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ARUP

Potential for Climate Action

Cities are just getting started

December 2015



C40 CITIES CLIMATE LEADERSHIP GROUP



The C40 Cities Climate Leadership Group, now in its 10th year, connects more than 80 of the world's greatest cities, representing 600+ million people and one quarter of the global economy. Created and led by cities, C40 is focused on tackling climate change and driving urban action that reduces greenhouse gas emissions and climate risks, while increasing the health, well-being and economic opportunities of urban citizens. www.c40.org

PARTNERSHIP



This report has been delivered through a collaborative partnership between C40 and Arup, the global consultancy firm. Arup has worked with C40 since 2009 to develop strategic research that is central to progressing our understanding of how cities contribute to climate change mitigation and adaptation. This is why in June 2015, Arup announced a major partnership with C40, committing \$1 million of professional support over three years to help cities take meaningful action against climate change.

This partnership is founded on Arup's independent and evidence-based approach, alongside C40's longstanding belief in "measurement for management". The partnership supports a strong research agenda, aggregating and analysing city data to help city actors identify opportunities, collaborate and to build roadmaps that will enable them to take meaningful climate action faster and more efficiently.

The C40-Arup partnership is supported by the City Leadership Initiative (CLI) at University College London (UCL). The CLI is a collaboration of UCL, World Bank and UN-Habitat and is geared towards providing improved understanding and advice on the role of city leadership in addressing global challenges.

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FOREWORDS

Mark Watts



Mark Watts
Executive Director
C40

This report is significant because it both analyses the most important specific actions that major cities can take to cut carbon emissions, and it identifies the barriers that need to be removed if mayors are to achieve them. The member cities of the C40 represent a combined population of over 600 million people and a quarter of world economic output. What happens in these cities will significantly dictate whether or not the world can tackle climate change.

The key findings are that, while C40 cities have already taken 10,000 climate actions between Copenhagen COP15 in 2009 and Paris COP21 in 2015, the potential for further delivery is much greater – a pool of nearly 27,000 actions. The report analyses each of these potential actions against three factors, the opportunity learn from their peers (ie has another city already done it), having mayoral power to deliver and scale of potential GHG reduction impact.

This allows us to identify over 2,300 priority actions which, if fully implemented, will cut GHG emissions by 450MtCO₂ in the next few years and will cost \$6.8 billion to catalyse. This is a relatively modest sum, but this analysis shows that access to funding is the single biggest obstacle to cities delivering greater climate action.

The report finds that fully three-quarters barriers to taking these potential actions require city leaders to partner with other actors – chiefly national/regional governments, or private companies. It provides further evidence that a collaborative approach is essential to tackling climate change – the essence of C40's work.

Finally, it will serve as a building block from which we can engage many other partners in this endeavour. Published against the backdrop of the crucial COP21 talks, it provides a positive reminder of the significant potential for climate action in addition to that which the Paris agreement will, hopefully, unlock.

Gregory Hodkinson



Gregory Hodkinson
Chairman
Arup

I am pleased to introduce this ground-breaking report, *Potential for Climate Action*. Building on the findings of earlier research by the C40-Arup Partnership, this report acknowledges the tremendous number of climate actions that cities globally are delivering, but asks the critical question – how do we leverage this momentum to deliver even greater impact in the future?

Our research has shown that while cities have shown strong commitment and innovation to date, there are many valuable opportunities remaining for them to scale up their action and make even greater strides towards emissions reductions and climate resilience. Lack of leadership, regulation and financial obstacles are preventing some cities from fully realising their climate goals.

There is a fundamental role for business and civil society, as well as government at all levels, to facilitate cities' ongoing climate leadership. Arup is committed to supporting our city partners in identifying and implementing the solutions that will enable low-carbon and resilient urban environments. As we move through the next stages of international climate negotiations, this report calls for the same commitment from other city actors. Only with a concerted, multi-stakeholder effort can the progress we've seen to date be sustained.

We are looking forwards to engaging with a broad spectrum of stakeholders to take this work forwards in the months and years after COP21, as city action will continue to be a central part in any global effort on climate change.

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EXECUTIVE SUMMARY

In a world first, this study quantifies the huge potential for expanding urban climate action, and presents the views of cities and city experts on what the challenges are in doing so. The study culminates in a firm call for cross sector collaboration to find the solutions to remove these challenges and unlock city potential. This will form the basis of a second report, to follow in 2016.

The evidence demonstrates that cities are showing incredible leadership in addressing climate change. The *Climate Action in Megacities (CAM)* series of reports shows that 10,000 actions have been undertaken in C40 cities since the 15th Conference of the Parties to the UN Framework Convention on Climate Change in 2009 (COP15). In 2015 almost half of actions are at a city-wide scale, an increase of 260% over that time. By 2015, cities are planning to expand four out of five of climate actions, showing that they have become confident that their actions are both effective and worthwhile.

Cities have experimented, shared, learned, gained confidence and are now pushing forward with an unprecedented, truly global wave of effective action. Confidence based on success breeds the ambition to expand.

It is crucial that cities are able to build on these strong beginnings, and that they do so quickly. As we pass C40's 10th anniversary, this work attempts to answer two important questions for C40 cities to consider over the coming decade. One, what areas offer further opportunity for climate action, and two, how can cities unlock this potential?

There is huge potential for cities to build on successful climate action

Detailed analysis of actions reported by C40 cities between 2011 and 2015 identifies around 27,000 actions that cities have not yet attempted to implement. The potential for expansion is clearly tremendous.

To achieve the kind of transformative reduction in emissions that is necessary, in the long term most of these actions will need to be implemented across all cities. However it is not realistic to suggest that all cities should – or even could – be taking every possible action in the short term. Some actions may also be entirely inappropriate for certain cities.

It is therefore useful to prioritise those actions that can have the most impact, and which can be delivered most easily. Analysis identifies a group of 2,332 actions that have the potential to reduce emissions and could be targeted in the short term. An enormous 66% of them are within the Buildings sector.

Cities face challenges to delivering and expanding climate action

How can cities unlock this potential, and what might currently be preventing them from doing so? The research reveals an important story about the challenges cities are facing around the world.

26,820

actions in the CAM database have not yet been attempted by C40 cities.

Of the challenges discussed in this research around 80% have been in existence for more than five years, and half of challenges have not been overcome despite cities investing resources to do so. Cities have not even been able to identify an approach to address 20% of the challenges they face. This demonstrates the extent to which challenges can become embedded in cities, and the difficulty of identifying effective solutions.

The most significant types of challenges to climate action across all regions are:

- **Economic and financial challenges** (representing 21% of the leading challenges experienced by cities). These relate to access to capital, limited financial independence, making the financial case for action, effective financial cooperation with the private sector, and so on. For example, Mexico City, Rio de Janeiro and Johannesburg have highlighted the shortage of funding devolved to the city from the federal level, particularly for environmental and climate related projects.
- **Political and leadership challenges** (20% of the leading challenges experienced by cities). These include challenges of city governance, collaboration with other partners outside the city, and so on. For example, Barcelona highlighted the difficulties of creating climate change plans for a 20-30 year horizon, using climate projections of 100 years, when governments change on a four-year cycle (for this reason Barcelona work to secure agreement of all stakeholders, including political parties).
- **Institutional, regulatory and legislative challenges** (17% of the leading challenges experienced by cities). A diverse group of challenges, including vertical and horizontal integration of government agencies, and inadequate legislation to support climate action. For example, in 2011 a C40 city was piloting crisis management strategies for climate adaptation, but a lack of integration between institutions has stopped this action from progressing to significant or city-wide scale.

We must act collaboratively to unlock cities' vast potential

An overriding finding throughout this work has been that nearly three quarters of the challenges our cities are facing cannot be managed unilaterally by cities – they require collaboration with national governments, the private sector and other actors. This underscores that there is no solution to climate change without partnership and collaboration. In order to deliver effective action on climate change at all levels of government, better collaboration, coordination and communication are required.

C40 and Arup are already working to frame cities' challenges in more detail, and crucially, to clearly outline the solutions. This work will involve a collaborative effort to convene the expertise of leaders across all sectors to establish how best to frame solutions for unlocking cities' vast potential. We invite any organisations delivering action in cities to express an interest in being involved. Through this research we intend to identify clear programmes of work, and actionable solutions that can be taken forward together immediately, to enable accelerated growth in city climate action.

75%

of the challenges cities face are the combined responsibility of government, business and civil society actors.

CHAPTER 1

Introduction

- 1.1 A Defining Issue For Our Time
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1.1 A DEFINING ISSUE FOR OUR TIME

Over the past ten years, the world has watched cities lead the way towards a climate-safe future. Through the *Climate Action in Megacities (CAM)* series of reports, C40 and Arup have quantified an enormous growth in the number, scale and impact of city climate actions over ten years.

Since 2011, C40 cities have taken nearly 10,000 climate actions. Over half of actions taken in 2015 have been at a city-wide scale, up from just 15% in 2011.¹

Measuring City Climate Action

“Climate action” as it appears in this report refers to specific activities, programmes, procurements, and policies undertaken by a city government to deliver either emissions reductions or adaptation to the impacts of climate change. Example actions include the implementation of a congestion charge, a building retrofit scheme, or energy-from-waste facility. Every two years C40 cities report on the actions they are taking, with reporting cycles now completed in 2011, 2013 and 2015. This data is compiled into the C40 Climate Action Database.

As cities continue to deliver more successful climate actions, ambition continues to grow. As illustrated by the year-on-year growth in membership of C40 and other city networks, together with emissions reduction pledges made via the Compact of Mayors,² it is clear that cities are committed to taking action on climate change at a global scale. Furthermore, in 2014, 228 global cities, representing 436 million people, set greenhouse gas reduction goals and targets amounting to a cumulative reduction of 13 GtCO₂e by 2050.³

It is crucial that cities are able to build on these strong beginnings, and that they do so quickly. Recent research by C40 in collaboration with SEI shows that based on current trends of consumption and infrastructure development, within five years the world will be “locked-in” to sufficient future emissions to exceed the globally safe carbon budget. In fact, the research indicates that a third of these emissions will be determined by cities, demonstrating that the climate problem cannot be solved without city mayors and citizens.

9,831

climate actions have been taken by C40 cities since 2011.

¹ *Climate Action in Megacities 3.0*, C40/Arup/UCL, 2015.

² <http://www.compactofmayors.org>

³ *Working Together: Global Aggregation of City Climate Commitments*, C40 and Arup, 2014.

This invites a pivotal question for our time: Could the world's leading megacities be taking more climate action, and if so, why aren't they and what must happen to allow them to unlock this potential?

It is this question that led C40, Arup and the City Leadership Initiative at University College London (UCL) to explore in detail the challenges that prevent cities from taking climate action. Implicit in this work is a recognition that only by understanding the challenges can we identify the most effective solutions and unlock the huge latent potential for action in cities.

Through this research, we intend to spur a cross-sector, global conversation to mobilise key actors around the interventions needed to enable continued and accelerated growth in city climate action, to bring together those who are involved in delivering climate action in cities, and to start identifying the challenges faced when doing so. A deeper understanding of the challenges and their possible solutions will be the subject of a second report to be published early in 2016.

1.2 SCOPE OF RESEARCH

1.2.1 TWO DRIVING QUESTIONS

As we pass C40's 10th anniversary, this work attempts to answer two important questions for cities over the coming decade:

- 1. What are the potential opportunities for further climate action in C40 cities?** This research addresses the potential for C40 cities to expand on their current success and increase their climate action over the coming decade. This can then help frame the level of ambition our cities could aspire to, and guide where they might consider acting next.
- 2. How can cities unlock this potential?** This research focuses on identifying any challenges that may currently be hindering action. This report is only the start of C40's efforts to address this problem, and offers a high-level analysis of the challenges our cities are facing.

1.2.2 EVIDENCE USED FOR ANALYSIS

Chapter 2 addresses the first of the above questions. The research in this chapter is based on self-reported data from C40's member cities between 2011 and 2015 as part of the *Climate Action in Megacities (CAM)* series of reports.⁴ The data has been analysed and reported in CAM in terms of the number and scale of climate actions that cities are taking and how they are delivering them. For the purposes of this report, we look at the data from the opposite perspective, assessing the climate actions cities *could be* taking, but currently are not. The work also considers the different potential emissions reduction impacts of these remaining actions, as well as their ease of delivery. These factors are used to prioritise the remaining actions for delivery.

From Chapter 3 onwards, the report shifts to the second question, taking steps to understand what are the main challenges our cities face globally that may be inhibiting them from progressing further climate action. This work is based on an extensive literature review of relevant work in this field, together with a comprehensive questionnaire to C40 staff working directly with member cities to deliver their climate goals. This work has provided C40 staff with specific insights into the challenges they have encountered in the cities where they work. This data is supplemented by one-to-one interviews with officials in 13 C40 cities, and Arup specialists engaged in the delivery of city projects.

The research methodology is presented in the Technical Paper that accompanies this report. Please refer to this paper for detailed background to the approach, data used for analysis, and classifications used in the challenges framework.

Sharing 10 Years Of Experience

Together, city officials and C40 staff have over 10 years of experience in collaborating to deliver urban climate action. This report draws on the experience and ideas of those staff to start unravelling the complex web of issues that our cities must wrestle with when identifying and delivering climate action. This report presents the initial high-level findings of an extensive consultation on the challenges cities face. More detailed findings, along with potential solutions, will follow in 2016.

The main groups who have contributed evidence directly are:

C40 City officials – Staff in C40 cities and officers of various positions and disciplines have been interviewed to provide city-specific perspectives.

C40 Regional staff – C40 staff operating at a strategic level with cities within a specific region who have a holistic, cross sector understanding of the priorities, successes and challenges of C40 cities at a city-wide scale.

C40 Initiative staff – C40 staff leading on thematic or sector-focused networks of C40 cities who have detailed project and topic-specific experience in supporting cities to deliver action in various areas, such as electric vehicles, or building energy efficiency.

⁴ *Climate Action in Megacities 1.0: C40 Cities Baseline and Opportunities*, C40 and Arup, 2011; *Climate Action in Megacities 2.0*, C40 and Arup, 2014; *Climate Action in Megacities 3.0*, C40, Arup and University College London, 2015.

1.2.3 REPORT STRUCTURE

The report is structured as follows:

Chapter 2: The opportunity to build on successful city climate action. Highlighting the enormous potential that still remains for cities to expand their climate action, and prioritising those actions that could be taken next.

Chapter 3: A framework for understanding city challenges. Presenting a structure for understanding and analysing challenges, which is informed by wider research and applied throughout the report.

Chapter 4: Enabling cities to do more. Highlighting the key findings of the challenges analysis and drawing out where the focus should lie if challenges are to be overcome. This chapter also highlights that city challenges are dominated by three particular types of challenges.

Chapter 5: An absence of collaboration underlies most challenges. Drawing attention to and exploring the overriding importance of cross-sector and cross-government collaboration in working around the challenges cities face.

Chapter 6: Conclusion. Bringing together the main threads of the report and charting out the next steps.

CHAPTER 2

The Opportunity To Build On Successful City Climate Action

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2.1 INTRODUCTION

The *Climate Action in Megacities 3.0* report has established cities' tremendous track record of climate action, and shows that they intend to expand on their success. It is now appropriate to consider the scope for such expansion, and where the first steps might be in doing so.

2.2 CITIES HAVE THE TRACK RECORD, CONFIDENCE AND AMBITION TO GREATLY INCREASE CLIMATE ACTION

C40 and Arup research⁵ has highlighted that cities are not only adopting an increasing *number* of climate actions each year, but, even more interestingly, are increasing the *scale* of the actions they are taking. In 2015, a higher proportion of actions is underway at the city-wide scale than ever before, while fewer actions are underway at a pilot scale. This sends a very clear message that cities have tried and tested different solutions, established the most effective actions and are focusing on these to deliver transformative change.

