Chapter 1:

Objectives and methods

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1.1 Objectives

The importance of cities in tackling climate change and contributing to meeting the goals of the Paris Agreement has received much attention lately. C40 Cities Climate Leadership Group (henceforth C40) and ARUP have recently published important studies on this topic such as *Deadline 2020: How cities will get the job done* (Hurst, Clement-Jones et al. 2016). This report argues that for the world to meet the goals of the Paris Agreement, every city needs to diverge considerably from its current business as usual pathway. The next 4 years are critical; emissions can only rise a further 5% from current levels (as opposed to a 35% increase in a business as usual scenario). UN Habitat III, or the United Nations Conference on Housing and Sustainable Urban Development, also took place recently in Ecuador. In response, prestigious scientific journals such as Nature and Science shone the spotlight on the vital role of cities in advancing global sustainability. In particular, the significance of networks such as C40 for building collective learning and diffusing good practices was highlighted (Acuto, 2016; Wigginton et al. 2016).

Across the globe cities are making undeniable strides in implementing ambitious climate policies, often breaking new ground ahead of state or national counterparts. In C40 cities, building energy consumption constitutes nearly 50% of greenhouse gas (GHG) emissions, rising to 75% and 80% in New York and London respectively. With building-related GHG emissions and energy consumption often outweighing other societal sectors such as transport or industry, advancing the necessary deep energy savings across the building stock demands an unprecedented level of innovation and ambition from policy makers.

This report builds on research started in the predecessor *Urban Efficiency: A Global Survey of Building Energy Efficiency Policies in Cities* (Takagi et al. 2014). The central objective of this updated and expanded study is to continue advancing understanding into the characteristics and outcomes of innovative city programmes[1] emerging across C40 cities to advance operational energy efficiency and retrofitting in existing, private sector buildings. Specifically, our focus is on seven cities in the C40 Private Building Efficiency (PBE)[2] network.

Our primary intended audience is city-level policy makers and decision makers across the world, both within and outside the C40 network. As such, our hope is that this resource will help enhance policy efforts in other cities, both in designing new programmes and making adjustments to programmes already under implementation. In addition, through studies such as Trencher et al. (2016) we actively seek to share the experiences of the C40 and PBE network with a global academic audience in fields such as climate policy, urban sustainability transitions and building energy efficiency.

This report's specific objectives are to identify:

- Varying approaches, attributes and innovative features of programmes
- Programme functions and processes by which they were designed
- Opportunities, challenges and limitations encountered during the design and implementation of programmes, and useful countermeasures
- Environmental, social and market impacts (either actual or potential)

1.2 Structure of report

Overall, this report may be broken down into the following two sections:

Chapter 2: Key findings and overall analysis
This collates the key findings from our seven case studies. It follows roughly the same focus and structure used in the individual case studies (outlined below).

Chapter 3: Detailed case studies
We conducted a total of seven individual case studies. This collection showcases innovative city programmes from Boston, Chicago, London, Mexico City, Shenzhen, Seoul and Tokyo (see Table 1). Each case provides an in-depth look at multiple dimensions of policy design and implementation. They adhere to the same analytical structure and examine areas such as:

- The background and context of building energy efficiency polices in that city
- Key and innovative attributes and mechanisms driving the programme
- Incentives driving building sector participation
- Processes by which the programme was designed and implemented
- Key impacts
- Drivers, challenges and useful countermeasures

[1] This depicts the interconnected package of policy instruments, laws, regulations and support mechanisms that make up a unified city initiative to promote operational energy efficiency and retrofitting in existing buildings.

[2] This city-only working group of C40 is currently comprised of approximately 30 members across Asia, Oceania, Africa, Europe, and North and Latin America. It facilitates sharing of good practices on tackling climate change in privately owned buildings.

1.3 Methods

Overview of scope and sample

As shown in Table 1, our sample consists of one city programme from seven C40 cities. Efforts were taken to ensure diverse geographical and cultural representation and also to include new cities that were not featured in the first Urban Efficiency report. Due to the limited sample size, we acknowledge that these city programmes do not necessarily represent global trends across the entire PBE or C40 network. For an exhaustive analysis of worldwide trends in building energy efficiency and climate governance in C40 cities we refer readers to the joint C40 and consulting firm ARUP publications (Watts et al. 2015; Schultz et al. 2015) or the World Resources Institute Report by Becqué et al. (2016). That said, many of the lessons generated by our seven cases are not regionally specific. They will undoubtedly provide insight for policy makers all across the globe, enabling others to learn from and replicate that city's success.

