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Incremental, reformistic or transformational: What kind of change do C40 cities advocate to deal with climate change?

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[Note for the reader: supplementary material is not included in this document.]

Abstract

In light of the relatively modest achievements of international climate change governance, high hopes are being placed on global city networks as an essential solution to problems of climate change adaptation and mitigation. The C40 network, in particular, promotes itself as the leading network in this respect. Very little is known, however, about what kind of change the network promotes and how far reaching the proposed solutions are. We assess the degree of (anticipated) change based on a stratified sample of twelve cities participating in the C40 network, signalled by adaptation and mitigation actions described in their policy documents. Our findings indicate that most proposed measures support the status quo, with majority of actions focusing on infrastructure and technology. The few truly transformational measures are proposed.

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Highlights:

- Despite their rhetoric of being world-leading innovators, the C40 and its member cities mostly promote actions that favour the *status quo*.
- Climate actions concentrate on infrastructure and technology.
- Transformational solutions are rare, and they mostly relate to physical infrastructure.
- Cities recognise unequal vulnerability, but promote few actions to reduce it.

- Cities need states to achieve their climate targets.

1. Introduction

As urbanisation spreads, cities have become the central arenas, where many societal and environmental challenges are played out (Romero Lankao & Dodman 2011). Climate change is an issue that cities need to address in terms of being major contributors to it but also due to the impacts that cities will experience. On the one hand, cities now consume more than two-thirds of global energy and produce more than 70 percent of the greenhouse gas emissions (GHGs) (World Bank 2010). On the other hand, urbanisation increases cities' vulnerability to climate change because they are concentrations of people and assets (Carter 2011). Furthermore, it is estimated that more than half of the world's population lives within 60 km of the sea, while approximately three quarters of all large cities are located on the coast (UN-Habitat 2008), making cities particularly vulnerable to sea level rise. Thus, climate change mitigation and adaptation have become an established policy area for cities.

Increasingly, cities are major players in climate change governance globally (Bulkeley 2010, Bulkeley 2005, Nelles 2012). According to Anguelovski and Carmin (2011), this trend of emerging urban climate governance denotes to the ways in which public, private, and civil society actors and institutions articulate climate goals, exercise influence and authority, and manage urban climate planning and implementation processes. The role of networks has become important in this trend towards governance with increasing participation in voluntary initiatives (Juhola, Westerhoff 2011).

C40 is a global network of large cities committed to addressing climate change, established in London in 2005. The target is to develop and implement policies and programmes that generate measurable reductions in both GHG emissions and climate risks. The network strongly promotes the idea of cities as leaders of change, who act when nations only talk (www.c40.org). To Davidson and Gleeson (2015), C40 is the best example that represents a new strategic urbanism phase of transnational urban governance. This is because the network ties together the most influential and economically powerful mayors of global megacities to adopt a more visible political stance. C40 has expanded to 86 members, concerting to ameliorate the climate impacts on their cities (www.c40.org/cities, 12.9.2016). Their work is mainly independent of nation states and even unremarked by their national governments (Davidson & Gleeson 2015). The motivation behind the new climate change policies driven by networks of city governments lies in the weak climate policies of the nation states.

It is precisely this "front-runner" status that is of interest here: these are the cities that are expected to come up with most far-reaching policies. Also, the network itself asserts that its members will be the driving force of change that will solve the climate problem. Both climate change mitigation and adaptation essentially encompass change, the former in terms of reduction of emissions, and the latter in terms of reduction of climate risks and vulnerability. Recently, more attention has been paid to how far reaching changes are considered necessary to achieve the desired policy goal, or to degree of change, as we call it here. Adaptation can be conceptualised as adjusting to the changing climate conditions (adjustment-based adaptation), as transforming the structures of society causing vulnerability (transformational adaptation), or as a combination of the two (reformist adaptation) (Basset & Fogelholm 2013). In terms of mitigation, degree of change means whether smaller adjustments, broader reformistic changes or fundamental transformations are made to reduce emissions or to achieve carbon neutrality (about carbon neutrality, see Kennedy and Sgouridis 2011).

However, to our knowledge, no systematic analyses of what kind of changes these cities promote has been undertaken. In this paper, we critically examine the notion of cities as engines of change. The specific question we pose is what kind of actions C40 member cities propose to address climate change and how far reaching these actions are? To answer these questions, we conduct a thematic analysis of documents produced by C40 network and a stratified sample of twelve of its member cities' climate strategies. We distinguish between three degrees of change: incremental, reformistic and transformational. Our findings reveal that neither the C40 network nor its member cities promote very profound change overall. The strategies highlight incremental change in infrastructure and technology much more than transformational changes in economic and social structures. Even among the self-proclaimed world leader cities within the C40 network, the level of ambition varies considerably. Cities also do recognise the limitations in their capacity to address climate change.