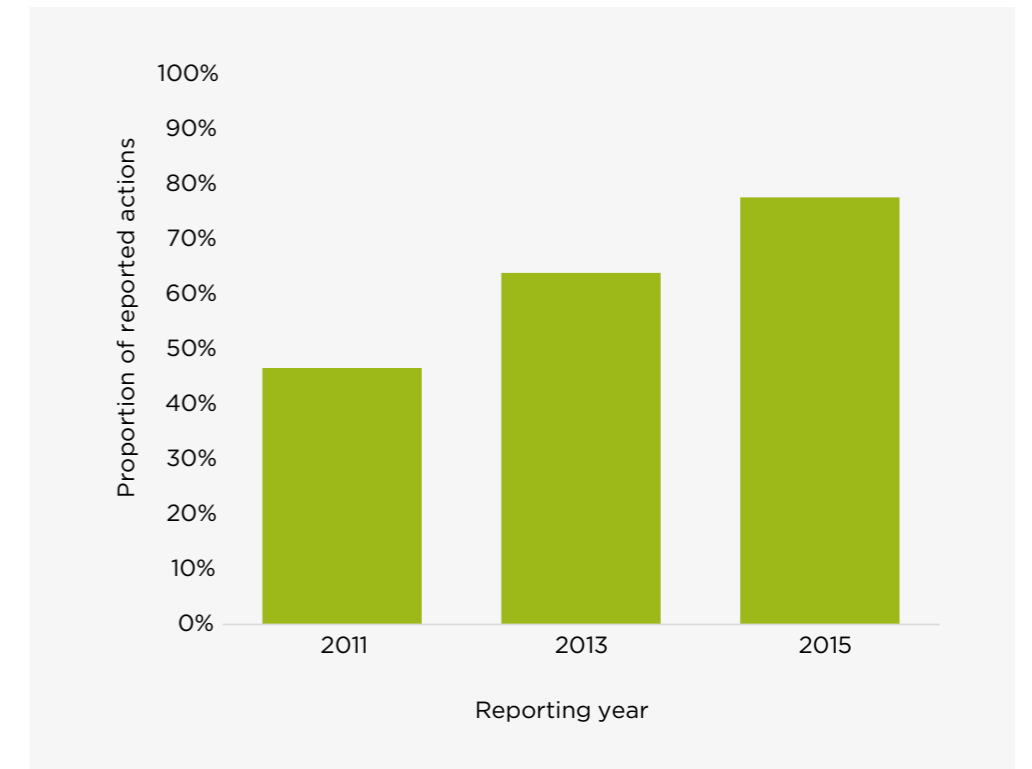
Cities have experimented, shared, learned, built confidence and are now pushing forward with an unprecedented number of effective actions. Confidence based on success breeds the ambition to expand.

The research confirms that city mayors have plans to expand more than 75% of the climate actions that are already in place, demonstrating their commitment to continue driving change. This is a tremendous increase from 45% in 2011, showing the growing confidence cities have in the actions they are currently implementing, as shown in Figure 2.01. Cities have learned what works and intend to build on it.

75%
of climate actions currently underway in C40 cities are planned for expansion.

5 *Climate Action in Megacities 3.0*, C40/Arup/UCL, 2015.

Figure 2.01. Proportion of actions being taken each year by C40 cities, which they state they plan to expand.⁶



77%
of actions in the CAM database have not yet been attempted.

2.3 THE OPPORTUNITY FOR CITIES TO TRY NEW THINGS

While the *Climate Action in Megacities* reports demonstrate examples where cities *are* taking action, this report focuses on actions cities are *yet to undertake*. Detailed analysis of actions reported by cities between 2011 and 2015 shows that around 26,820 actions have not yet been taken. While cities are taking extraordinary steps to advance their climate action and making ever-greater commitments for the future, 77% of actions are yet to be attempted by cities. Given the unprecedented wave of urban climate action we see today, this shows how the potential for expansion is vast, with significant scope for greater ambition.

Figure 2.02 shows the proportion of actions yet to be taken out of those available for each C40 city region. The absolute number of actions yet to be taken is included on the front of each bar (this is influenced by the number of cities in each region, with some regions containing more C40 cities than others). The variation between regions is small; in all regions, more than 70% of possible actions have not yet been started. Typically cities from regions in the global south have a slightly greater opportunity to deliver new climate action.

6 *CAM 3.0*, C40/Arup/UCL, 2015.

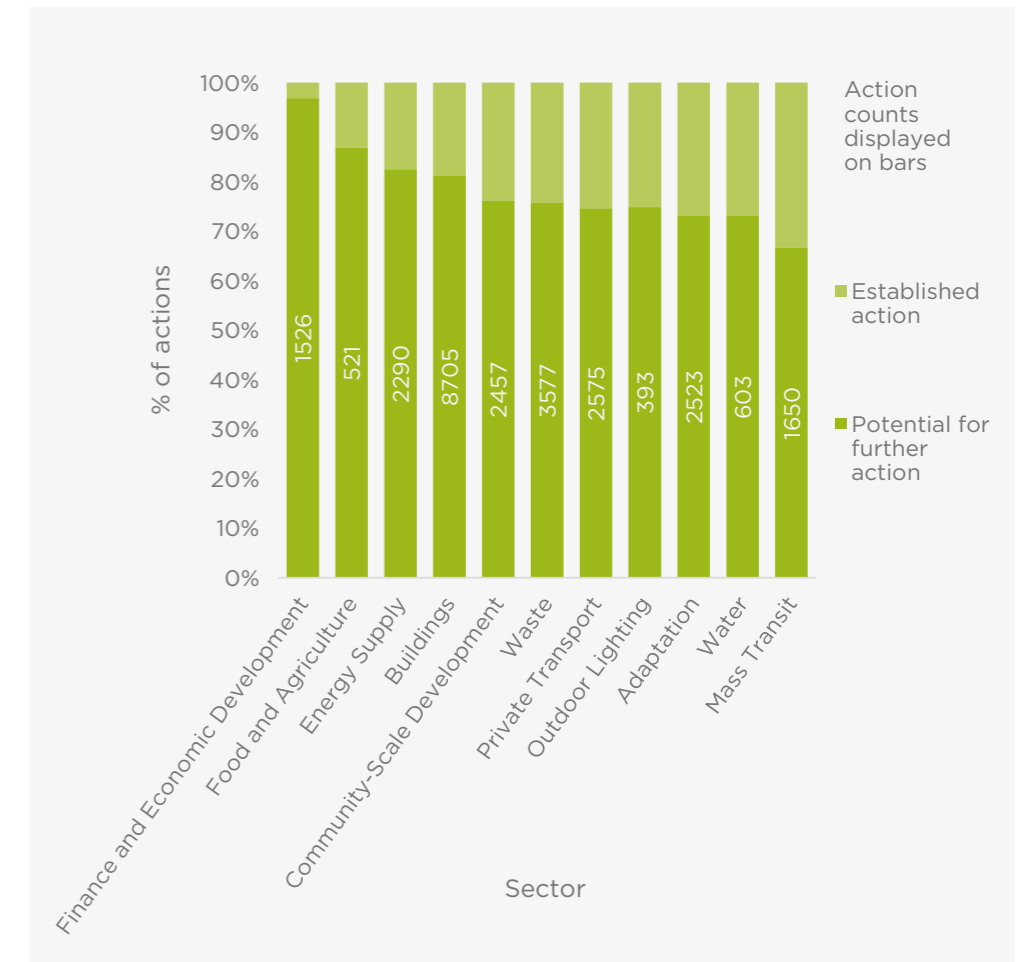
Figure 2.02. Proportion of actions started versus those not yet started in each region.



Figure 2.03 shows the proportion of actions yet to be taken by sector, as well as the absolute number of actions remaining for each sector. The absolute number is affected by the fact that in some sectors, such as Buildings, there are many more possible actions for cities than in other sectors, such as Outdoor Lighting.

Almost a third of all the actions that cities are not yet taking are in the Buildings sector (32%). This is significant given that, as outlined in CAM 1.0,⁷ buildings typically account for on average 45% of greenhouse gas emissions across C40 cities. A further third of untaken actions is made up of actions from the Private Transport, Outdoor Lighting and Adaptation sectors, meaning that just four sectors out of eleven make up two-thirds of the actions that are as yet untaken by C40 cities.

Figure 2.03. Proportion of all actions in each sector that have potential to be taken further.



32%
of climate actions that have not yet been taken are in the Buildings sector.

As a proportion of actions that could be taken within a sector, there is very significant untapped potential remaining within Finance and Economic Development and Food and Agriculture. These are relatively small sectors compared with others, however 97% and 89% of actions within each respectively are currently untaken. Even on a proportional basis Buildings is still a sector with below average action uptake.

⁷ Climate Action in Megacities 1.0: C40 Cities Baseline and Opportunities, C40/Arup, 2011.

2.4 DEFINING THE PRIORITY ACTIONS

The volume of untapped action is tremendous. To achieve the kind of transformative reduction in emissions that is necessary, in the long term most of these actions will need to be implemented across all cities. However it is not realistic to suggest that all cities should – or even could – be taking every possible action in the short term. Some actions may also be entirely inappropriate for certain cities.

97%

of possible actions in the Finance and Economic Development sector have not yet been taken.

It is therefore important to prioritise those actions that can have the most impact, and which can be delivered most easily. This would give an appreciation of the growth of action that might be expected or encouraged in cities in the short term.

To identify the actions that cities could be taking as a top priority, three categories of action have been considered to help identify the most attractive actions from amongst those yet to be taken. These are:

- **Actions where cities can learn from their peers:** actions that are successfully implemented by similar cities but are not taken in the city being considered. This implies that the action *may* be suitable for consideration in that city.
- **Actions which cities have strong power to deliver:** actions that are within sectors where cities have strong powers, meaning that cities should have control over them, but where action is not being taken. The evidence used to undertake this analysis was reported by all C40 cities on the powers exercised over 70+ assets and functions within the city, for instance the power over buses or electric utilities. This data is discussed and presented in a separate C40 report⁸ and in CAM 2.0.⁹
- **Actions that will have a high impact:** actions that have a high potential to reduce city emissions,¹⁰ meaning that they could make a big impact on cities' climate goals, but nevertheless are not being selected for implementation. The evidence used in this analysis was developed by C40, building on work undertaken in partnership with Stockholm Environment Institute in 2014 on the potential impact of urban climate action.¹¹

These categories have been used to understand the relative priority of the different actions yet to be taken by C40 cities. The selection is action and city specific, since while an action may be high impact in several cities, only a small number of cities may have strong power to deliver that action. The action would only be prioritised for those cities with strong power in this case.

⁸ *Powering Climate Action: Cities as global changemakers*, C40/Arup/UCL, 2015.

⁹ *Climate Action in Megacities 2.0*, C40 and Arup, 2014.

¹⁰ All actions in the CAM database have been evaluated for their overall potential to reduce greenhouse gas emissions. Actions have been grouped according to their 'high', 'medium' or 'low' emissions reduction potential.

¹¹ http://c40-production-images.s3.amazonaws.com/researches/images/28_SEI_White_Paper_full_report.original.pdf?1412879198

It is recognised that there may be cases of specific prioritised actions that for local reasons are not in fact suitable for delivery in the stated city. For instance an action may be high impact and the city has high power to deliver, but the action is not appropriate for climatic reasons. It is however beyond the scope of this work to undertake individual feasibility assessment for the many thousands of actions considered here. These numbers are therefore not presented as the basis for city specific action planning. They are rather intended for use as a guide to the shape and scale of potential future action.

The priority groupings that have been identified are as follows, listed in order of importance (see pages 22-23 and 24-25 for two infographics that relate the categories of action and the different priorities):

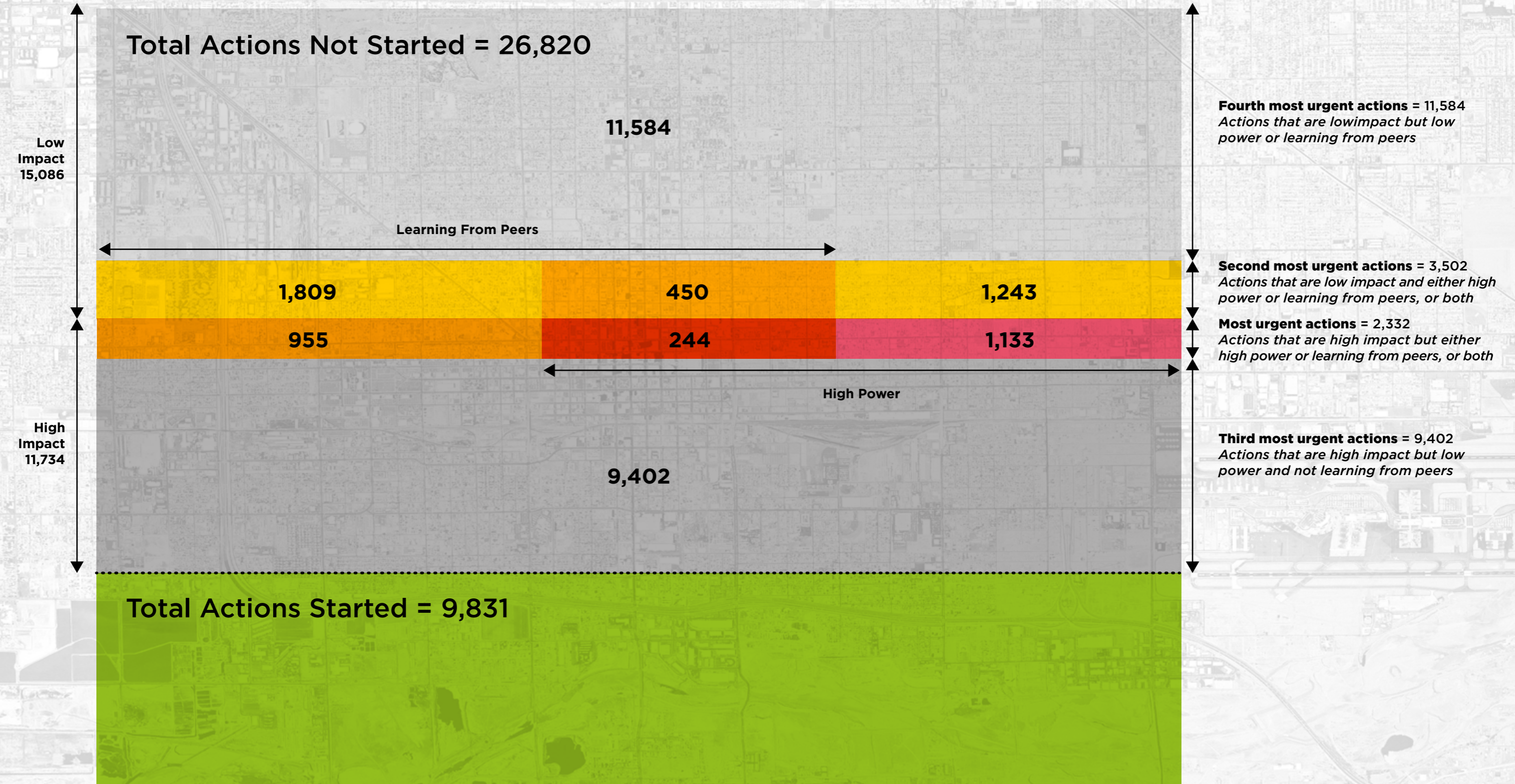
3,502

actions are highly accessible, with medium to low GHG reduction potential.

1. **First Priority Actions – High GHG Impact And Highly Accessible.** These actions have the highest impact in terms of reducing emissions, and are typically actions for which a city has *either* strong power to deliver *or* many of their peers are taking that action. They are therefore the group of actions which should be prioritised, and which might be expected or encouraged in cities in the next one to two years. The total number of C40 first priority actions is 2,332. Since 2011 C40 cities have worked on delivering 9,831 actions, and so this would represent an increase of 24%.
2. **High Priority Action – Medium To Low GHG Impact, Yet Highly Accessible.** Those actions that are not the highest impact, but where cities are considered able to deliver (have either high power or are able to learn from their peers) would represent the second priority group. These represent 3,502 actions. These would be the next actions to target because they would likely be the most easily delivered.
3. **Medium Priority – Remaining High GHG Impact.** All the remaining high impact actions would be the next to prioritise. These actions have not been highlighted as readily deliverable, however they have a high impact and so should be the next priority after the higher priority actions. These may be more challenging to deliver but are high reward. This would represent 9,402 actions.
4. **Moderate Priority – Remaining Action.** Finally, the remaining 11,584 actions would then be delivered in the longer term as appropriate to ensure maximum climate impact. These actions have not been identified as high impact, nor as actions over which a city has high power or which peers are already delivering.

A bird's eye view of actions underway in C40 cities, and potential for more

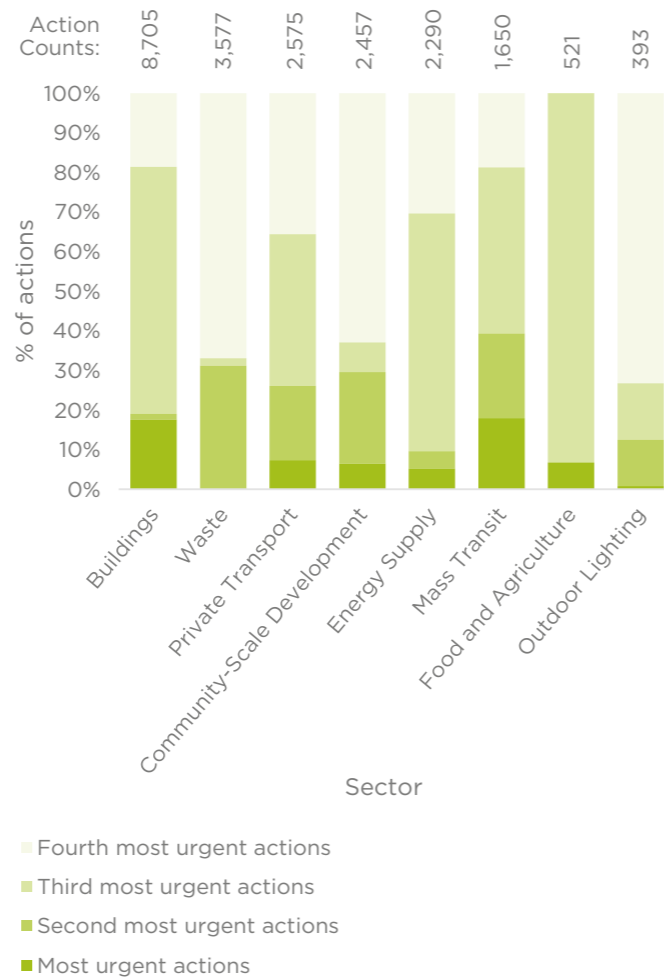
The actions C40 cities have embarked on since 2011, compared to the actions that could yet be taken. This is from an action list of 444 actions in 11 sectors, for 66 responding cities across 7 global regions. Of those actions yet to be taken, highlighted are those that are high GHG emission reduction impact, those where a high number of similar cities are taking action and those over a which a given city has high power (See Section 2.4 for more detail).



