integration. In examples in New Zealand, China, Canada, Denmark there has all been failings when regional and national level support is not forthcoming. This problem can be alleviated by intermediaries or regional roles (e.g. CTCs for CoM) who can utilise experiences of best practice or financial muscle respectively.

The many global networks and partnerships offer cities the opportunity to share knowledge and access resources when national governments do not demonstrate ambitions. A combination of MLG with global networks such as GCoM and C40 appear to be the best solution for a city to gain access to support, knowledge, experiences; whilst gaining recognition of its efforts, something which can be vital for investment and investors. Having said this again it is difficult to assess the success of these networks, as it appears fragmented in who is progressing to those stagnating. Furthermore, what seems clear from this analysis is that even in these global networks it is those cities that are independently capable (i.e. financially and capacity-wise) or those who receive regional and national backing that are successful in their mitigation efforts. This leads on to an important point on the great variance between the more developed countires and the lesser developed countries. It is worth noting that many of those cities leading the success stories are situated in the more developed countries, while many of the cities in the global south are challenged by balancing development issues and climate change actions.

# 5 Conclusions

In conclusion this research has found that a combination of approaches is needed by cities, but the MLG approach offers the best framework for cities to tie in with national aims and thus the 2ºC target. The approach though must gain the support of numerous actors including citizens, the private sector and higher-tier government. The information in this report will aid municipalities in identfying frameworks and methods to begin to implement climate mitigation actions, but each city must consider their own specific situation and needs. It is clear there is no one-size fits all framework that can be used by cities in their drive to mitigate climate change. The plethora of climate change mitigation globa networks offer strong platforms to communicate outwards and inwards the opportunities and barriers of municipal action, but we must see if these networks and partnerships actually bear any impact ion global warming. This will definetly not take place unless there is collective action at all spatial and temporal scales.

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# Appendix

## Appendix 1 Excert of the Literature Review Screeming

| | Authors/ title | Year | Purpose/c ontext | Locati on | Temporal focus | Mechanism | Top-down / Bottom-up | Description/Actions |
|---|---|---|---|---|---|---|---|---|
| 19 | Berhtou and Ebbesen.....Local governing of climate change in Denmark: recasting citizens as consumers | 2015 | Empirical analysis of CAPS and citizen interaction | Denmark | Short-medium term | CAPs and local governance assessment of public engagement | Top down/municipal | - Finds that CAPs often reduce mitigation to numbers and measurements of economic and environmental benefits which enacts citizens merely as consumers that must be directed in their mitigation choices.<br>- Loss of valuation of social aspects of climate mitigation<br>- technology, materiality, and citizenry are closely entangled in other and more complex ways than just through the lens of behavior<br>- Local administration bodies such as municipalities are often tightly regulated and bound by political will and allocation of resources, a fact which often leads to activities that are well within status quo. We argue that much of what we have shown in this paper can be explained by this fact. This is developed further elsewhere. |
| 20 | Matschoss & Heiskanen .....Making it experimental in several ways: The work of intermediaries in raising the ambition level in local climate initiatives | 2016 | Use of innovation intermediaries in climate change governance | Experimental cases Finland | Short-med term | Intermediaries | Bottom-up/local | - 3 cases focus on joint purchase of solar panels<br>- Roles they play: dissemination of practices and innovation knowledge for climate change action<br>- Scale up successfully new solutions, lobbying to break down administrative boundaries, face to face local interaction to engage participants and stakeholders<br>- Often aim to balance interests of stakeholders involved, but they can also disturb the status quo, and break down institutional lock ins<br>- They aggregate knowledge and advocate for better practice and innovation |
| 22 | Azevedo & Leal.....Methodologies for the evaluation of local climate change mitigation actions: | 2017 | Assessment of methodologies to understand the contribution by local authorities | - | - | Assessment of impact | Local governmental level | - Quantification is needed to understand climate change mitigation not just innovation recognition<br>- Realisation between policy and actual actions<br>- Linkage between governance levels<br>- Need relevant benchmarking |

## Appendix 2 Excert of the Literature Review Synthesis Matrix Used

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MLG | X | X | | X | | | | X | | | X | x | | | | | | | | | | | X | X | X |
| Top-Down | | | | X | | | | X | X | X | | | | X | X | | | | X | | | | X | | |
| Bottom-Up | | | X | | X | X | X | | X | | X | | | | X | | X | X | X | X | | | | | |
| Challenges | | | | X | | | | | | | | | X | | | X | X | | X | | | X | | X | X |
| Networks | | | X | | X | | | | X | | X | | | | | X | | | | | | | | X | |
| Asia | X | | | | | | | X | | X | | | | | | | | | | | | | | | |
| Europé | | X | | X | | X | X | X | | | | x | | | | | | | X | | | | | | |
| China | | | | | | | | X | | X | | | | X | | | X | | | | | | X | | |
| North America | | | X | | | | | X | | | | | | | | X | | | | | | | | | |
| Private Sector/Private capital | | | | | X | | X | X | | | | x | | | X | | | | | X | | | | | |
| Finance | | | | | | | | | | | | | | | X | | | | | | | | | | |
| City/state Case Study/s | | | X | | | | | | | X | | x | | | X | | | X | | | X | | | | X |
| CAPs | | | | | | | | | | | | | | | | | | X | X | | | | | | |

Appendix 3 List of Major Climate Intiatives and Networks Relvant to Municiaplities