2. Analytical framework

2.1 Climate change governance networks: C40

The role of city networks in climate governance has become of interest to researchers in recent years, as different networks, such as C40, ICLEI and Compact of Mayors have emerged (Gustavsson et al. 2009; Bulkeley 2010; Castan Broto and Bulkeley, 2013; Reckien et al 2014). Previous research on the C40 network has focused on the development and structure of the network. In particular, we draw two conclusions from these contributions.

First, it is unclear to what extent network participation results in climate change responses and policy implementation (Lee 2013, Fünfgeld 2015). Lee and van de Meene (2012) consider the C40 as a network of developed and less developed cities "focused on learning to adapt and respond to climate change", thus learning and information sharing are the primary aims of the network. However, C40 was not established to address lack of ability to tackle climate change, but based on an assumption that large cities were already creating best practices and only needed a forum for cooperation (Acuto 2013). According to Lee and van de Meene (2012), city to city communication is often unofficial in C40 network. Lee and Koski (2014) further point out that although C40 cities have publicly demonstrated their willingness to mitigate climate change, the goals they set and achieve varies. Van der Heijden argues that lenient criteria for participation and lack of enforcement can result in larger number of cities participating but with limited success (van der Heijden 2014). In addition, it appears that the more global the city, the less likely it is to reach its climate policy goals as small and wealthy cities appear to be most effective actors in climate policy (Lee & Koski 2014).

Second, the climate networks that have formed have a varied membership, engaging cities with different levels of economic development, geographical location, national context and political institutions. Lately, the C40 network has explicitly targeted cities in middle and low income countries (Bulkeley 2010), diversifying the structure of the network. Lee and van de Meene (2012) have shown that cities with most experience in climate policy are the central hubs of the network, whereas cities, which have just started to develop their climate policies are situated in the periphery of the network. Hence, European cities and the North American cities form two separate clusters and the Asian and South American cities are sporadically connected to European and North American cities. Also, according to Acuto (2013), C40 may seem horizontal, but contains a great deal of unevenness: it seems that London, New York City and a small group of other cities form a clique inside the network with other cities left to a more peripheral role. However, this might be changing, as the economic and political importance of cities in Brazil, Russia, India and China grows (Acuto 2013). In our sample, we include cities from five continents, half of them situated in Global South and half of them Global North.

Para on learning – and then how translates into practice.

2.2 Mitigation, adaptation and degree of change

Mitigation refers to human interventions to reduce the sources of GHGs or create carbon sinks[1] (Allwood *et al.* 2014). The interventions to reduce emissions mostly relate to energy production and consumption. In cities, important sources of GHG emissions are heating/cooling of the buildings, transportation systems and energy production. Also, consumption of goods and services in cities causes emissions outside of the city boundaries (Rosenzweig et al 2011). Apart from concreating on emission reductions through changed behaviour or technology, or reduced use of energy, cities can mitigate through compensation of emissions. One way to compensate emissions is to create carbon sinks, e.g. by increasing green areas.

Adaptation has emerged in response to risks and vulnerability related to climate change. The natural hazard school has emphasised the biophysical risk and its effects on society, which leads to defining adaptation as purposeful adjustment (Thomalla et al. 2006). This has been criticised by the political ecology school for being palliative and not considering how social structures contribute to vulnerability (Basset & Fogelman 2013). Critics have claimed that adaptation cannot be socially and environmentally sustainable without fundamental societal transformations (*e.g.* Eriksen *et al.* 2011). Currently, the adjustment-based adaptation concept dominates the scientific discourse, although there has been a shift towards a reformist point of view, which can be noticed *e.g.* looking at the adaptation models presented in the IPCC reports (Basset & Fogelman 2013).

Here, we study the degree of change in the mitigation and adaptation strategies of C40 member cities[2]. To examine the change in the cities advocated by these strategies, it is necessary to consider how the city itself is conceptualised as a system, what parts of the system are changing and what constitutes as change in that system. The city affects the climate system especially through energy production and consumption, traffic, overall consumption of the citizens and land use, thus creating the need to mitigate. On the other hand, the city is vulnerable to climate change impacts through various ways. Changing climate can have negative impact on resource production, market needs, infrastructure, and citizens directly to which there is a need to adapt. Thus, to achieve the targets of climate change