Sector split of remaining actions by urgency

Per sector, the proportion of untaken actions that are first, second, third and fourth priority.

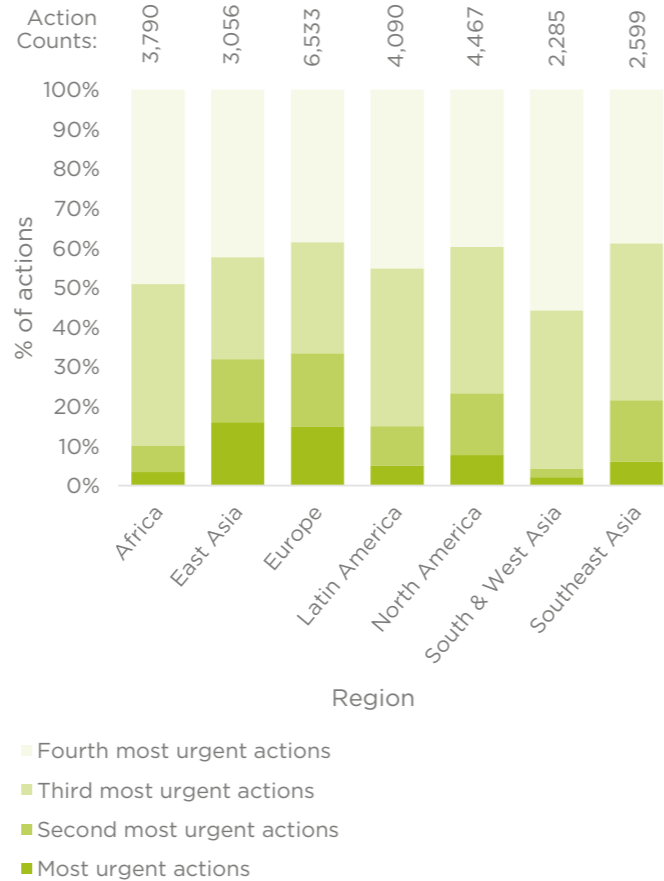
- Some sectors are not included in this graph because use of effect on GHG emissions to measure impact is not appropriate (such as in adaptation or finance actions).
- The sectors outlined for the most urgent action are the building sector, along side mass transit, with mass transit the most significant second priority sector also.
- Community scale development and Private Transport are both significant sectors to address from the outset, but become even more so as a second priority group.



Regional split of remaining actions by urgency

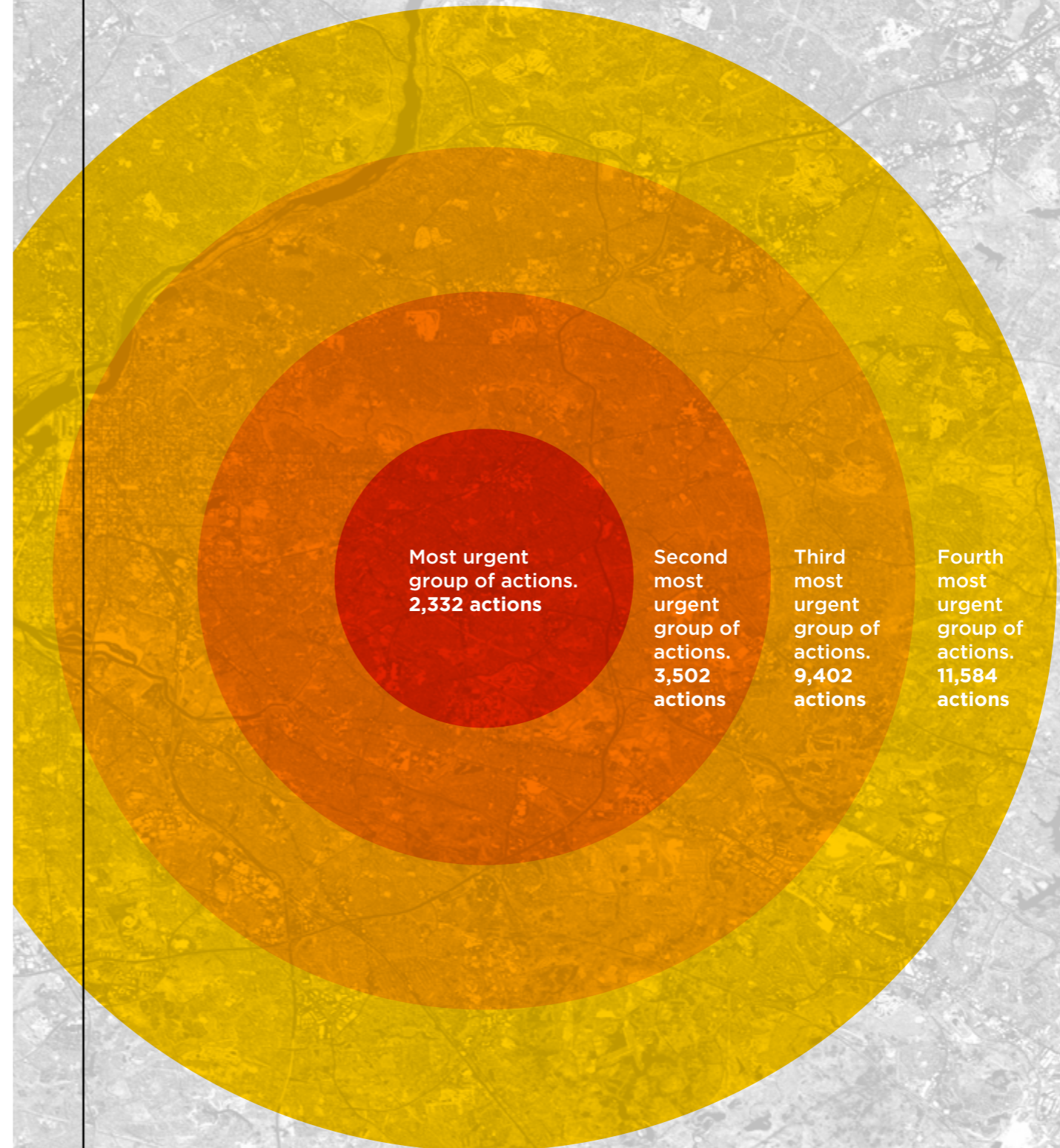
Per region, the proportion of action remaining to be taken by order of priority.

- The region with the most high priority actions yet to be taken is East Asia. East Asia and Europe have the highest volume of first and second priority actions. This implies that these regions have strong power to deliver many of the remaining action, and that they are already making progress with these actions providing ample opportunity to learn from best practice.
- Africa has a large proportion of third priority actions, those that are high impact but not picked out as uniquely easy to deliver. This is a similar split to South and West Asia.



The way forward is clear

There is tremendous potential for more action, and large volumes of readily accessible, high impact actions available to target in the short term. Most action should eventually be taken in all cities to deliver the level of transformative change needed, however it is not feasible for cities to target all actions in the short term. So while cities would ideally take all actions that are appropriate and practical, it is helpful to outline the next steps. This image highlights the priority of various groups of action on prior page (See Section 2.4 and previous page for explanation of below action grouping).



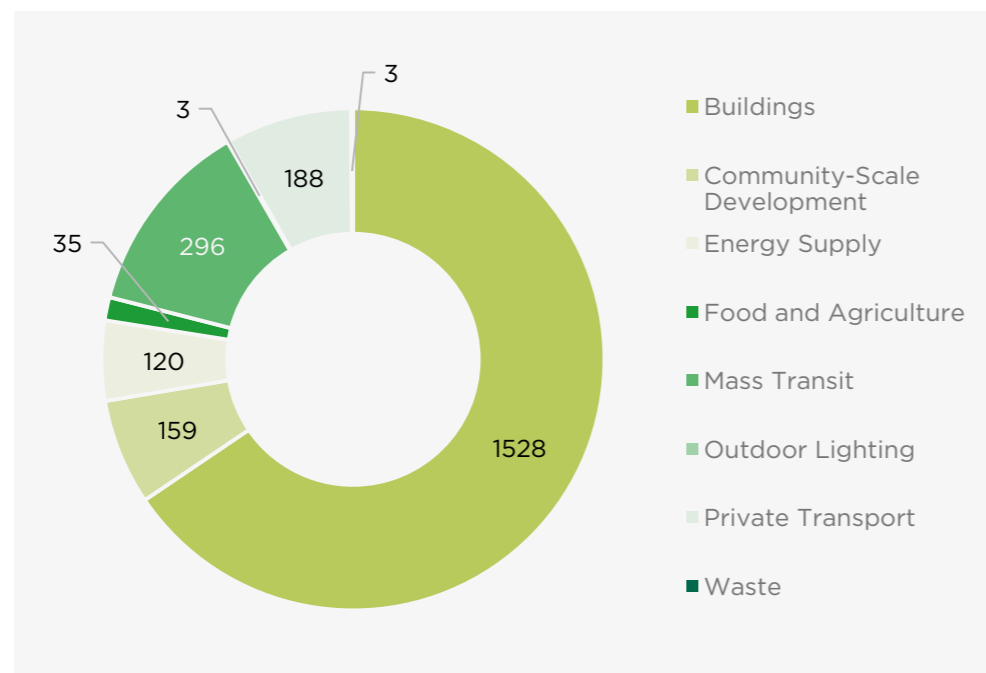
2.5 UNPACKING THE FIRST PRIORITY ACTIONS

The first priority actions comprise a group of 2,332 actions that should be achievable and could have a high impact on climate change, but which are not being widely implemented. This includes actions from eight city sectors; *an enormous 66% of them are within the Buildings sector.*

When we analyse the geographic distribution of action opportunities the Buildings sector is dominant in the priority action group across all regions, particularly in South & West Asia, where Buildings actions represent 85% of the priority actions. The Buildings sector represents more than 50% of priority actions in cities in East Asia, Europe and North America.

Actions from the Mass Transit and Private Transport sectors also contribute to the priority actions in all regions; in Africa, Europe, Latin America and North America, Mass Transit alone accounts for around 20% of of untaken action. Energy Supply actions form a small proportion of untaken actions in all regions except Latin America and South & West Asia, while Community-scale Development actions are being missed in all regions except South & West Asia.

Figure 2.04. Sector breakdown of first priority actions.



2.5.1 IMPACT OF DELIVERING THE FIRST PRIORITY ACTIONS

The first priority action set of 2,332 actions could be delivered in the short term and has been selected specifically to deliver the maximum impact. Based on a modelling approach used in Climate Action in Megacities 3.0,¹² we estimate that the carbon emissions that could be saved by implementing these actions would be 450 MtCO₂e cumulatively by 2020. This is roughly equivalent to the annual emissions of the entire United Kingdom.

¹² Climate Action in Megacities 3.0, C40/Arup/UCL, 2015.

450 MtCO₂e
could be saved by 2020 if the highest priority actions were implemented.

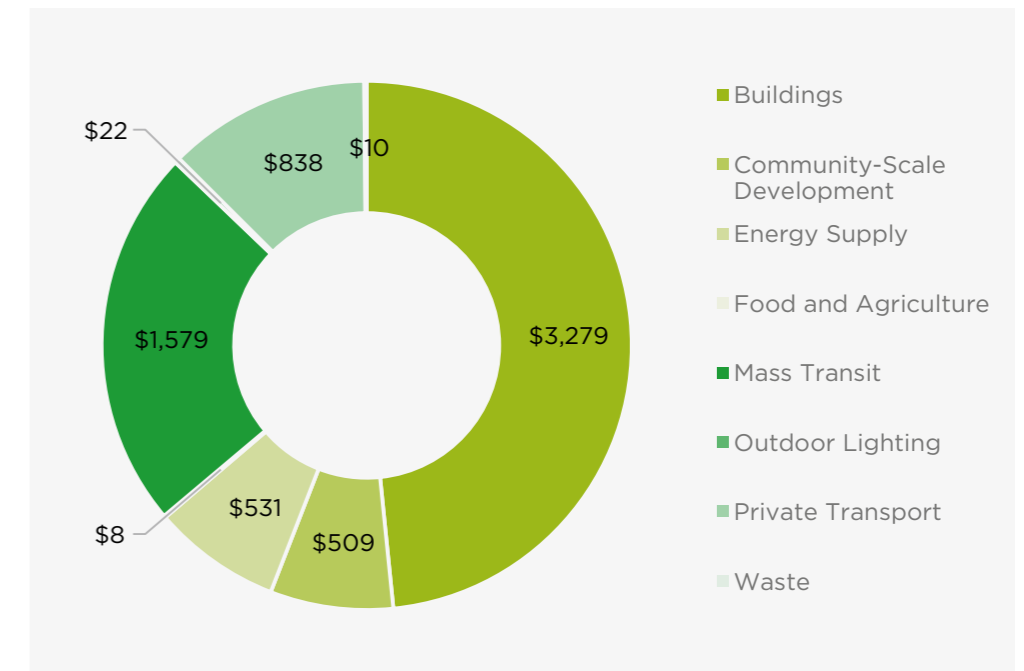
2.5.2 INVESTMENT REQUIRED TO UNLOCK THE FIRST PRIORITY ACTIONS

Analysis has been carried out to estimate the investment required by cities to take the first priority actions.¹³ It is estimated that \$6.8bn is required to unlock the actions within the first priority. The two sectors requiring the largest investment are Buildings and Mass Transit.

\$6.8 BILLION
is needed to enable delivery of the highest priority actions.

Where cities reported the costs of climate actions they were nearly always financed by the city themselves.

Figure 2.05. Sector breakdown of the estimated cost of implementing priority climate actions (US\$ millions).



2.6 UNLEASHING THIS POTENTIAL

The existence of untaken, yet high impact and achievable, action implies that there are underlying factors that influence a city's ability to take any particular action.

These factors - *the challenges* to climate action - may delay, limit, divert or completely prevent an action from being taken, therefore compromising a city's efforts to reduce greenhouse gas emissions and become climate resilient. In order to understand these challenges and find solutions, we must understand what they are and how they work. The following chapter establishes a framework for doing so, and the remainder of the report will focus on analysing the challenges that might affect climate action.

¹³ It should be noted that the data provides indicative costs to the city, but is not necessarily representative of the total action capital or operational cost, and so all numbers derived based on this evidence are purely indicative, and not a clear statement of expected investment. Rather this is investment cities require to unlock action, by for instance leveraging more private sector capital.



CHAPTER 3

A Framework For Understanding City Challenges

3.1	Introduction	30
3.2	Challenge Types	30
3.3	Characteristics Of Challenges	32

3.1 INTRODUCTION

For the purposes of this research, a challenge is defined as *an obstacle that hinders a city's ability to deliver climate action*. The obstacle may be permanent or temporary, originate within or outside the city, and may prevent, delay, limit or divert a city's implementation of climate action. This chapter presents the challenges framework that has been developed to structure understanding and analysis of challenges and, in later research, to develop proposals for the associated solutions.¹⁴ Understanding the specific elements of a challenge that hinder a city from delivering action is crucial to shape the solutions required to overcome them.

3.2 CHALLENGE TYPES

The framework consists of seven 'challenge types', which broadly describe the specific challenges that cities recognise in their day-to-day experience. The challenge types are named according to the context in which the specific challenges arise. The challenge types are described in Table 3.01, together with examples of the relevant challenges for each.

Table 3.01. Overview of challenge types.

Challenge type	Description	Example challenges
Political and leadership	Challenges related to prevailing political ideologies or priorities, governance typologies, or the strength of leadership from key actors.	<ul style="list-style-type: none"> Climate change scepticism in influential political parties Short mayoral terms/electoral cycles Civil society interests not represented in city decision-making Business lobbies rally against climate action.
Institutional, regulatory and legislative	Challenges that result from conflicting interests between government agencies, policies and laws, including difficulties with coordinating unitary climate action across government.	<ul style="list-style-type: none"> Fragmented or 'silo-ed' working by city agencies Short-term policy cycles misaligned with project delivery cycles National policy/legislation fails to promote climate action at city level Unclear roles/responsibilities for climate action, including across jurisdictional boundaries.