Table 1: **Overview of sampled programmes**

City	Programme	Target	Year implemented
Boston	*Renew Boston Trust Commercial*	• Commercial • Industrial • Residential (MF*)	2018***
Chicago	*Retrofit Chicago Energy Challenge*	• Commercial	2012
London	*Business Energy Challenge*	• Commercial	2014
Mexico City	*Sustainable Buildings Certification Program*	• Commercial • Industrial • Residential (MF*)	2009
Seoul	*Building Retrofit Program Loan Scheme*	• Commercial • Residential (MF* & SF**)	2012
Shenzhen	*International Low Carbon City*	• Commercial • Industrial • Residential (MF* & SF**) • Public	2012
Tokyo	*Carbon Reduction Reporting Program*	• Commercial • Industrial • Public	2010

* MF = multi-family ** SF = single-family *** Not yet launched

Official representatives from each participating city were given the liberty to nominate which programme should be included in our study. Specifically, officials were invited to choose one innovative and flagship programme that seeks to advance operational energy efficiency and retrofitting in existing private buildings. In particular, we emphasised that the chosen programme should have high instructive value for other cities around the world, both within and outside the C40. As such, it should be understood that all of the seven cities have multiple programmes targeting energy efficiency and retrofitting in the building sector. Generally, these other programmes are not examined in our case studies.

All cities surveyed are active members of C40, and specifically, are members of the PBE network (see footnote 2). This is one of seventeen "networks" (i.e. working groups) within the larger C40. Networks are organised under six areas covering climate mitigation, adaptation and sustainability topics of highest priority to C40 cities. These help cities spur policy innovation and replicate, improve and accelerate climate action. The particular focus of the PBE network is on promoting joint-learning and collaboration across cities through sharing knowledge and resources, stakeholder engagement, data management and policy development in privately owned buildings. Therefore, our analysis of programmes within this network generates rich insights into pioneering or innovative approaches and potential impacts from different types of programmes under implementation by frontrunner cities.

Our specific focus is on existing, private sector buildings. Our use of the term "private" buildings includes commercial, industrial and residential (both multi-family and single dwelling) buildings. However, one of our case studies (Shenzhen) also includes components that deal with new construction and public buildings.

Data collection

Data collection for cases was conducted via four methods, each elaborated below:

1. Written questionnaires
2. Semi-structured telephone interviews
3. Document analysis
4. Email contact and case study verification

Written questionnaire

These were administered electronically and in English. They were sent to official city representatives who possess intimate knowledge about the design and implementation of each programme. These questionnaires enabled the gathering of basic qualitative and quantitative information regarding the following points:

- Background information on unique city conditions hindering the advancement of energy efficiency or sustainability in the building stock.
- Programme objectives and mechanisms by which they seek to advance operational energy efficiency and retrofitting
- Scope of programme and attributes of targeted buildings
- Innovative features
- Incentive and support mechanisms
- Links to other city programmes or policies
- Inputs during programme design such as timeframes, staffing, budgets and methods of stakeholder engagement
- Inputs during programme implementation such as timeframes, staffing, budgets and methods of stakeholder engagement
- Modifications made after initial design in reaction to particular circumstances
- Various impacts observed (environmental, social and market)
- Key drivers of success during design and implementation phases
- Challenges encountered and countermeasures taken during both design and implementation phases

Semi-structured telephone interviews

Written questionnaires were then followed up with semi-structured telephone interviews. At least one was administered for each city, and in some cases, several. These took place via telephone conference over the period December 2015 to August 2016. Initial interviews lasted approximately 90-minutes and typically consisted of one, two or more official programme representatives[3] from each city. For non-English speaking countries, English translators were sometimes utilised. Interviews were facilitated by researchers from Clark University and attended by officials from C40 PBE, Tokyo Metropolitan Government Bureau of the Environment and the research team in Tokyo (CSR Design Green Investment Advisory, Co. Ltd.). Interviews allowed programme representatives to elaborate in more detail on questionnaire responses and provide anecdotal evidence concerning the points of interest described above. Conversations were recorded, then later transcribed into minutes and analysed manually.

[3] In some cities, interviewed programme representatives were not direct employees of cities, but private or non-profit sector experts placed to aid with design and implementation.

In three cases however (Tokyo, Boston, Seoul), interviews were administered in person due to the physical proximity of government offices to the researchers involved. Additionally, some cities chose to conduct a second telephone interview in lieu of completing a questionnaire.

Document analysis

Data gathering was supplemented by the collection and analysis of key documents. These included those accessed via official programme websites such as programme reports, press releases and policy documents. Also, access was often granted by cities to key internal documents such as data reporting spreadsheets, programme participation agreements and case studies of individual building retrofit projects. Documentation was also examined from third party sources. Such documents include government or non-profit sector evaluations or analysis reports, press articles and academic journal papers.

Email contact and case study verification

Cities were contacted several times via email to request additional information throughout the data collection and case study drafting process. Sometimes these requests involved simple questions. At other times, these involved more comprehensive lists of questions that were translated into the language of that country to facilitate ease of answering.

As a final verification procedure, all case studies have been checked for accuracy several times through the assistance of cooperating programme representatives. This process was also used to obtain additional information relating to certain observations or interpretations.

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