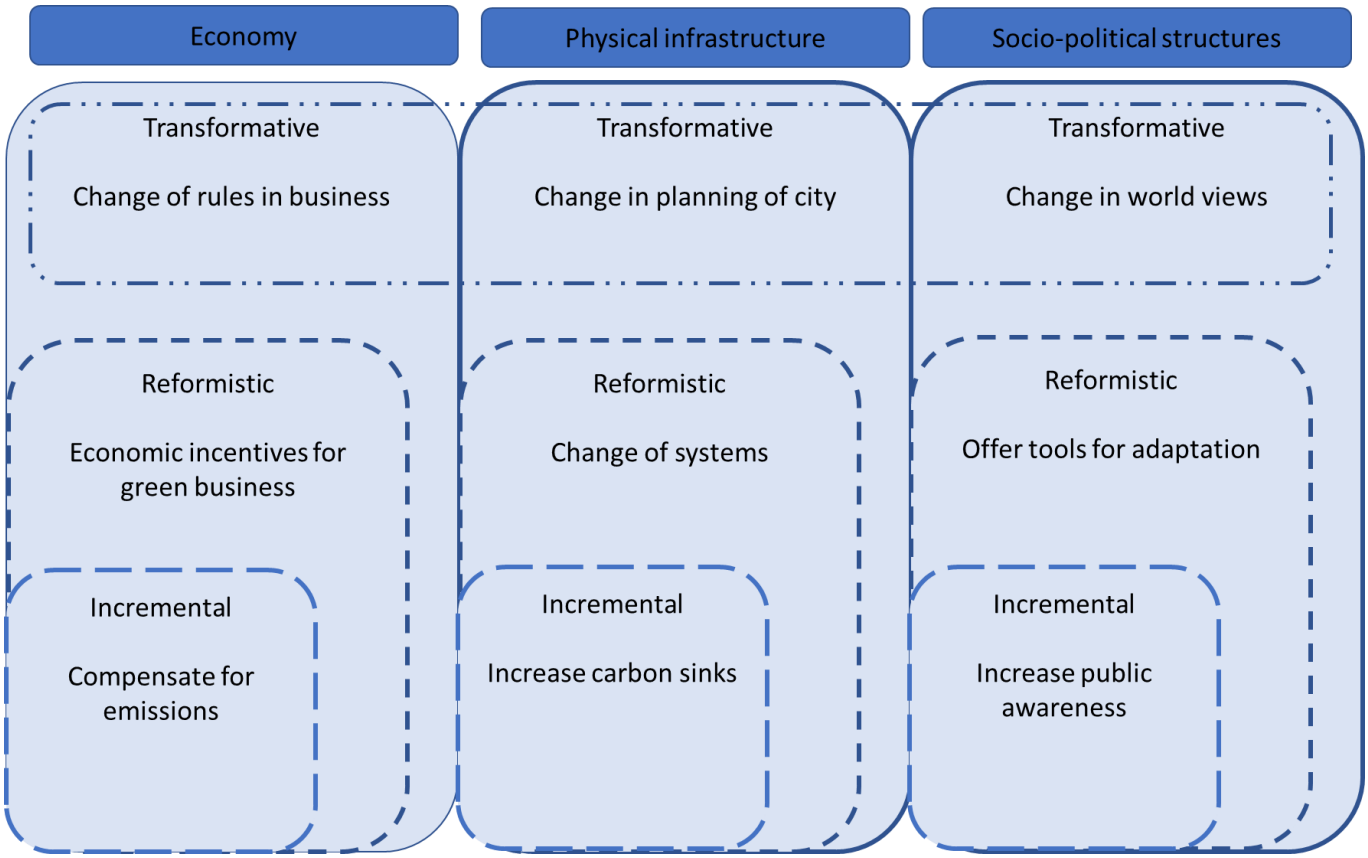
[1] In addition to CO_2 emissions, black carbon also affects climate change, and its reduction is considered as part of mitigation (Allwood *et al.* 2014). Whilst the need and measures to reduce emissions of CO_2 are well known, black carbon might not yet be taken into account in the analysed mitigation strategies.

[2] It is not always self-evident how to define a city. In some cases, governmental boundaries divide urban areas where practices are strongly connected. For example, City of Melbourne the metropolitan area has nearly 4 million inhabitants, considerably more than in the city that is actually member of C40. Here we take the city definitions from the analysed documents. For example, in the case of Melbourne, we concentrate on the City of Melbourne, as the strategies apply to that region, not the whole metropolitan area.

mitigation and adaptation, there should be changes in the physical and socio-political components of the city. Similar to Wolfram (2016), we consider the city as a multiple complex system and focus here on three interacting components: the economy, the physical structures (natural and man-made), and the socio-political structures (e.g. governance structures, institutions, companies and so on).