¹⁴ The wider research that underpins this framework is outlined in the accompanying Technical Paper.

Challenge type	Description	Example challenges
Resources and funding	Challenges related to a city's ability to secure funding for climate action, or to access appropriate staff/expertise to shape and deliver action.	<ul style="list-style-type: none"> City budget defined by national government Inability to collect local revenues Economic evaluations do not incorporate co-benefits of climate action Inability to access international financial mechanisms Inability to attract expert staff to government roles.
Information and knowledge	Challenges that relate to a city's ability to access information and acquire knowledge required to take effective decisions about climate action.	<ul style="list-style-type: none"> Poor transfer of knowledge between decision-makers and scientific institutions Inability to communicate the impacts of climate change in a non-technical way Weak evidence base to explain the local impacts of climate change Inability to identify effective solutions to local climate risks.
Social and cultural	Challenges that relate to the accepted norms, practices and behaviours of a city's institutions, businesses and citizens that may conflict with climate action.	<ul style="list-style-type: none"> Desired lifestyle incompatible with emissions reductions Deeply embedded social system rejects change Pervasive media distributes negative messaging about climate science.
Technology and infrastructure	Challenges related to the availability and compatibility of appropriate, functional or proven technologies or infrastructures required to deliver climate action.	<ul style="list-style-type: none"> Ageing or inadequate critical infrastructure (e.g. railways, power lines) Telecommunications networks cannot support modern ICT City is hesitant to invest in "new" technologies that are not well proven Incompatibility between new and existing technologies.
Physical and human context	Challenges that relate to a city's geographical location and demographic characteristics that can affect the viability of climate actions, including historical land use planning.	<ul style="list-style-type: none"> Physical constraints of a city, e.g. topography/climate, that prohibit action Lock-in to an urban form due to historical planning Uncontrolled population growth due to external forces (e.g. refugees) Significant low-income population makes provision of basic needs a higher priority.

3.3 CHARACTERISTICS OF CHALLENGES

To allow city challenges to be characterised and measured, a framework for describing them has been developed. This was used to guide and formulate the data collection process. The challenges have been characterised according to six principal components, which are critical to determining the potential options for navigating around them.

- **Actors**, describing the party or parties who typically create a challenge. This includes levels of government (city, regional, national), the private sector, financial and international institutions, and civil society. Often, the actors that create a challenge are also those that must resolve it.
- **Timing**, referring to the stage in the project delivery cycle (see figure 3.01) at which a given challenge is typically encountered. By understanding timing, actors are better able to foresee a challenge and make interventions to avoid or remove it.
- **Interconnectedness**, which considers the degree to which challenges are integral to one another (see figure 3.02), either causing or mutually reinforcing each other, or co-occurring. Interconnected challenges are often more entrenched and difficult to resolve than those that are more discrete.
- **Cost**, which describes the resources (human effort, time, financial resources) that are typically required to overcome a challenge. Inevitably, high-cost challenges tend to be more difficult to address.
- **Longevity**, referring to the typical lifetime of a challenge. While some challenges are permanent, others may be temporary or recurring on a cyclical basis. The longevity of a challenge influences how the city chooses to respond.
- **Impact**, which focuses on the degree to which a challenge delays, limits, diverts or prohibits a city from delivering climate action, and the emissions reductions that are missed as a result of action not being taken. Impact is influenced by other characteristics, including the interconnectedness and longevity of challenges. The scale of the impact may catalyse a city to find solutions to the challenge, or not.

The following chapter summarises the key findings from the analysis of challenges, which was underpinned by this conceptual challenges framework. Appendix 1 outlines the full framework of characteristics for three particularly prevalent challenge types.

Figure 3.01. Climate action delivery cycle (adapted from Moser and Ekstrom, 2010).

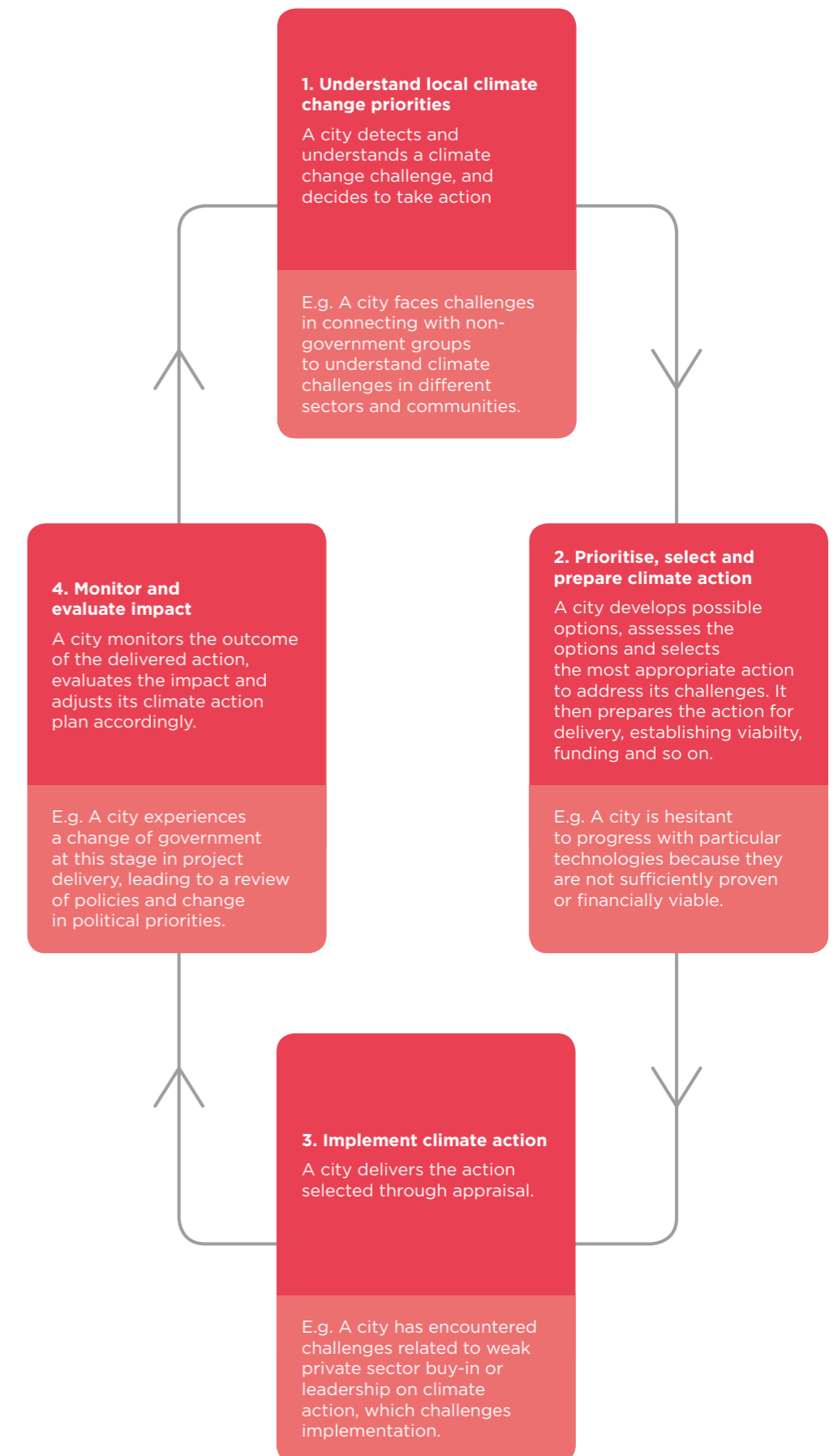
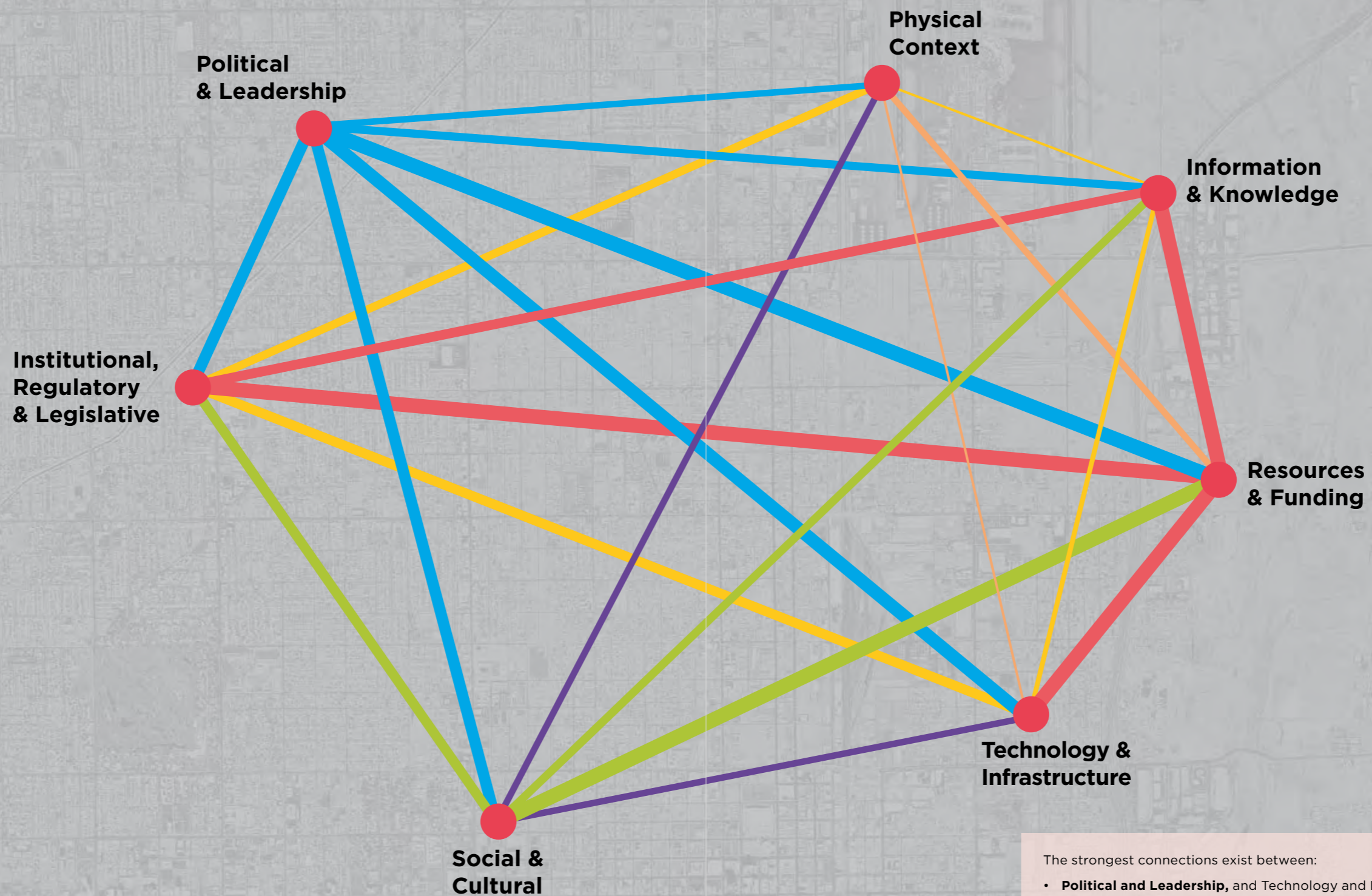


Figure 3.02. Interconnections between challenge types identified in the challenges research. The thicker the connecting line, the more often the challenge types have been linked to each other in responses to questionnaires and interviews for this study.



The strongest connections exist between:

- **Political and Leadership**, and Technology and Infrastructure
- **Resources and Funding**, and Social and Cultural
- **Political and Leadership**, and Resources and Funding
- **Resources and Funding**, and Institutional, Regulatory and Legislative.

The link between Institutional, Regulatory and Legislative, and Political and Leadership challenges is stronger than average, due to their inherent link to the city governance structures and processes. The significance of these challenge types is illustrated further in chapter 4 and Appendix 1.



CHAPTER 4

Enabling Cities To Do More

4.1	Introduction	38
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4.1 INTRODUCTION

There is enormous remaining potential to expand city action, which paints an encouraging picture of the future role that cities can play.

The next and obvious question is *how can cities unlock this potential, and what might currently be preventing them from doing so?*

This chapter presents unique insights into the challenges that are affecting cities' ability to deliver and progress climate action, highlighting the trends across C40 cities, regions and city sectors.

The data underpinning this analysis has been gathered through detailed questionnaires with C40's Regional Directors and Initiative Staff (see Chapter 1 for details). The questionnaires focused on understanding the challenge types that are most common and significant, together with the characteristics of those challenges. The data were quantified for analysis. Important trends were identified and data points were cross-checked against the action gap to find significant connections.

Specific findings from the analysis were validated by in-depth interviews with city officials, which drew out the nuances of how challenges occur and are experienced on the ground. The interviews have been used here to illustrate the data and contextualise the findings with real-world examples.

Further information about the methodology for this work is presented in the accompanying technical paper.

4.2 THREE CHALLENGE TYPES

Cities in every region are facing challenges to taking the action they want or need to mitigate or adapt to climate change. Challenges affect all sectors from sustainable community development through to energy efficiency and adaptation.

The most significant challenge types across all regions are:

- **Resources and funding challenges** (representing 21% of the challenges considered to be relevant to C40 cities)
- **Political and leadership challenges** (20%)
- **Institutional, regulatory and legislative challenges** (17%)

These three types are also the most prevalent when viewing challenges on a sector basis. Physical Context challenges represent only 7% of all challenges mentioned in C40 cities, likely because cities are accustomed to working within their physical constraints and do not view this as a challenge per se.

21%

of the challenges cities face are related to Resources and Funding.

27%

of institutional challenges are related to poor coordination across sectors or agencies.

Figure 4.01. Frequency with which challenges are relevant to cities and sectors for C40 cities.¹⁵

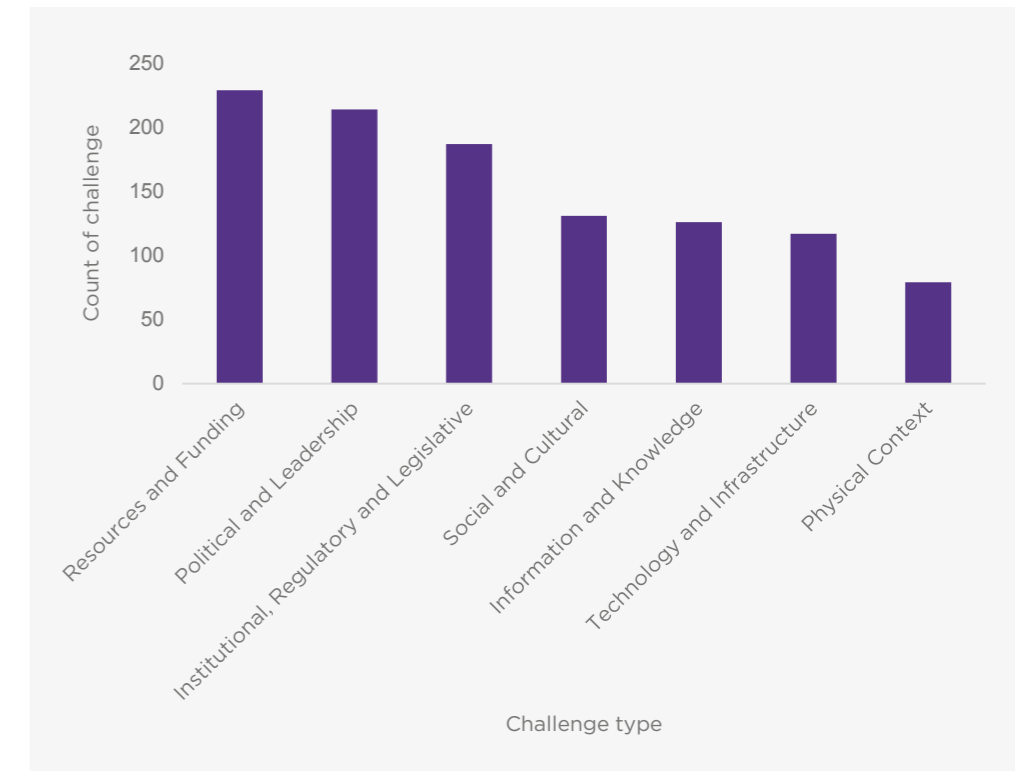


Table 4.01. Most frequent challenges within each of the dominant challenge types, based on survey data from C40 Regional Directors.