(Taken from: The Bonn-Fiji Commitment of Local and Regional Leaders to Deliver the Paris Agreement At All Levels, Novemeber 2017, http://www.cities-and-regions.org/)

| Name | Actions |
|---|---|
| **City Climate Planner – GBCI, WRI, ICLEI** | The City Climate Planner program raises the global talent base of city climate planning professionals through training and professional certifications that form the building blocks of local climate planning and policy development. |
| **Climate Reporting Partnership – ICLEI Carbon Climate Registry, CDP** | This new partnership brings together CDP and the carbon Climate Registry, two of the leading climate reporting platforms in the world, in an effort to build a robust database of self-reported climate commitments, actions and performance tracking by public and private actors. |
| **Coalition for Urban Transitions, including the new Global Urban Leadership Council** | The Urban Leadership Council is a group of representatives from city networks, urban think tanks and the private sector aiming to build high-level political commitment to sustainable urban development in rapidly urbanizing countries and provide guidance to the Coalition for Urban Transitions, an initiative overseen by C40, the WRI Ross Center for Sustainable Cities and the New Climate Economy. |
| **Collaboration for multilevel climate governance – NDC Partnership, ICLEI** | ICLEI and the NDC Partnership are now working together to design, implement and align climate action strategies across all levels of governments. |
| **CONNECT – PLATFORMA** | CONNECT is an innovative methodology that was launched in 2017. It fast-tracks matchmaking between municipal and regional expertise needed in EU partner countries with the existing expertise in Europe's towns and regions. CONNECT carefully crafts and monitors outcomes of peer-to-peer exchanges and skills-based matches that focus on municipalities' key challenges such as climate action. |
| **Covenant of Mayors in Sub-Saharan Africa: Launch of the Political Commitment Document and the recruitment campaign of Sub-Saharan Cities – CEMR** | CoM SSA, a regional body of the Global Covenant of Mayors for Climate & Energy, is, through its Political Commitment Document, opening the door for more Sub-Saharan cities to commit to the CoM SSA. Participation strengthens city capacity to expand access to sustainable and efficient energy services |
| **From Action to Transaction: The Africa Subnational Climate Fund – R20** | The African Subnational Climate Fund bridges the gap between high infrastructure demands and the low number of bankable projects |

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|---|---|
| | reaching investors. The fund provides ready-to-invest projects and financing to support the implementation of at least 100 infrastructure projects by 2020 |
| **Front-Line Cities and Islands – ICLEI, GLISPA** | Front-Line Cities and Islands is a coalition of coastal cities and islands on the front lines of the impact of climate change, working to build resilience coastal city-to-island partnerships, and designed to increase exposure to innovative resilience strategies and creative financing mechanisms. |
| **Green People's Energy for Africa – BMZ** | Green People's Energy for Africa will improve access to reliable, climate-friendly energy and productive use through community-driven, decentralized renewable energy projects. Thereby it will accelerate the transformation and decarbonisation of the African energy sector, empowering rural communities and local actors to participate in the energy system and supporting the development of effective national framework conditions |
| **Global Covenant of Mayors for Climate & Energy** | The Global Covenant of Mayors for Climate & Energy formally brings together the Covenant of Mayors and the Compact of Mayors to form the largest global coalition of over 7,400 cities from six continents and 121 countries advancing city-level transitions to low emission & climate resilient economies through voluntary action. |
| **Mobilization of the African civil society at territorial level in the fight against climate change – Climate Chance** | This initiative aims to mobilize African cities and regions to respond to climate change related challenges across the continent, by encouraging their commitments to collective action and through an exchange of good practices to advance implementation of the Paris Agreement. |
| **One Planet City Challenge – WWF, ICLEI** | By combining a friendly biannual competition, capacity building, technical support and public promotion, the One Planet City Challenge provides a way for cities to engage in long term reporting of their climate performance. |
| **Partnership for Climate Protection – Federation of Canadian Municipalities, ICLEI Canada** | This network of 340 Canadian municipalities combines political commitments to act on climate change with capacity building support. New initiatives resulting from PCP include ICLEI Canada's Building Adaptive & Resilient Communities (BARC) program, and FCM's Municipalities for Climate Innovation Program (MCIP), which includes the Transition 2050 network and the Climate and Asset Management Network (CANM). |
| **Planners for Climate Action – UN-Habitat** | Planners for Climate Action helps ensure urban and regional planners can play a strong role in advancing global climate and sustainability goals. To this end, this initiative will improve urban and regional planning practice and planning education |

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|---|---|
| **RegionsAdapt – nrg4sd** | RegionsAdapt is the first global initiative for regional governments to take concrete action, cooperate and report efforts on climate adaptation, focusing on key priority areas such as water resource management, disaster risk reduction, agriculture and biodiversity |
| **SDG Indicators for Municipalities – DST** | SDG Indicators for Municipalities hones the Sustainable Development Goals to craft indicators for the municipal level in Germany, to ensure local governments align and track progress towards global targets |
| **SuRe Standard – Global Infrastructure Basel (GIB Foundation)** | The SuRe Standard is designed to strengthen sustainable and resilient infrastructure development by guiding project owners in accounting for social, environment and governance criteria, while enabling them to communicate benefits to potential investors. |
| **Transformative Urban Mobility Initiative (TUMI) – BMZ** | Through TUMI, 11 acclaimed institutions offer technical and financial support for cities' efforts in emerging and developing countries to implement sustainable mobility projects and programs, thereby aiming to advance global climate action and provide better and more equitable transport access to urban inhabitants |
| **West African Economic & Monetary Union (WAEMU) Regional Partnership for Localizing Finance – FMDV** | This initiative focuses on West Africa and advocates for fiscal decentralization and innovative financing strategies and mechanisms, while building the case for public and private investments by preparing a pipeline of sustainable local infrastructure projects and matching them with funding sources. |
| **Urban Transitions Alliance – ICLEI, RVR** | The Urban Transitions Alliance is a group of industrial and former industrial cities making a shift to become global leaders in sustainable urban development by defining shared challenges, co-creating locally relevant solutions and developing transition action plans. |

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