Defining the degree of change is challenging, especially when it comes to identifying a transformation, as transformative changes are often recognised only afterwards (Pelling 2011). In the context of adaptation, Basset & Fogelman (2013) defined the degree of change using a three-step scale (adjustment, reformist, transformational). Adjustment refers to maintaining the *status quo* by actions that repair the damage caused by climate change, transformation refers to addressing the root causes of vulnerability by fundamental changes in structures and power relations of the society and reformist adaptation occupies the middle ground (Basset & Fogelman 2013). Following this, we formulate a definition that covers both mitigation and adaptation to be applied in the context of cities based on three steps: incremental adjustments, reformistic change and transformational change. We seek to define what they mean in terms of the above mentioned three components, economy, physical infrastructure and socio-political structures, see Figure 1.

Figure 1. Degree of change. The degree of change grows when moving to right in the table. It should be noticed that the limits between different categories are not as sharp as they may seem in a table: the categories of change should be seen more as a continuum.



Incremental change: In terms of incremental change, the target is to make adjustments to maintain business as usual (Howden et al. 2010). In the context of economy, this can mean that companies earn the right to continue emitting by paying compensations, for example. When it comes to physical structures, incremental changes can be an increase in carbon sinks or a construction of a flood defence structures. With regards to socio-political structures, incremental change refers to a growing awareness of climate change to alter behavioural patterns. Incremental changes do not change entire systems, e.g. the water treatment system or economic structures.

Reformistic change: Reformistic change means that there is an intention to change the features that cause the problems without fundamentally changing the structures (Basset & Fogelman 2013, Pelling 2011). For example, if the fuel to produce energy is changed or the capacity of the water system is increased, the fundamental structures of the system remain the same. Reformistic economic change refers to actions through which a city promotes the change to clean tech, for example. Thus, the field in which the companies work may change, but the fundamental basis of the economy and market remains the same. When the city actively offers citizens tools to adapt or mitigate climate change and intends to change the behaviour of citizens, it can also be categorised as reformistic change in terms of socio-political structures.

Transformational change: In transformations, the patterns, elements, and interrelations of the city system change fundamentally. Transformation has many definitions but it is broadly considered to be a fundamental change that is distinguished from minor and marginal adjustments (Kapoor 2007, O'Brien 2012, Basset & Fogelman 2013). Transformation is a process of structural change that is not limited to technical aspects, but also requires the involvement of social and symbolic changes. This means fundamental alterations in e.g., sense-making, worldviews, political and power relations, social networks, and ecosystems, physical infrastructure, and technology (Feola 2015). In economic terms, transformational change would mean changes in the rules of business-making. It would also involve rethinking the way the physical structures work and the city is planned, and even rethinking of the division between urban and nature and the definition of a city. In addition, this type of change would mean fundamental changes e.g. in the lifestyle or in the way the city is governed.

There are two points to note in the analytical framework we present above. First, as the different parts of the city are connected to each other, this means that, the degree of change is connected between sub-systems. For example, if only incremental changes in physical infrastructure are made, it can make transformational change in the behaviour of the citizens practically impossible. Also, the change in the city level cannot be truly transformational, if the change is not transformative in all the categories. Second, as noted in the transformations literature (e.g. Basset & Fogelman 2013, Pelling 2011), identifying change empirically is difficult and a strict classification into categories, such as above, can be arbitrary. Hence, we consider what we outline above more of a continuum of change, rather than a strict classification scheme.

3. Methodological approach

We chose C40 network because its focus on global leading cities. Due to practical limitations, we were not able to analyse all the member cities of C40 but selected 12 member cities, six of them situated in Global North and six of them in Global South (see table 2). Here, we define Global North as Annex I countries, and Global South as Non-Annex I countries of the United Nations Framework Convention on Climate Change[3]. The selection includes at least one city from five continents. To make sure that the selection represents the whole network and not only the most active cities, we

[3] http://unfccc.int/parties_and_observers/parties/annex_i/items/2774.php

calculated how often the cities are mentioned in C40 documents and selected both often and rarely mentioned.

The availability of the strategies was a selection criterion for the cities. We were unable to create a balanced selection of cities situated in Global South with both mitigation and adaptation strategies. Therefore, adaptation strategies form a slightly bigger share of the material of cities in the Global South. However, all the adaptation strategies are not very comprehensive, e.g. in the cases of Madrid and Buenos Aires, adaptation is covered only briefly.

Our material consists of adaptation and mitigation strategies of a selection of members of C40 network and documents produced by the network itself, including Climate Action in Megacities reports (CAM, published on 2011, 2014 and 2015) and "Unlocking Climate Action in Megacities" report (2016). We collected the strategies in 2016. The length of documents varied greatly from book chapter of 12 pages to 266-page documents, the average length being approximately 100 pages.