Resources and funding challenges	Political and leadership challenges	Institutional, regulatory and legislative challenges
1. Gap between investment required to deliver an action and budget available (19%)	1. Weak leadership on climate action from the private sector (14%)	1. Poor interaction and coordination across sectors and institutions to deliver climate action (27%)
2. Perceived conflict between economic growth and climate action (17%)	2. Failure of city government to connect with civil society, private sector, or other stakeholder groups (14%)	2. Poor land use planning (18%)
3. Inability to access financial resources for climate action (15%)	3. Climate actions not seen as politically compelling (13%)	3. Existing legislation/regulation inhibits implementation of climate action (14%)
4. Inadequate economic evaluation to quantify and prioritise the benefits of climate action (15%)	4. Unable to articulate co-benefits of climate related activities and other urban policies (10%)	4. Absence of planning codes, regulations and standards (12%)

¹⁵ 'Count of challenge' refers to the number of times a challenge from each type was identified in the survey as existing in the cities that respondents were working with. Respondents were asked to name the cities they were referring to in their answers.

The three major challenge types are not only highly prevalent in their own right, but they are also heavily linked to the occurrence of other challenges (see figure 3.02). Addressing these challenge types is therefore central to unlocking city climate action. Further analysis of these three challenge types is presented in Appendix 1.

The remainder of this chapter will focus largely on these three dominant challenge types. This is because it has been considered useful to understand specific, significant challenges in more detail. It does not mean, however, that the remaining four groups are not important. C40 will look to explore these other challenges in more depth at a later date.

4.3 CHALLENGES VARY BY GEOGRAPHICAL REGION

Cities in different regions find different challenge types more significant. For example, Political and Leadership challenges prevail in European cities (38% of all challenges mentioned for this region). This is also the only region in which Social and Cultural challenges are not deemed to be an issue at all.

Institutional, Regulatory and Legislative challenges are the most dominant in South & West Asia (39% of challenges for this region). Cities in this region do not typically have the powers to set and enforce policy or legislation themselves, and are therefore reliant on other levels of government to set the policy context for climate action. If this policy is not forthcoming, cities are unable to facilitate action with their delivery partners leading to a gap in action.¹⁶

Resources and Funding challenges are the major inhibitor of climate action in North America (34% of challenges for the region), where cities typically govern through implementation, and therefore depend on accessing the financial resources required to deliver.

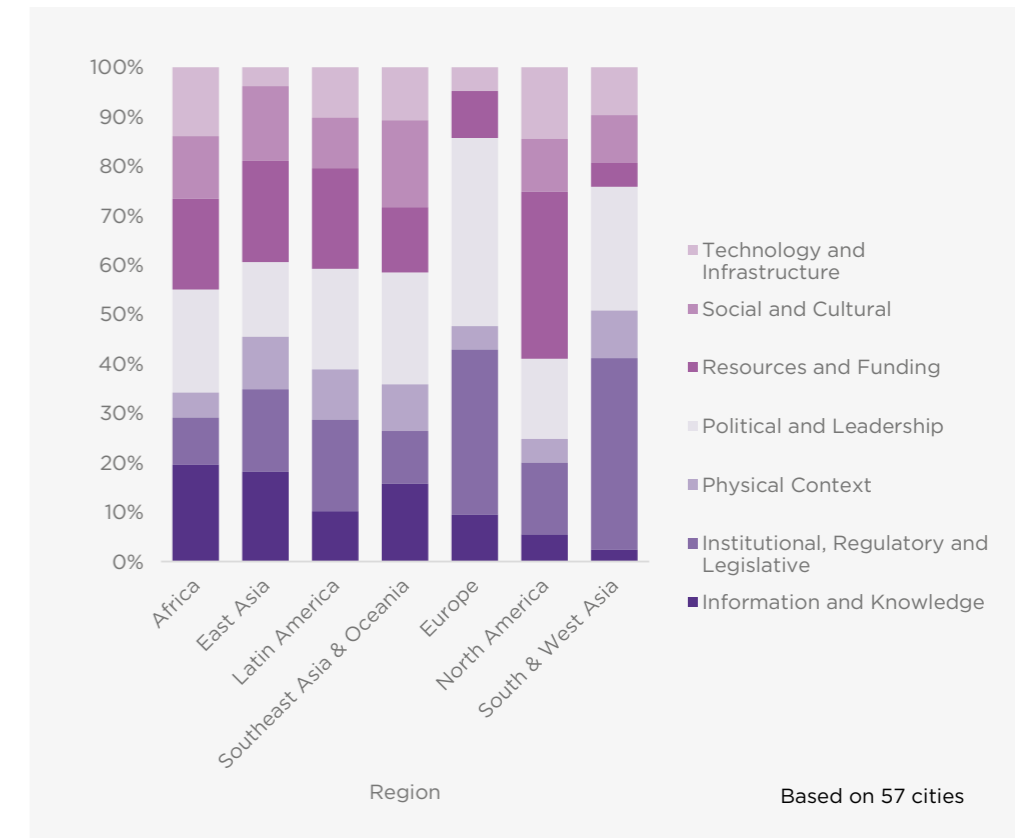
• **38%**

of challenges in European cities are related to Political and Leadership issues.

• **39%**

of challenges in South & West Asian cities are due to Institutional, Regulatory and Legislative issues.

Figure 4.02. Frequency with which challenge types are connected with cities in each region.



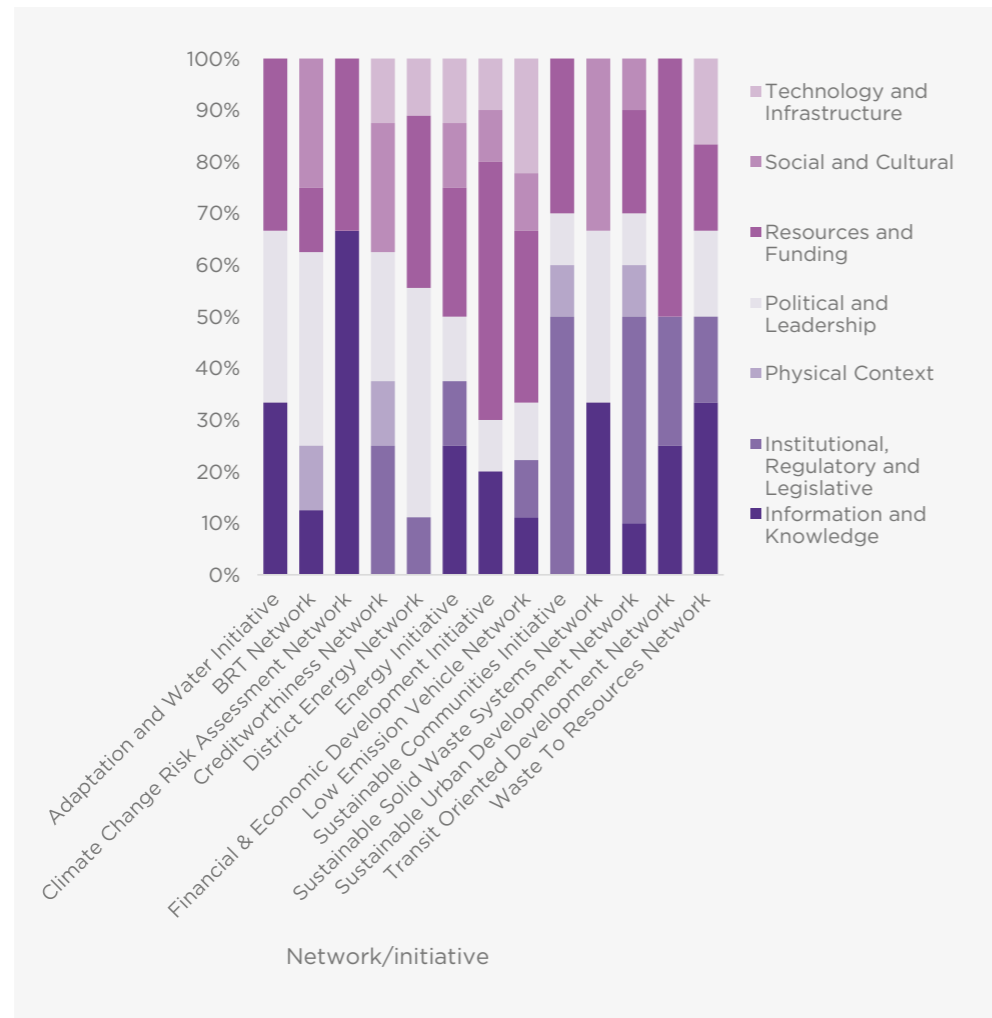
4.4 CHALLENGES VARY WITHIN CITIES BY SECTOR

Even within cities, the dominant challenge types vary depending on the specific initiative a city is trying to deliver, or sector in which they are trying to take action. While Resources and Funding challenges are highly relevant across all initiatives, there are important differences between them.

The other C40 initiatives and networks have identified a wider array of relevant challenge types. Intuitively, Social and Cultural challenges are most relevant to initiatives that require an element of behaviour change, including Bus Rapid Transit (BRT) and Sustainable Solid Waste Systems. Likewise, Technology and Infrastructure challenges are more relevant to initiatives that call for more innovative solutions, such as Low Emission Vehicles and Waste-to-Resources.

¹⁶ As highlighted in *Powering Climate Action*, cities in South and West Asia typically exhibit a Facilitating governance typology. The full set of city governance typologies is outlined in *Powering Climate Action: Cities as Global Changemakers*, C40/Arup/UCL, 2015.

Figure 4.03. Frequency with which challenge types are connected with initiatives in cities.



AROUND 65% of challenges faced by cities in the Climate Change Risk Assessment Network are related to Information and Knowledge.

4.5 CITIES EXPERIENCE CHALLENGES WITH PRIORITISING, PREPARING AND IMPLEMENTING ACTION

The three dominant challenge types occur most frequently during the first three stages of project delivery. Political and Leadership challenges are the most common challenge type when cities are seeking to understand their climate priorities (24% of all challenges experienced at this stage) and develop options for climate action (23% at this stage). Resources and Funding and Institutional, Regulatory and Legislative challenges become more influential when cities are implementing climate actions, each representing 23% of challenges at this stage (see figure 4.04). This shows a clear shift from challenges that occur earlier

in the project cycle at the strategic/planning level, such as inadequate political leadership on climate issues, to challenges that occur at a more practical delivery level at later stages. Obstructive regulations/legislation and gaps between required funding and city budgets were frequently mentioned in relation to implementation of actions.

Only 4% of challenges are faced at the stage of monitoring and evaluation, suggesting either that this is a relatively smooth internal process, that monitoring and evaluation is not a standard practice for cities, or that few actions progress to this stage.

Figure 4.04. Frequency with which challenges are connected with each stage in the project delivery cycle across all regions, including count of challenges.

30% of challenges occur when cities seek to understand local climate priorities.



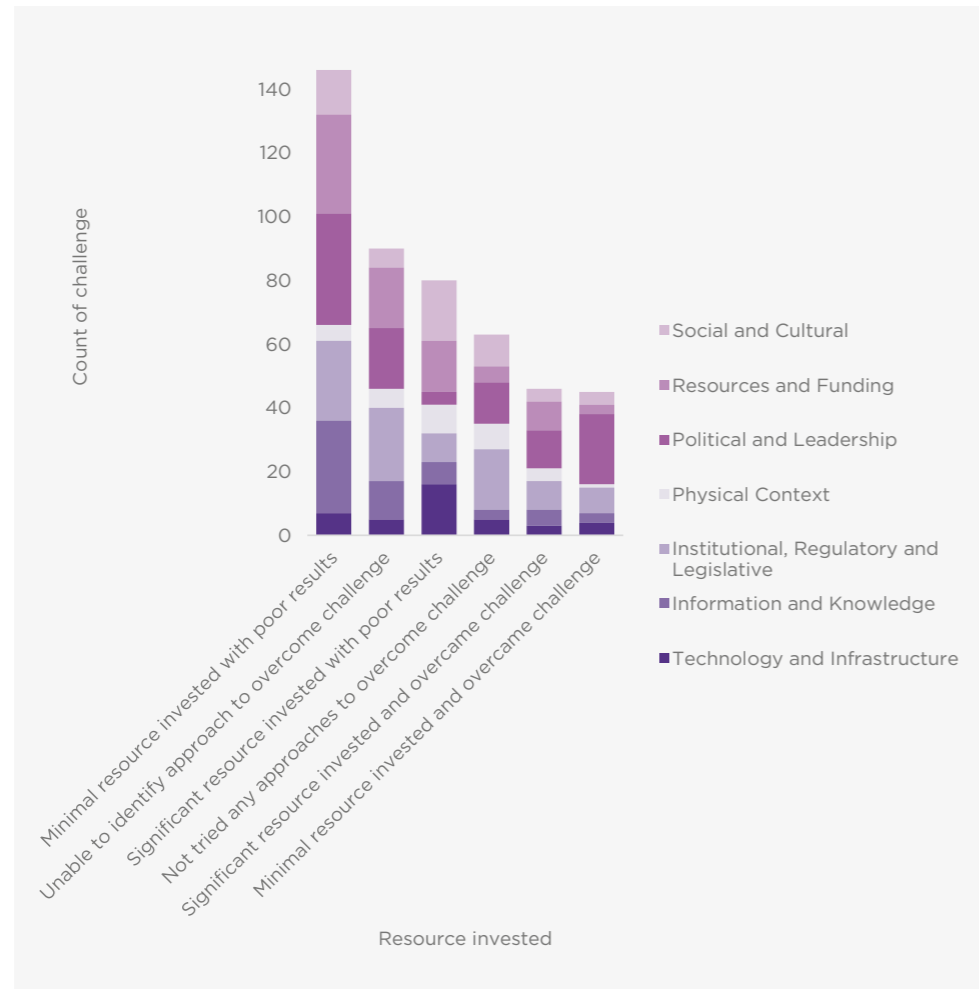
4.6 CHALLENGES ARE COSTLY AND DIFFICULT FOR CITIES TO OVERCOME

Of the challenges discussed in this research: 82% have been in existence for more than five years; 48% have not been overcome, despite the city investing resources to do so; and cities have not been able to identify an approach to address a further 19% of challenges. This demonstrates the extent to which challenges can become embedded in cities, and the difficulty of identifying effective solutions. The longer a challenge remains, the greater the missed opportunity for the city in terms of mitigating or adapting to climate change.

Resource and Funding, Information and Knowledge, and Institutional, Regulatory and Legislative challenges have proved particularly difficult for cities to overcome.

48%
of challenges have not been overcome even after specific efforts to do so.

Figure 4.05. Scale of resources cities have invested in addressing challenges across regions and sectors, split by challenge type.



4.7 SUMMARY

This chapter has highlighted the dominance of three challenge types in affecting cities' ability to take climate action. Regional and sector-based analysis also showed the nuances between challenge types that are more relevant in cities in each region, and in sectors in each city. The chapter highlights that challenges most often occur as cities seek to understand their climate change challenges and develop options for climate action. Furthermore, the data emphasises the difficulty of overcoming challenges, particularly those types that fundamentally affect the core assets of a city; its politics, leadership, funding base, and physical context.

What has not been discussed here - which is crucial to addressing cities' challenges and enabling cities to move forwards - are the actors and relationships that cause these challenges. This will be the focus for Chapter 5.



CHAPTER 5

An Absence Of Collaboration Underlies Most Challenges

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5.2	The Capacity To Overcome Most Challenges Is In The Hands Of Governments	49
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5.1 INTRODUCTION

This chapter investigates the actors and relationships that are most often at the root of challenges. This will be the key to overcoming challenges and enabling cities to move forwards.

The evidence collected to date about the challenges to climate action points clearly to the fact that *communication, coordination and collaboration* are central.

Cities have shown that they are willing and able to act, but stronger relationships within and beyond the city government will be pivotal to enable them to unlock their full potential.

CAM 3.0 has provided evidence of cities' incredible talent and appetite for collaboration with each other. Complementing this, other research has shown that cities can deliver far more climate actions when they collaborate.¹⁷ This is encouraging when considering the need for the wider collaborations that this chapter points towards.

5.2 THE CAPACITY TO OVERCOME MOST CHALLENGES IS IN THE HANDS OF GOVERNMENTS

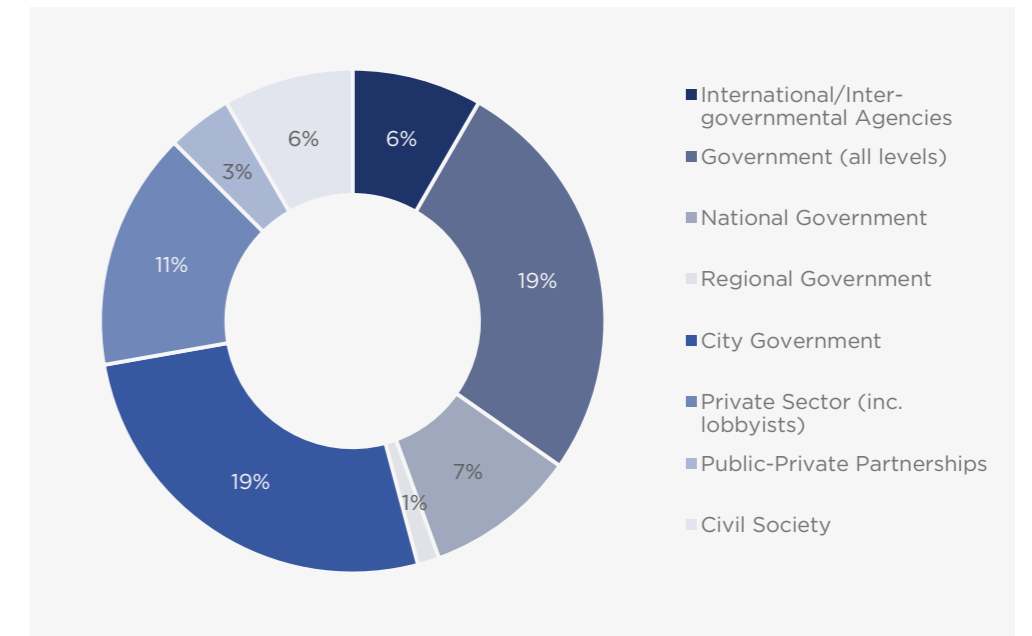
Governments, particularly the national and municipal levels, are identified globally as having the major responsibility preventing city governments from taking stronger action. Of the challenges faced by cities, 65% are associated with government entities. This is a powerful finding, indicating that city potential is not being held back by fundamental and unchangeable forces, but by the way in which we organise and operate. These are problems that can, and hopefully will, be addressed.

65%
of challenges are due to government actors.

17 Powering Climate Action: Cities as Global Changemakers, C40/Arup/UCL, 2015.

Figure 5.01. Frequency with which challenges are connected with each group of actors across C40 Initiatives.

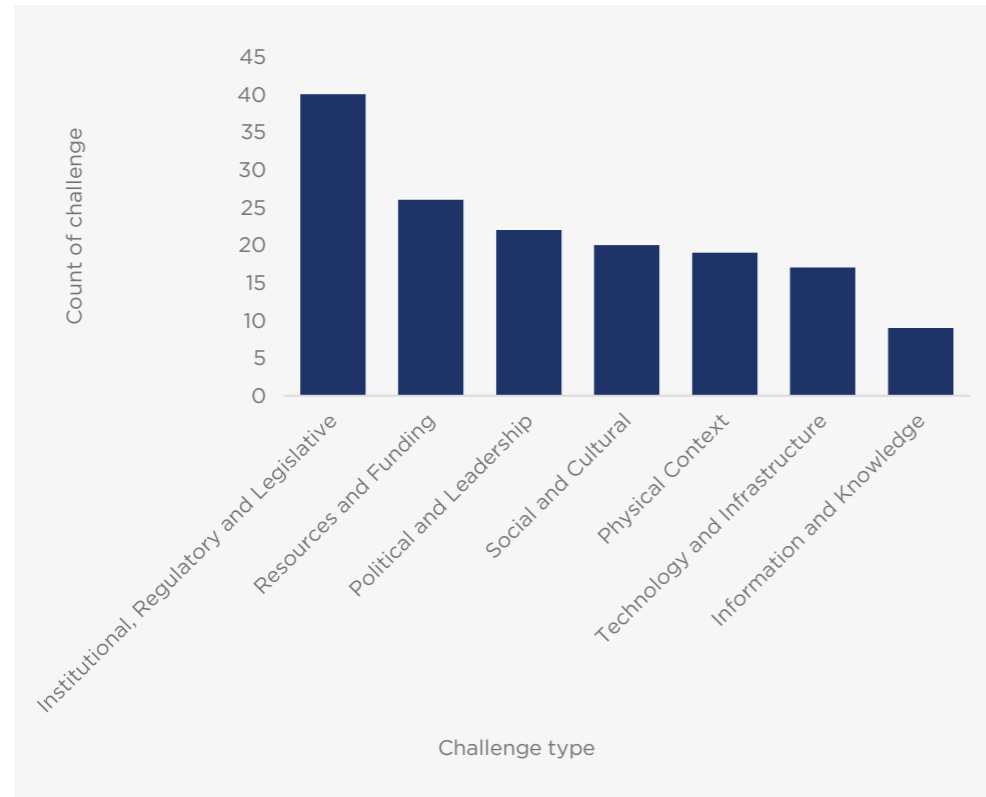
7%
of challenges are due to national government actors.



5.2.1 VERTICAL INTEGRATION: COLLABORATION BETWEEN CITY, REGIONAL AND NATIONAL GOVERNMENT

National governments are perceived by C40 and city staff as a central actor in creating challenges to city climate action, identified by cities in all regions and responsible for 7% of all challenges occurring across city initiatives (see figure 5.01).

Figure 5.02. Frequency with which challenge types are linked to national government actors, across regions and initiatives.



COORDINATION OF NATIONAL AND CITY INTERESTS

The survey highlighted that national level policy and political interests can have a major impact on city climate action. Together, Institutional, Regulatory and Legislative, and Political and Leadership challenges represent 26% of challenges originating from national government actors (see figure 5.02). City interviews suggest that while competing interests are inevitable, a certain level of consistency and complementarity in national politics - especially climate change politics - is essential to create a supportive environment for city level climate policy and to create investor confidence for other actors. Many cities have been affected by changing or uncertain leadership on climate change at a national level. For example, for Melbourne national funding cuts and changing priorities have meant that neither business nor investors had certainty on the future policy environment, making it difficult to invest or progress low carbon initiatives.

26%
of challenges due to national governments are Institutional, Regulatory and Legislative.

Melbourne

“We had three years in the wilderness as the only voice, and not the loudest or strongest voice, so it’s difficult.”

Over the past ten years Australian climate politics have been in a state of continuous change... A focus on Melbourne highlights the challenges that this turbulence and lack of national policy continuity presents to climate action at the city level. Despite the city’s will to invest in climate actions, Melbourne has limited ability to influence or criticise national government, and cannot achieve local goals without aligned policies at the state and federal level. Without a positive national policy context, not only will the city face further challenges in driving forwards its climate goals, but there is also no incentive for the private sector to buy into a pro-climate agenda. National instability may therefore lead to stagnation in city level climate action, despite a strong local political will.

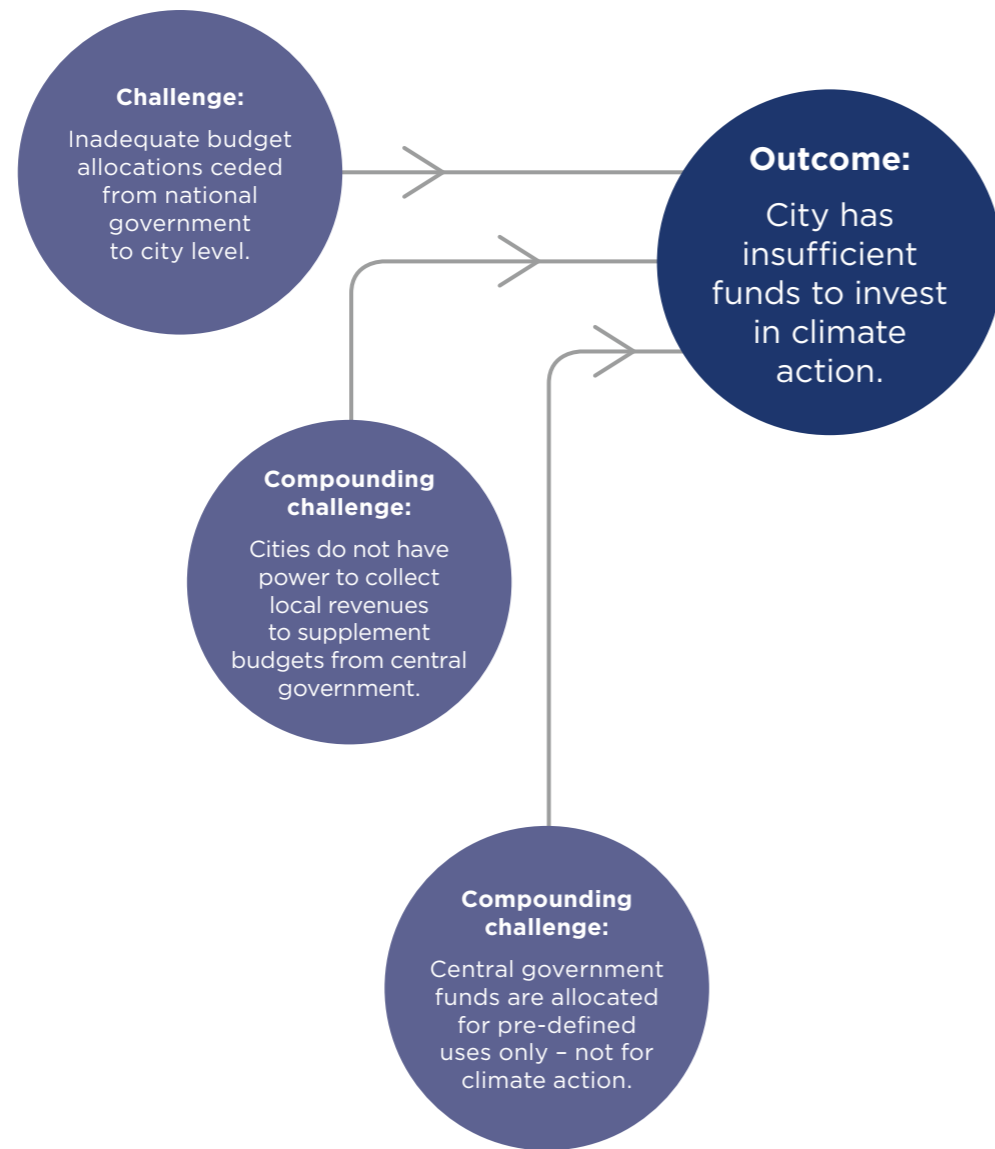
17%
of challenges due to national government are related to Resources and Funding.

EFFECTIVE ALLOCATION OF FUNDS BETWEEN NATIONAL AND CITY GOVERNMENT

Resource and Funding challenges are one of the critical challenge types attributable to national government, representing 17% of challenges arising from national government actors (figure 5.02) and illustrated further by real stories from a number of city officials.

Mexico City, Rio de Janeiro and Johannesburg have highlighted the shortage of funding devolved to the city from the federal level, particularly for environmental and climate related projects. Often, when funding is allocated to cities, national governments stipulate how it can be used, which prevents cities from investing in local interests. Cities’ limited funds are further compounded when cities do not have the power to collect taxes or raise revenues in other innovative ways, for instance through issuing green bonds. For example, in Amman the city faces challenges in securing international funding as their income from tax revenues is affected by taxes controlled nationally, making it hard to forecast the amount of public funding they can match to international funds. In addition, international funders often request sovereign guarantees, effectively meaning the city has to have national approval for funding. A number of different funding related challenges together have a compounding effect, worsening the outcome for cities in terms of their ability to access sufficient funds for climate related actions (see figure 5.03).

Figure 5.03. Compound challenges can worsen the outcome for city climate action.



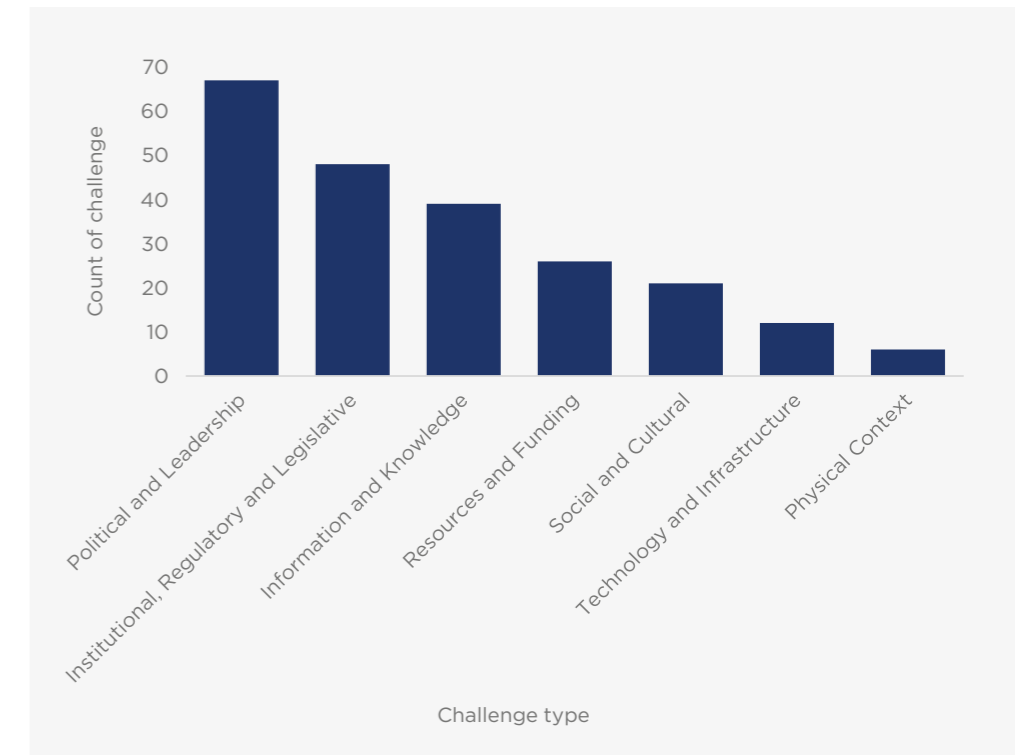
5.2.2 HORIZONTAL INTEGRATION: COORDINATION WITH METROPOLITAN AUTHORITIES

Through interviews, cities have also acknowledged the barriers related to partnerships with neighbouring authorities in the wider city-region. In Mexico City, the metropolitan area is composed of 59 municipalities, only 16 of which are controlled by the city government; the other authorities are part of different states. Mexico City has control over policy for the 16 municipalities within its jurisdiction, but there is no overarching framework to ensure alignment across municipal boundaries. This means that actions requiring coordination on a larger scale than the city itself may be compromised. A similar barrier has been identified by Amman, where lack of control and coordination over regional transport has proved challenging and could potentially hamper city efforts to better organise public transport services.

5.2.3 COLLABORATION WITHIN AND BETWEEN CITY GOVERNMENTS THEMSELVES

Of the challenges, 19% have a connection with city governments themselves. These are most often Political and Leadership (31%) or Institutional, Regulatory and Legislative (22%) issues.

Figure 5.04. Frequency with which challenge types are connected with city government actors, across regions and initiatives.



19%
of challenges are due to city governments themselves.

COLLABORATION BETWEEN CITY AGENCIES

A particularly common challenge identified by C40 staff relates to fragmented or conflicting actions taken by individual institutions within the city government, which prevent united action towards shared climate goals. This issue was highlighted in the survey data in relation to cities in all regions. For example, in 2011 a C40 city was piloting crisis management strategies for climate adaptation, but a lack of integration between institutions has stopped this action from progressing to significant or city-wide scale.

31%

of challenges related to city government are due to Political and Leadership issues.

COORDINATION OF CLIMATE CHANGE EXPERTISE WITHIN CITY INSTITUTIONS

The relatively recent appearance of climate change as a city issue leads to challenges related to the absence of institutional and staff knowledge to inform effective decision-making. This challenge was identified from the survey data as a common difficulty for cities, which was corroborated through the interviews.

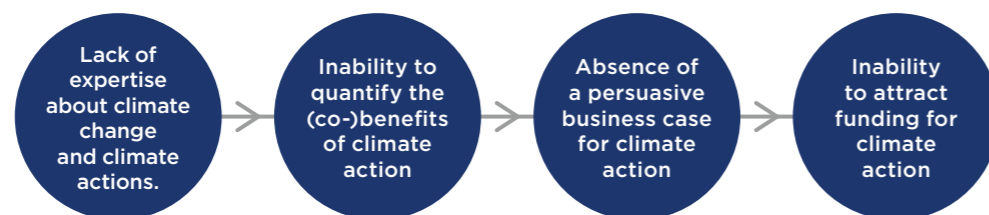
Officials in Ho Chi Minh City and Johannesburg have highlighted the difficulties of finding and bringing together appropriate local skills and capacity to understand the climate challenge, or relevant guidance on the options for climate action. Johannesburg started a climate change programme in 2003, which has matured over the years. Whilst there are strategies for adaptation and mitigation of climate change, the challenge of mainstreaming climate change into decision making remains. Johannesburg competes with other state departments for skills and has experienced loss of expert staff, but continuously strives to build capacity across the city.

Ho Chi Minh City have also started a climate change programme in 2009 supported by a Climate Change Bureau and steering committee. This is the first city in Vietnam to develop a climate change action plan; as a new focus for both the city and the nation they face challenges in terms of staff knowledge and also public awareness. The advantage is that the skills and capacity that Ho Chi Minh City is gaining can be spread to the whole country – for example development of policies for Public-Private Partnerships (PPPs) can be shared nationally.