Annex 1	**Location:**	**Population:**	**Mentioned by C40:**	**Material:**
London	Great Britain, Europe	10,3 million in metropolitan	12	M and A 2011
Madrid	Spain, Europe	6,2 million in metropolitan area	0	M and A 2014
City of Melbourne	Australia	138 000	7	A 2009, M 2014
New York City	USA, North America	18,6 million in metropolitan area	9	M and A 2015
Copenhagen	Denmark, Europe	about 1,2 million in metropolitan area	4	A 2011, M 2012
Vancouver	Canada, North America	2,49 million	3	A 2012, M 2014
Non-Annex 1				

Buenos Aires	Argentina, South America	15,2 million	3	Combined 2009
Johannesburg	South Africa, Africa	9,4 million	5	A 2009
Ho Chi Minh City	Vietnam, Asia	7,3 million in metropolitan area	4	A 2013
Lagos	Nigeria, Africa	21 million	2	A 2012
São Paulo	Brazil, South America	11,9 million	2	Combined 2011
Delhi	India, Asia	25,4 million in metropolitan area	1	M 2009

Table 2. City selection. The letters in the material column: M = mitigation document and A = adaptation document. Combined means that both mitigation and adaptation is covered in the same document. All the population numbers are from the C40 web page.

In our analysis, we coded climate actions presented in the documents using the Atlas (Atlas.ti 7.5.10) programme. First, we coded only about half of the documents and the actions were divided into three categories: actions related to economy, to physical infrastructure and socio-political actions, and then again for mitigation and adaptation, as these are often dealt with separately in cities. We then compared the coded segments to our definitions of the degrees of change and grouped the actions related to each component under the three categories. As a result, we got six codes: Economy_Incremental, Economy_Reformist, Economy_Transformational, Infrastructure_Incremental, and so on. The rest of the documents were coded with these codes, again separating mitigation and adaptation.

Typical actions coded with "Infrastructure_Incremental" were e.g. different flood protection structures, like flood walls (adaptation) or changing coal to gas in the energy production (mitigation). Under "Socio-political_Reformist", we coded actions like the development of applications to support adaptive behaviour or developing a network of local leading organisations to address mitigation barriers. We coded support for citizen based sharing economy that aims to reduce consumption as "Economy_Transformation". The results were summarised in tables (see supplement material). For more coding examples, please see results and supplement material. It should be noted that the degree of change does not directly reflect the effectiveness of an action. Adaptation actions that might be contrary to mitigation efforts, mostly increasing air-conditioning, were coded under "Risk of maladaptation". The potential for maladaptation was recognised in some documents.

Apart from the climate actions, we also coded direct definitions of climate action (e.g. what is adaptation, what is mitigation) to support the overall picture of the degree of change. We also had a code for "interesting but rarely discussed themes", which included climate actions taken for protecting nature itself and not principally to benefit people, for example. Finally, we reflected the results from city documents to those produced by C40.

4. Results

Both cities and C40 address climate change from an anthropocentric point of view. Climate action is justified by maintaining security, well-being and economic growth in cities. In general, the promoted actions are mainly incremental and reformistic, but some more transformative are also proposed. Overall, the network and the member cities highlight no-regret solutions, flexibility, and synergies, e.g. actions that contribute to both mitigation and adaptation (for summarised analysis of each city, see supplementary material).

Climate change adaptation is normally defined as adjustments to reduce the vulnerability of the society. When it comes to mitigation, the cities had variable targets (see table 3).

City:	**Mitigation target:**
Buenos Aires	32,7 % reduction from 2008 by 2030
Delhi	No exact target
Ho Chi Minh City	No data
Johannesburg	No data
Lagos	No data
São Paulo	No exact target
Copenhagen	Carbon neutral 2025
London	60 % reduction by 2025 and 80 % by 2050 (on 1990 levels)
Madrid	more than 35 % reduction on 2005 levels by 2020

Melbourne	Carbon neutral by 2020, 25 % renewables by 2018
New York City	80 % reduction on 2005 levels by 2050
Vancouver	Only renewables and 80 % reduction from 2007 by 2050, ”Greenest city of the world” by 2020

Table 3. Cities are different when it comes to the ambitiousness of the mitigation target. For reference, Paris Agreement targets carbon neutrality in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

Indirect emissions are not taken into account in many mitigation strategies, as they are considered difficult to measure and control but may still have remarkable role. For example, the city of London estimates that indirect emissions formed about 48 % of the carbon footprint of London in 2004. None of the cities targeted carbon neutrality without compensations. For example, the strategy of Copenhagen mentions that the currently planned compensations will work only as long as Danish power generation is based on coal at least to some extent. As the national goal is to be independent of fossil fuels by 2035, city has to replace current compensations with emission reductions in the future.

4.1. Economy: Global hubs of green growth

All analysed cities recognise climate change both as a challenge and as an opportunity to the economy. The challenges mainly related to physical risks as a result of climate impacts. Raising awareness of climate change in the business community is included in almost all adaptation strategies. Some cities promote voluntary programmes or some sort of restrictions to make their industrial base more sustainable, e.g. Lagos’ strategy aims to support the change to a more sustainable and climate proof agriculture. Some of them also provide leadership in terms of political leadership towards low carbon economy. For example, the strategy of London states

> ‘[T]he Mayor will provide political leadership by ensuring all his strategies provide London with a consistent and coherent policy framework for making the transition to a low carbon economy, whilst actively encouraging both government and London boroughs to do the same’ (GLA 2011, p. 64).

In addition to incremental and reformistic changes, Vancouver and New York City offer examples of more transformative thinking, which were not found elsewhere. In Vancouver, the citizens have started local sharing economy projects that target the reduction of overall consumption, and the

mitigation strategy states that the city will find out what would be the best way to support these. The strategy of New York City states that as the current market rules do not value externalities, such as lower GHG emissions, the city will start to work to change these rules.

When it comes to the opportunities, most of the cities aspire to be global hubs of green growth. In practice, this means supporting innovation and start-up centres and programmes. This also includes support for new business models, like the storm water harvesting business model in London or small scale biofuel production from restaurant food waste in Delhi. Cities also invest in mitigation and try to encourage the private sector to do the same by offering financial and other benefits, like opportunities to test and develop new innovations. The investments also create markets for new solutions and therefore support new business. The cities actively build green image that attracts private investments. The strategy of Copenhagen states that city wants to offer

> '…help and inspiration to companies on how to reduce their CO2 emissions in the Green Business network. This provides easily accessible tools for climate action and energy consultancy tailor-made to each business' (City of Copenhagen 2012, p. 33).

However, there are also cities who only state that advantage should be taken, but do not mention concrete actions to support this, especially in the Global South.

In general, fundamental changes in the economy are not promoted, which is in line with the C40 documents. The overall vision of C40 is to create sustainable future without compromising economic growth. When describing best practices, C40 highlights the cost efficiency and need to find win-win solutions in solving climate change related challenges. In general, best practices are economically tempting and easy to sell to different stakeholders in the city. Although Vancouver is used as an example of green economy, the sharing economy or intentions to decrease consumption are not mentioned. The tendency of C40 to support conventional economic solutions has also been noticed by van Heijden (in press/prep?, 2017) and Acuto (2013).

More specifically, the network states that climate action will not take place, if it cannot be justified on economic grounds. It is argued that

> '[W]ithout a strong economic case for action, it is difficult to justify spending money on climate actions – whether from the government's own treasury, national government, or national or international development banks' (C40 2016, p. 24).

Most wealthy countries and industries have generally preferred reforming to rethinking, when it comes to social and economic arrangements causing climate change, and this is also seen in the international institutions dominated by them (Gillard et al. 2016). According to our material, C40 or its member cities are not an exception.

4.2 Infrastructure

In all the cities, most actions relate to infrastructure, as do the documents by C40. This is not surprising, considering that addressing and solving challenges posed by physical changes and threats are defined as the focus of the adaptation in all the strategies, and mitigation is also often seen as a technical question. All the cities propose at least some reformistic level changes, as well as some transformative changes. It is also generally thought that the actions should serve multiple goals, for example, increasing green spaces can offer more carbon sinks, decrease overheating, increase flood resilience and protect biodiversity, while also making the city more attractive.

All the cities recognise challenges related to overheating and the unpredictability in the changes in the amount of water, either flooding due to heavy rain and/or sea level rise, or drought. Almost all the strategies mention protective structures against flooding, changes in planning, renovation of the water systems and different ways of increasing of blue-green infrastructure. In some cities, e.g. London and Johannesburg, both flooding and drought are possible challenges. Drought is addressed through renovating water systems, developing their management and recycling water, but also by identifying new water sources.

Developing a city-wide multifunctional green infrastructure that could bring down temperatures, reduce flood risks, store water, decrease air pollution, increase biodiversity, and increase public health and welfare was proposed in every adaptation strategy in some form, except in the one of Buenos Aires. New innovations of green infrastructure, such as green or blue roofs and green walls are also mentioned in almost every strategy, as well as highlighted in the C40 documents. As all roofs are not suitable for green infrastructure, white roofs are mentioned as an alternative. In London, more technical cool roofs are mentioned, as well as high-albedo and permeable paving materials. Some cities also plan a new infrastructure system to collect rainwater for non-consumptive purposes, which would address both flood and drought risks, and change perceptions and the notion of rainwater from a problem to a new resource. In Melbourne, this system is already used, and it is proposed to be a new business model in the strategy of City of London.

The proposed changes in infrastructure have some transformative characteristics, as the basis of city planning is changed. The future city should not be a traditional urban "concrete jungle" but every building should be viewed as a potential green space, and there should be a network of green and blue spaces that secure the access to ecosystem services also within the city.