COMMUNICATION OF THE INVESTMENT CASE FOR CLIMATE ACTION

Inexperience and lack of expert knowledge also challenge cities to develop a persuasive investment case to justify climate action, taking into account co-benefits (the other benefits that accrue from climate actions, beyond direct climate change mitigation or adaptation). This challenge was emphasised by questionnaire respondents in this research. Difficulties with understanding and demonstrating the benefits of climate action were named as one of the most common and taxing challenges for cities. Following on from this, the absence of a strong business case is an obstacle to cities attracting funding for climate action, especially where there is unfamiliarity or mistrust with new and innovative urban solutions. These linked challenges demonstrate the interconnections between challenges – particularly where one challenge causes others – that must be understood if the root of the problem is to be solved (as illustrated by figure 5.05).

Figure 5.05. Challenges can cause other challenges, leaving the root of the problem difficult to trace.



Rio de Janeiro

“We built the Madureira Park in a neighbourhood that was a concrete jungle. It has lowered the temperature in the surrounding area by 2°C, which has a strong impact on energy consumption for cooling, local health and wellbeing, and recreation. This has had a lot of co-benefits, which were not clear in the original funding proposal or evaluation of the project. It’s hard for people to see the wider benefits before the project is delivered.”

COORDINATION OF CLIMATE ACTION WITHIN EXISTING POLITICAL CYCLES

The research also highlights the challenge of short-term electoral and planning cycles in cities, which are discordant with long-term climate projections, delivery programmes for major projects, and the timescales over which the impact of climate actions can be observed and valued. This tension can mean that climate actions are not prioritised by city leaders. In their interview, Barcelona highlighted the difficulties of creating climate change plans for a 20-30 year horizon, using climate projections of 100 years, when governments change on a four year cycle – for this reason Barcelona work to secure agreement of all stakeholders, including political parties.

5.2.4 DESPITE THE DOMINANCE OF GOVERNMENT ACTORS, THESE CHALLENGES REMAIN DIFFICULT FOR CITIES TO OVERCOME

There is substantial opportunity resulting from the fact that many challenges originate either in lack of coordination within city governments, or between city and other government institutions. There is a chance to unleash the full potential of the public sector if these blockages can be removed.

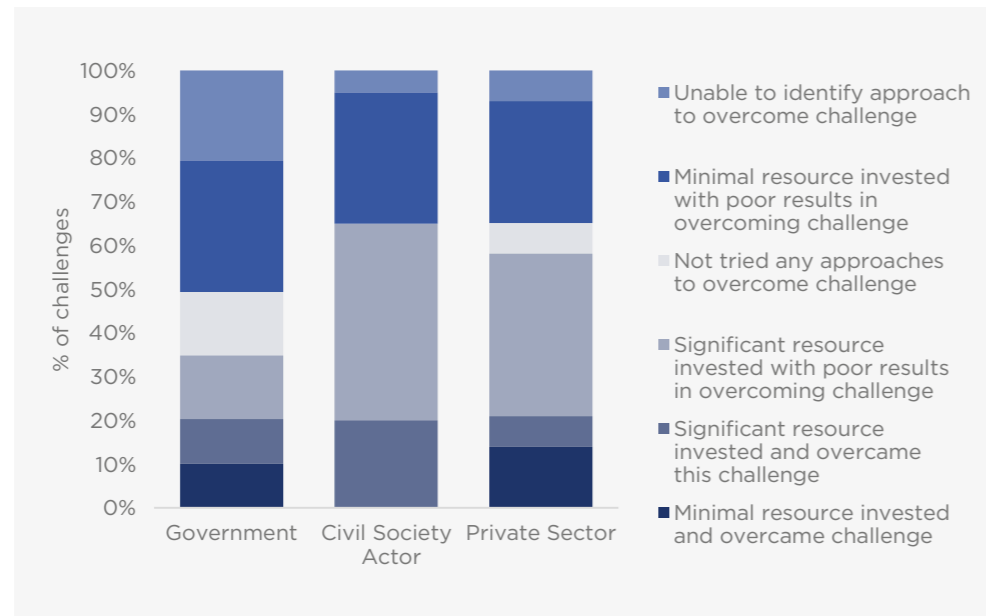
In fact, cities have allocated relatively few resources to address the challenges that are created by government actors. They are investing disproportionately in resolving the challenges arising from civil society and private sector actors. Cities have invested in resolving 95% of the challenges created by civil society actors and 90% of challenges emerging from the private sector, albeit with poor results.

On the other hand, cities have not tried or have not been able to identify an approach to address 21% of challenges arising from government actors. It appears cities would benefit from refocusing their resources to address their most common challenges.

21%

of challenges related to government actors have not been addressed at all.

Figure 5.06. Scale of resources cities have invested to address challenges, split by actor responsible for the challenges.



5.2.5 BY OVERCOMING GOVERNMENT CHALLENGES, CITIES WILL BE BETTER ABLE TO PROGRESS ACTIONS AT ALL STAGES OF THE DELIVERY CYCLE

Challenges arising from government actors make up more than two-thirds of challenges at each stage in the delivery cycle. This finding shows that by addressing government challenges, cities may be better able to progress climate action at all stages.

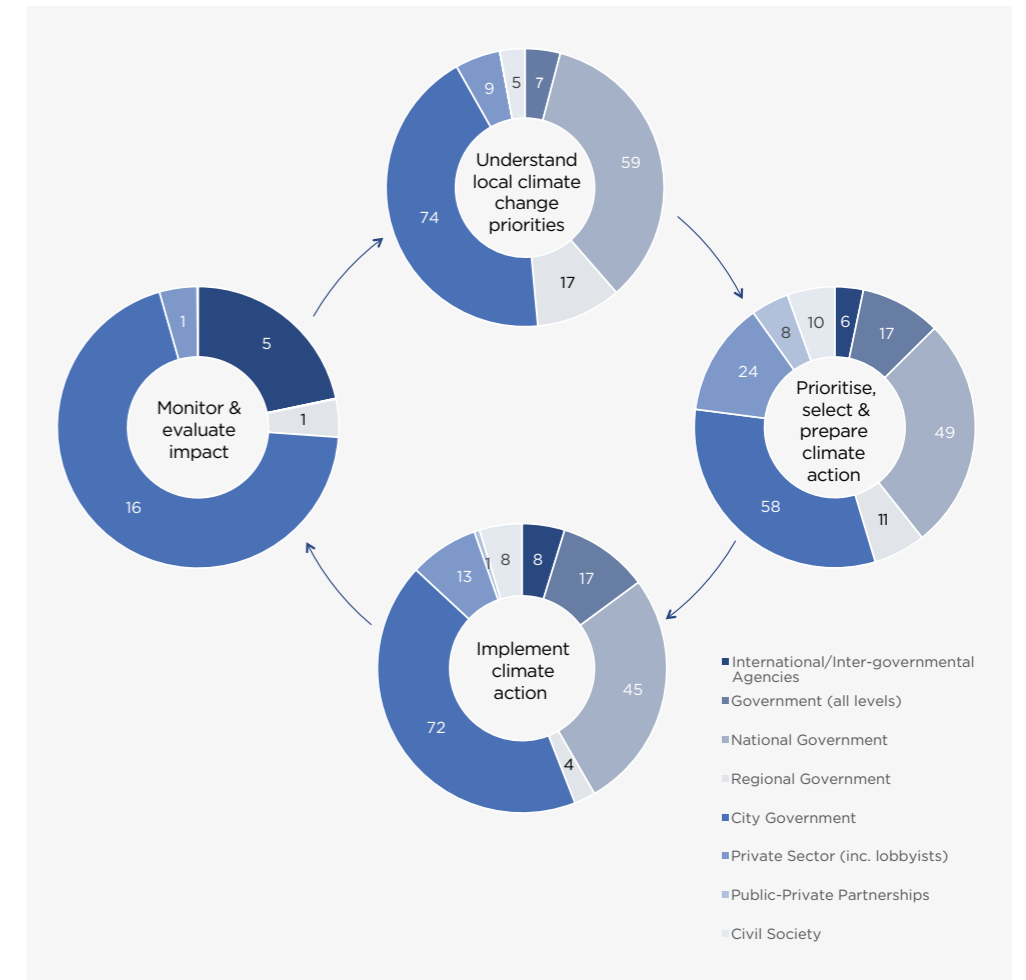
The data shows that challenges from national governments are most significant at the earliest stage of the delivery cycle (35% of challenges at this stage), when cities are trying to understand local climate change priorities. Nevertheless, national government is also significant in creating challenges at the stages of prioritising and preparing action, and implementation.

Challenges from city government are more significant than any other actor at all stages in the delivery cycle, particularly when understanding local priorities (43% of challenges) and during implementation of selected actions (43%). While relatively few challenges have been identified overall at the stage of monitoring and evaluation, city government is also the dominant actor at that stage (67%).

Nevertheless, the role of other actors cannot be overlooked. Challenges from private sector and civil society actors are particularly pervasive when cities are prioritising, selecting and preparing climate actions, when they jointly make up 22% of the challenges arising. This is a critical stage in terms of cities working out what is appropriate and gaining the broader buy-in that will secure sustained success for any intervention. Private sector and civil society challenges are also evident during the implementation of climate action (14%) – the stage at which citizens and businesses will be asked to transform their day-to-day choices due to the city’s chosen climate commitments. Private sector and civil society actors will be discussed further in the following sections.

20%
of challenges related to civil society actors have been overcome.

Figure 5.07. Frequency with which challenges are linked with each actor at each stage in the delivery cycle, across regions and initiatives.



22%
of challenges arising when selecting climate actions are due to private sector and civil society actors.

5.3 COLLABORATION WITH NON-GOVERNMENT PARTNERS

Cities that collaborate with other actors are able to deliver twice as many climate actions as those that govern through a less partnership-based approach.²⁴ However, this research shows that cities are facing a range of challenges to forging the partnerships that they need with the private and civil society sectors. Failure of city governments to connect with private sector and civil society stakeholders on climate issues is the most frequent challenge experienced by cities in the Political and Leadership type.

Melbourne

“We don’t do anything alone, we always work in partnership. You can’t do anything alone.”

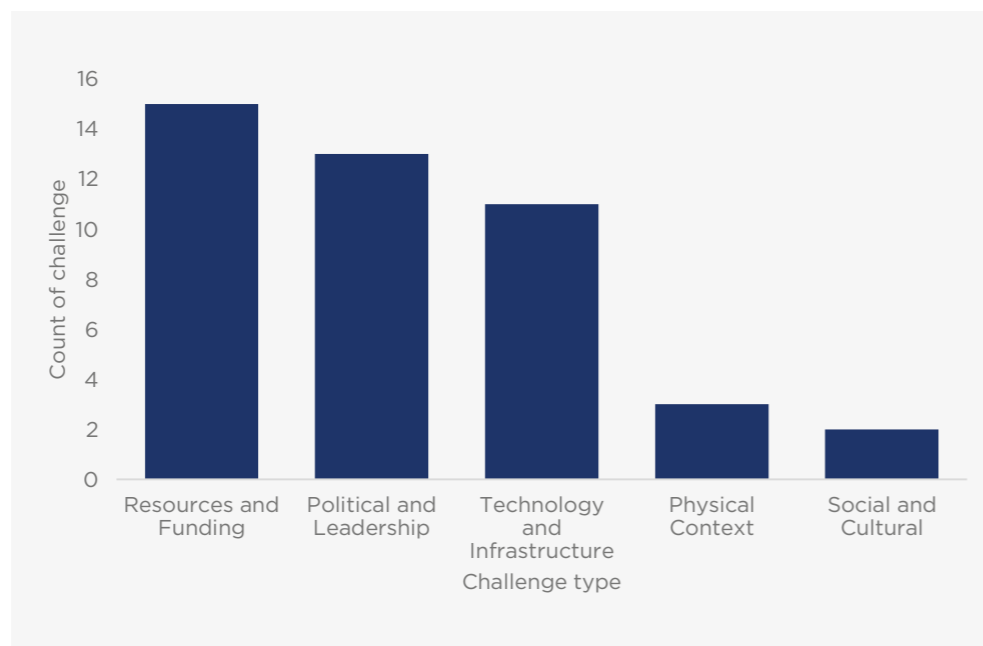
5.3.1 COLLABORATION BETWEEN CITIES AND THE PRIVATE SECTOR

The data shows that 11% of challenges to climate action are directly associated with private sector actors, and a further 3% originate from public-private partnerships. The challenge types attributable to private sector actors are almost exclusively of three types: Resources and Funding (34%), Political and Leadership (30%) and Technology and Infrastructure (25%) (see figure 5.08). The significance of Resources and Funding and Political and Leadership challenges demonstrates the importance of private sector actors in helping cities to scope, lead and finance their climate actions.

Of the Resources and Funding challenges that arise from the private sector, the most prevalent is the challenge of cities finding sufficient funding to pay for services that the private sector is able to provide. This is followed closely by the challenge of insufficient engagement between cities and the private sector to unlock support for climate action. This challenge points strongly towards the overall theme of collaboration.

Within the Political and Leadership challenge type, 75% of challenges arising from the private sector are related to a lack of strong leadership from private sector actors to drive climate action.

Figure 5.08. Frequency with which challenge types are linked to private sector actors, across regions and sectors.

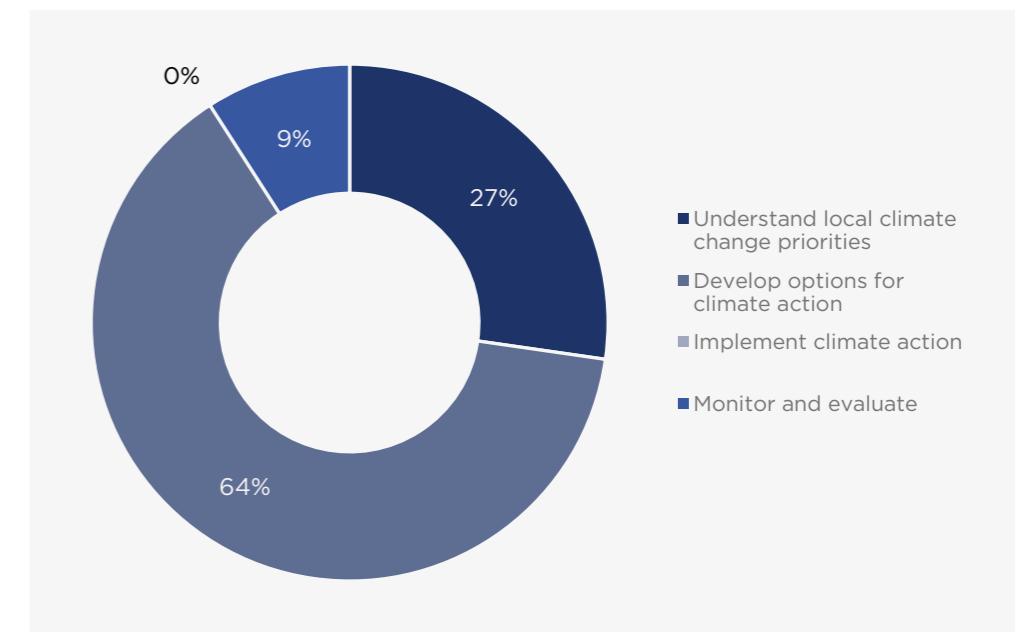


75%

of challenges related to private sector actors are due to a lack of strong climate leadership.

64% of private sector-led Technology and Infrastructure challenges occur during the development of options for climate actions, when cities are identifying the best course to take to address their climate priorities (see figure 5.09). Cities often look to the private sector for leadership on appropriate city innovations, and to demonstrate the effectiveness or viability of solutions with which cities themselves have little experience. The data shows that cities in North America and Southeast Asia have all faced challenges in working with the private sector as a result of poor information and evidence about the solutions they could deliver in partnership. In Bogotá, lack of confidence in new technologies has prevented the city from introducing smart street lighting – an action proposed in 2011 that could have had a high impact on the city’s emissions, but which was not progressed.

Figure 5.09. Frequency with which private sector Technology and Infrastructure challenges are linked with each stage in the project delivery cycle, across regions and sectors.