Changing the mode of energy production away from fossil fuel based systems is considered a priority when it comes to mitigation. For example, Vancouver, London and Copenhagen plan to minimise the role of fossil fuels in the cities' energy production. The share of renewable energy is to be considerably higher than now, in Vancouver 100 % by 2050. Copenhagen plans to maintain centralised energy production, replacing fossil fuels with biomass, waste and large wind farms. The recycling of plastics will reduce the emissions emanating from the burning of waste. The remaining emissions will be compensated. Some cities will research the opportunities to decentralise renewable energy production. Decentralising energy production could open a way for a more profound transformation: it could turn the current consumers to producers and change the structure of energy market. Only New York City mentions nuclear power as an important low-emission energy source.

When reducing the emissions from energy production, the cities claim they need the support of the state. This especially comes out in Melbourne, the mitigation strategy of which states clearly that the city will not be able to reach its targets without the support of the government and the state. This is because the city uses energy produced outside of its borders.

Decreasing energy consumption is seen as a no-regret solution and widely supported in the cities. Increasing energy efficiency is promoted, especially within the built environment. The energy planning guidance from the city should be changed so that the whole lifecycle of new buildings is energy efficient, and that old buildings should retrofitted accordingly. When it comes to transportation, cities want to build more effective public transportation systems, more attractive network for walking and cycling, and an infrastructure to support electric vehicles.

4.3 Socio-political solutions

Raising the awareness of citizens is mentioned in all the strategies, at least in the context of emergency situations. Warning systems and instructions on how to act during extreme weather events are typical actions. Some cities also propose preventative measures in the case of extreme events, or target citizens to increase their contribution to mitigation. For example, actions target citizens' daily water consumption to decrease permanently, not only during drought periods in London and Johannesburg.

This will be supported by changing the way the people pay for their water. Some cities, like Melbourne, Johannesburg and Copenhagen, state that the employees of the city can lead the behavioural changes by being good examples, and therefore organise targeted education for them.

There are differences in how much the inequality within the city or geographical areas is taken into account. Some cities have specific programmes to find the most vulnerable people, whilst some cities do not address this theme at all. In London, the unequal distribution of vulnerability is addressed both through social services and intentions to develop a new sense of community in the neighbourhoods to encourage the people to take care of the vulnerable ones. The strategy of Lagos stresses the vulnerability of women and states that gender equality should be taken into account in all adaptation actions. In New York City, reducing overall inequality (including economic inequality) is seen as one of the most important goals when developing the city, and this is also reflected in the climate strategies.

The adaptation plan of Johannesburg notes that the most important adaptation action is to reduce the poverty, and if this is not done, adaptation is likely to be ineffective in the poorest neighbourhoods. Thus, the city should help the neighbouring municipalities in reducing vulnerability to decrease climate related immigration into the city. In some documents of the cities in the Global South, international development funding is mentioned as a possibility to fund climate actions. Apart from that international support for the poorer communities is not discussed and the reduction of poverty is not a theme found in the strategies in the Global North.

Most of the cities see that there should be more co-operation both inside the public sector and between the public and the private sector. For example, London targets co-operation with the government and private sector so that flood proofing of buildings to would be further encouraged. The citizens are generally not seen as driving forces for climate action, but as objects of the actions. However, gaining local support to these actions is seen as important. Here, New York City stands out, as the role of citizens in the strategy process is highlighted. C40 itself somewhat promotes more active role to the citizens, however, the focus is still on top down measures, like raising awareness and creating campaigns.

As stated earlier, the climate action is based on the needs of citizens. There were some actions that aim to protect nature without direct benefits to society, but climate action was not motivated by the moral arguments in general, such as “protecting nature is the right thing to do”.

5. Discussion and conclusions

The C40 claims that its member cities will lead the change that is necessary to overcome the problem of global warming (C40 2015, 2016). Our findings suggest that C40 and its member cities do not currently promote transformative change. Global South cities promote change but this mainly refers to increasing the material standard of living. Global North cities see that the current state of the society is worth protecting. Essentially, strategies support the idea of creating a sustainable city by changing as little as possible, not by fundamental changes that would fit in the definition of transformation (Feola 2015). All cities focused on infrastructure with their climate actions, whilst the least number of measures were targeted at citizens. Individual citizens are mostly not portrayed as important and active stakeholders, contrary to some views expressed in transformation literature (O'Brien 2015), and also in the C40 documents (C40 2016). Thus, it appears that the promoted climate action is predominantly based on incremental adjustments and reformistic changes. There are examples of transformative change that are proposed in certain categories but these are rare, and no city strategy proposes transformative change across the board.

All in all, climate change is seen as an opportunity across the C40 network, offering new jobs and creating innovations. This is especially highlighted in the strategies of cities situated in the Global North. The C40 documents support this view, combining climate action and economic development. However, this opportunity to address climate change is mainly to be realised with the help of incremental and reformistic changes. It is widely agreed that climate actions should be designed so that they support economic growth whenever possible, and the long-term vision is that society will be environmentally sustainable with rising material standards of living. Also, many cities highlight that climate actions will help them to be successful in global competition: they aim to be global hubs of clean technology that attract innovative companies and talented individuals.

Overall, these findings are in line with the dominant international discourse of climate action that e.g. IPCC promotes (Basset and Fogelholm 2013). It reflects the fact that those most actively participating in the conversation are also those who benefit from the status quo. This leads to a push towards green growth and so-called "decoupling" of GHG emissions and growth of GDP. However, there are also critical voices stating that we should target more profound change, including making our societies less dependent on economic growth since combining economic growth and sustainability is a risky and a slow process (Antal & van den Bergh 2016).

To contribute to the wider literature on the role of cities in climate change governance, we conclude with four observations. The first one concerns the sources of the ideas presented in the climate strategies of the C40. The overall vision of the targets of climate action was remarkably similar in all the cities and C40 itself, although some cities were considerably more ambitious than others. It is not clear, however, to what extent the membership of C40 is the cause of this similarity. It may also be that cities get their ideas by following the dominant international discourse on climate action in general, the C40 being just one promoter of this discourse embedded in various global institutions. One piece of evidence pointing to this direction is the fact that while the strategy documents of many cities mention the C40 in the list of organisations in which the city participates, most of them do not give any further details of how they participate in the network. This suggests that membership in C40 is not seen as a very important part of strategic climate work by cities. Thus, the extent to which the similarity of the strategies is driven by C40 and to what extent other factors are at play remains to be evaluated in further studies.

Our second concluding observation concerns the extent to which the strategies of the cities we have analysed will be put into practice. To give just one example, the Johannesburg adaptation action plan, which received a nomination in a competition organized by C40, states that all the views expressed in the plan are views of the writers and may not reflect the views of the city. This raises some doubts how eager the city will be in implementing the strategy. Indeed, it has been noted that C40 documents sometimes portray solutions as a success, even before they have actually proven to be successful (van Heijden in press/prep?2017).

Moreover, city networks like C40 carry a risk of becoming elite networks with members-only benefits (Comments from Jeroen, reference?). Although the C40 has expanded to Global South, it is based on idea of bringing together the most powerful cities (Acuto 2013). Our results also show that membership in the network does not mean that there would be ambitious climate strategies. This supports the observation of Acuto (2013) that unevenness remains inside the network. This may result as growing support and funding for very limited amount of cities that already do a lot, while many others remain in the stage of doing very little or even nothing. For example, there is an advisor programme in C40, in which cities with best performance mostly get involved.

Our third concluding observation is that the city level is not free from the problems that have complicated the climate action at the national level. Climate strategies of the cities still focus on carbon production, not consumption – something that has long been criticized as one of the main failures of climate policy making at the national level (Helm 2009; 2012). A few cities do recognize

this problem, but none propose creative solutions to overcome it. Moreover, cities seem to be trapped in the same "prisoner's dilemma" that has long plagued the international climate negotiation process between nation states (Helm, 2009). No city wants to be the first to fundamentally change the rules, e.g. by introducing heavy carbon taxes, fearing that companies will flee to other cities and diminish the global importance of the first cities adopting such policies. To avoid such race to the bottom, actions of the leading cities on such policies should be done at the same time and in a co-ordinated manner. The C40 or its member cities make no proposals for such coordination.

As fourth concluding observation, our results support the view that successful mitigation and adaptation requires both city-level and national level actions. Despite the strengths of global megacities, they still have somewhat restricted powers in comparison to states. They generally have to follow the laws of the state, and our results suggest that they may need the support of states to achieve their climate targets. Therefore, it does not seem probable that the cities could take care of this change alone. Helm (2009) argues that successful climate action requires significant economic compensation from Global North to Global South. He also points out that climate change is not an independent problem, but a problem connected to e.g. international trade issues, which means that the solutions also need to be connected to these issues (Helm 2009). Our results support the view that city level action might not be enough to answer these challenges. A network like C40 may be a way through which the cities can influence the global level, but it might also end up limiting the potential for change they have in global governance (Acuto 2013).

Finally, the fact that we found very little evidence of transformational change in the documents we analysed does not necessarily mean that transformational change is not taking place in cities. It is possible that transformational change is happening in such an uncontrolled and unplanned manner that it is not visible in the city strategies. If that is the case, it is probably not led by the city officials either. This remains to be analysed in future studies.

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