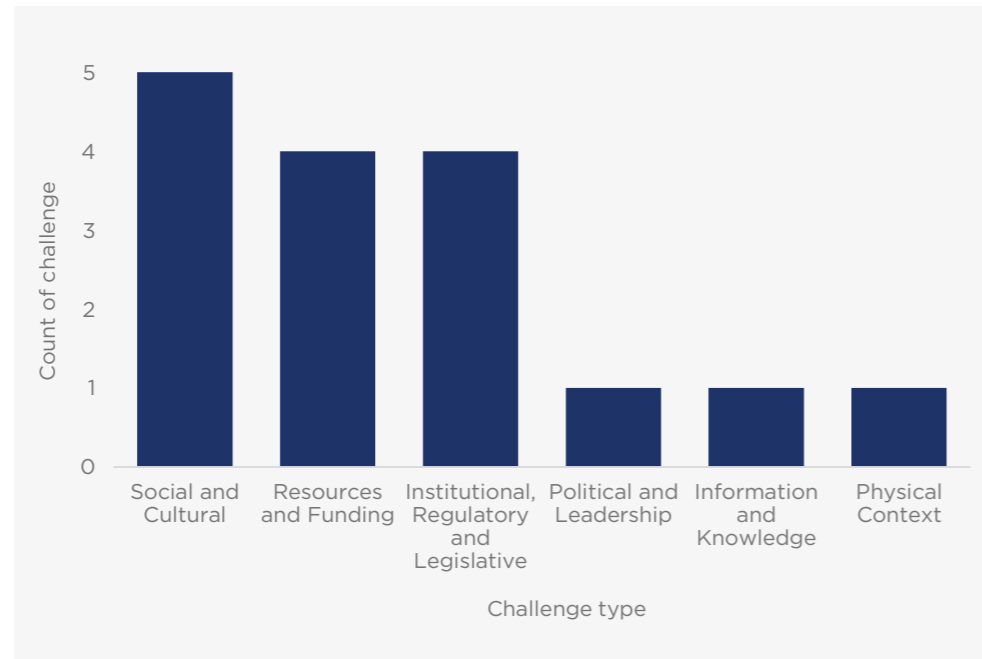


64%

of private sector Technology challenges affect cities’ ability to develop options for climate action.

5.3.2 COLLABORATION BETWEEN CITIES AND CIVIL SOCIETY ACTORS

Figure 5.10. Frequency with which challenge types are linked to civil society actors, across regions and sectors.



6% of all challenges identified in the research emerge from civil society organisations and citizens (figure 5.01).¹⁹ Almost a third of these are Social and Cultural challenges (figure 5.10), particularly those related to a perceived incompatibility between desired lifestyles and climate actions, which means citizens are unsupportive of climate action. This sentiment influences government actors, who are reluctant to agree to actions that voters may not like. In this respect, Social and Cultural challenges are closely linked with Political and Leadership, and Institutional, Regulatory and Legislative challenges.

For example, Social and Cultural challenges were highlighted in an interview with Houston, a city where 74% of trips are made by private car.²⁰ Bus travel in Houston has been viewed as a low-income and undesirable mode of travel, a perception that has led to negative responses to transit expansion proposals (including bus rapid transit, light rail and local bus) from some stakeholders, delaying efforts to achieve modal shift and curb overall city emissions.

Perceived conflicts between lifestyles and climate action were identified in the survey as one of the most difficult challenges of all to resolve; it has not been successfully overcome in any of the cases highlighted by the research. This is higher than Social and Cultural challenges as a whole, 83% of which have not been overcome even when significant resources have been allocated to address them.

¹⁹ It is important to note that this finding is biased by the selected group of respondents.
²⁰ CAM 3.0, C40, Arup and UCL, 2015.

Vertical Integration Study

A report by the Stockholm Environment Institute (SEI), in partnership with Bloomberg Philanthropies, explores the relationship between city authorities and other levels of government in achieving dramatic cuts in urban greenhouse gas emissions. The study builds upon earlier work that found that aggressive urban action could reduce global greenhouse gas (GHG) emissions by up to 15% of the reductions needed to keep warming within 2 degrees Celsius. The new report identifies ideal roles of national, state, and city governments in undertaking these aggressive urban GHG abatement actions. Key findings of the study include:

- For approximately 20% of urban GHG abatement potential, city should be policy leaders and architects. The greatest opportunities here are in the passenger transport sector, and include improved spatial planning, promotion of walking and bicycling, enhanced transit system development, and more efficient transportation management.
- For another 40% of urban abatement potential, the ideal role for cities is to be critical implementers of nationally applied policies. Opportunities here are greatest in the residential and commercial buildings sectors.
- For the remaining 40% of urban abatement, cities can be strategic partners, taking crucial independent actions to enhance the effectiveness of policies enacted at higher levels of government. For these diverse opportunities, cities could enhance national efforts through incentives, education, permitting, and infrastructure development.

32%

of challenges related to civil society actors are due to Social and Cultural issues.

5.4 SUMMARY

This chapter has highlighted the themes of *collaboration*, *coordination* and *communication* as being central to the challenges that cities face to advancing climate action. By focusing on the actors involved in creating challenges, it is evident that these themes are prevalent in the challenges created within city governments themselves, and in the relationships that cities hold with other levels of government, the private sector, and civil society. These findings begin to frame the challenges faced by C40 cities. This framing will be significantly deepened in a study to follow in 2016, which will also address the solutions that can be taken to overcome these challenges.



CHAPTER 6

Conclusion

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6.3	A Call To Action	65

6.1 CITIES ARE READY TO BE UNLEASHED

In a world first, this research has established the potential for city action, and cited the by now extensive evidence from the *Climate Action in Megacities* research, showing that cities intend to realise that potential. To understand how this potential can be unlocked, in a second world first, a comprehensive survey has been started looking at the challenges cities are facing. This survey draws on the learning, experience and ideas of both C40 cities, and C40 staff who have over 10 years of experience in collaborating to deliver urban climate action. In doing so, a framework has been developed for understanding challenges to climate action in cities.

The research has shown that cities worldwide are experiencing challenges that delay, limit, divert or prevent them from building on their existing climate action and advancing further towards a climate-safe future. These challenges at least partly account for the gaps in climate action that are identifiable in C40's database on city action.

While the impact of challenges may be great in the short term, the research has shown that only in a minority of cases will challenges completely prevent climate action; for around 90% of challenges, the effect is to delay or limit the scope of actions. This gives confidence that challenges can be successfully navigated in order to accelerate and expand climate action in cities.

While all cities encounter difficulties at some level, the dominant challenge types vary in different cities and the actors, timing, cost and other characteristics are locally specific. Resources and Funding, Political and Leadership, and Institutional, Regulatory and Legislative challenge types are globally the most common, and the most connected to other challenge types. The first and foremost task in unlocking the vast potential for action outlined in Chapter 2 is to better understand the main threads and themes amongst these three groups of challenges, and to start unpicking how they might be managed.

6.2 THERE IS NO SOLUTION WITHOUT COLLABORATION

The process of unpicking these challenges has been thoroughly started in this work, though with much still to be done, in particular in developing practical solutions for how to mitigate them.

However the evidence here clearly highlights that nothing short of a cross sector collaborative effort can hope to succeed. This must bring together national, regional and city governments, the private sector and civil society.

In almost three quarters of cases the challenges identified cannot be addressed unilaterally by cities. There is no solution without partnership and collaboration. It no longer makes sense to wait for leadership from national governments, or innovation from the private sector, or a critical mass of civil society activity. All must be convened together to understand what is needed from and for one another. This is particularly true for government, with better collaboration, coordination and communication required across all levels.

90%

of challenges have the effect of delaying or limiting the scope of climate actions.

This is a potent message for the 21st Conference of the Parties to the United Nations' Framework Convention on Climate Change (COP21), a summit of national governments hoping to work together to deliver the collective action needed. It is also potent after COP, however, because whatever the success of international efforts to forge a treaty on climate change, it is this broad church of state and non-state actors that will deliver many of the actions required to establish a climate safe trajectory for the world's economy. As demonstrated in another C40 piece of work²¹ this cannot be achieved without cities, and doing so will save the world economy US \$16.6 trillion by 2050.²²

6.3 A CALL TO ACTION

C40, Arup and UCL have taken a deliberate decision to end this report on these open questions: how do the three main types of challenge manifest in cities, and what are the solutions that will enable cities to manage them and take advantage of the huge potential for climate action?

We present this evidence base about challenges to climate action with the objective to invite contributions and stimulate a productive conversation between actors across government, business and civil society. As we observe the incredible contribution that cities are making to address climate change globally, we are calling for actors to identify and unite around the solutions to help cities do more.

C40 seeks to establish a Task Force of partners who work with cities, from all sectors, to collaborate on this exercise over the coming months. And to explore challenges highlighted in this report, such as those preventing cities and private sector working together, to accessing capital, to making the case for action, and so on.

This process will culminate in a second, more detailed report deeply analysing the themes within the three main groups of challenges identified in this work, and crucially the solutions to them. The aim is to define and ultimately deliver efforts to overcome challenges and unlock the remaining potential in cities.

Decisive, high-impact, global and collaborative action on climate change is possible; cities have demonstrated that. C40 and Arup look forward to working with cities and partners to ensure this success grows and grows.

²¹ http://c40-production-images.s3.amazonaws.com/researches/images/40_The_Decisions_We_Make_Today_Will_Shape_Tomorrow.original.pdf?1444239976

²² <http://2015.newclimateeconomy.report>

Appendix

Supplementary Information

A.1	Digging Deeper: The Characteristics Of Three Dominant Challenges	68
	A.1.1 Resources And Funding	68
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A1: DIGGING DEEPER: THE CHARACTERISTICS OF THREE DOMINANT CHALLENGES

Chapter four has highlighted three challenge types that are most common in cities globally, and which are strongly linked to the occurrence of other types of challenge. The following snapshots dig deeper into these three intractable challenges.

A1.1 RESOURCES AND FUNDING

Prevalence	Most frequently occurring challenge type across C40 cities (21% of all challenges mentioned in survey).
Most frequently occurring challenges	<ol style="list-style-type: none"> 1. Gap between investment required to deliver an action and budget available (19% of all Resource and Funding challenges mentioned in survey data) 2. Perceived conflict between economic growth and climate action (17%) 3. Inability to access finance resources for climate action (15%) 4. Inadequate economic evaluation to quantify and prioritise the benefits of climate action (15%)
Actors	<p>Responsibility for creating Resource and Funding challenges lies predominantly with national and municipal governments. In the Chinese leaders, national governments are the only actors named. Emerging economies and boom cities are the only city groups that face challenges with funding from international agencies. More established economies see a greater role for private sector actors in contributing to funding challenges.</p>

Timing	<p>39% of Resource and Funding challenges arise during the implementation stage of climate action, as cities try to deliver their agreed actions. Resource and Funding challenges are also significant at the stages of understanding priorities (21%) and developing options for action (35%), when cities need to access expert staff and information to guide their decision-making. For example, difficulties with making a business case for climate action are mainly encountered in the first stage of project delivery.</p>
Interconnectedness	Resource and Funding challenges are the most embedded of all challenge types. They have extremely strong connections with Political and Leadership challenges, Technology and Infrastructure, Information and Knowledge, Social and Cultural and Institutional, Regulatory and Legislative.
Cost of addressing challenges	<p>For 35% of Resource and Funding challenges, cities are investing minimal resources with poor rates of success in overcoming the challenge. Cities have been unable to identify an approach to tackle 21% of Resource and Funding challenges. Cities have successfully overcome 17% of Resource and Funding challenges.</p>
Longevity	Mostly last longer than 5 years.
Impact	Mostly thought to delay climate action, with no examples mentioned of Resource and Funding challenges completely preventing action. This may be a positive sign for cities' achievement of climate goals in the longer term, provided challenges can be overcome.

A1.2 POLITICAL AND LEADERSHIP

Prevalence	This is the second most prevalent challenge type, after Resources and Funding (20% of all challenges mentioned in survey data).																																																												
Most frequently occurring challenges	<ol style="list-style-type: none"> 1. Weak leadership on climate action from the private sector (14% of all Political and Leadership challenges mentioned by C40 regional staff). 2. Failure of city government to connect with civil society, private sector, or other stakeholder groups (14%). 3. Climate actions not seen as politically compelling (13%). 4. Unable to articulate co-benefits of climate related activities and other urban policies (10%). 																																																												
Actors	<p>The actor responsible for Political and Leadership challenges is more varied than the other two intractable challenges. The national government does not completely dominate as the actor primarily responsible across any of the GDP typologies. The responsible actor is usually the city itself, with smaller numbers of very important challenges arising from the private sector.</p> <table border="1"> <caption>Approximate data for Actor by GDP Typology (from chart)</caption> <thead> <tr> <th>GDP Typology</th> <th>National Government</th> <th>Regional Government</th> <th>Municipal/City Government</th> <th>Mayor's office</th> <th>Specific Political Party</th> <th>Civil Service</th> <th>Public-Private Partnerships</th> <th>Private Sector</th> <th>Lobbyists for Business</th> </tr> </thead> <tbody> <tr> <td>Boom cities</td> <td>10%</td> <td>15%</td> <td>65%</td> <td>5%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> </tr> <tr> <td>Chinese leaders</td> <td>50%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> </tr> <tr> <td>Emerging economies</td> <td>30%</td> <td>10%</td> <td>55%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> </tr> <tr> <td>Established cities</td> <td>25%</td> <td>15%</td> <td>40%</td> <td>10%</td> <td>5%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> </tr> <tr> <td>Global economies</td> <td>25%</td> <td>15%</td> <td>40%</td> <td>10%</td> <td>5%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> </tr> </tbody> </table>	GDP Typology	National Government	Regional Government	Municipal/City Government	Mayor's office	Specific Political Party	Civil Service	Public-Private Partnerships	Private Sector	Lobbyists for Business	Boom cities	10%	15%	65%	5%	0%	0%	0%	0%	0%	Chinese leaders	50%	0%	0%	0%	0%	0%	0%	0%	0%	Emerging economies	30%	10%	55%	0%	0%	0%	0%	0%	0%	Established cities	25%	15%	40%	10%	5%	0%	0%	0%	0%	Global economies	25%	15%	40%	10%	5%	0%	0%	0%	0%
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Global economies	25%	15%	40%	10%	5%	0%	0%	0%	0%																																																				

Timing	<p>Political and leadership challenges are the most important challenges at the earliest stages of project delivery, with potential to prevent action before it has even started. 32% of these challenges occur as cities are trying to understand their climate priorities, and 35% as cities develop their options for action. Challenges remain significant but decrease in importance as the cycle progresses.</p> <table border="1"> <caption>Timing of Challenges</caption> <thead> <tr> <th>Stage</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Understand local climate change priorities</td> <td>32%</td> </tr> <tr> <td>Develop options for climate action</td> <td>35%</td> </tr> <tr> <td>Implement climate action</td> <td>29%</td> </tr> <tr> <td>Monitor and evaluate impact</td> <td>4%</td> </tr> </tbody> </table>	Stage	Percentage	Understand local climate change priorities	32%	Develop options for climate action	35%	Implement climate action	29%	Monitor and evaluate impact	4%				
Stage	Percentage														
Understand local climate change priorities	32%														
Develop options for climate action	35%														
Implement climate action	29%														
Monitor and evaluate impact	4%														
Interconnectedness	Strong connections with all other challenge types, potentially a causal relationship. Strongest connections with Technology and Infrastructure and Resources and Funding challenge types.														
Cost of addressing challenges	<p>30% of Political and Leadership challenges have been addressed by cities using minimal resources, with a poor success rate in overcoming them.</p> <p>However, the success rate for overcoming Political challenges is higher than other challenge types; 34% of challenges in this type have been overcome.</p> <table border="1"> <caption>Success Rate of Overcoming Challenges</caption> <thead> <tr> <th>Outcome</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Minimal resource invested and overcame barrier</td> <td>20%</td> </tr> <tr> <td>Significant resource invested and overcame this barrier</td> <td>15%</td> </tr> <tr> <td>Significant resource invested with poor results in overcoming barrier</td> <td>30%</td> </tr> <tr> <td>Not tried any approaches to overcome barrier</td> <td>12%</td> </tr> <tr> <td>Minimal resource invested with poor results in overcoming barrier</td> <td>5%</td> </tr> <tr> <td>Unable to identify approach to overcome barrier</td> <td>18%</td> </tr> </tbody> </table>	Outcome	Percentage	Minimal resource invested and overcame barrier	20%	Significant resource invested and overcame this barrier	15%	Significant resource invested with poor results in overcoming barrier	30%	Not tried any approaches to overcome barrier	12%	Minimal resource invested with poor results in overcoming barrier	5%	Unable to identify approach to overcome barrier	18%
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A1.3 INSTITUTIONAL, REGULATORY AND LEGISLATIVE

Prevalence	This is the third most prevalent challenge type, after Resources and Funding, and Political and Leadership (17% of all challenges mentioned by survey respondents).																																										
Most frequently occurring challenges	<ol style="list-style-type: none"> 1. Poor interaction and coordination across sectors and institutions to deliver climate action (27% of all Institutional, Regulatory and Legislative challenges mentioned by C40 regional staff) 2. Poor land use planning (18%) 3. Existing legislation/regulation inhibits implementation of climate action (14%) 4. Absence of planning codes, regulations and standards (12%) 																																										
Actors	<p>National and city governments are the dominant actor responsible for Institutional, Regulatory and Legislative challenges, and to a lesser extent regional government. City government actors are particularly driving these challenges in established cities and global economies. In cities at an early stage of development (boom cities, Chinese leaders, emerging economies), national government plays a more significant part in creating Institutional challenges.</p> <table border="1"> <caption>Approximate data for Actor by GDP typology (from chart)</caption> <thead> <tr> <th>GDP typology</th> <th>Citizens</th> <th>Civil Service</th> <th>Municipal/City Government</th> <th>Regional Government</th> <th>National Government</th> <th>Government</th> </tr> </thead> <tbody> <tr> <td>Boom cities</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>45%</td> <td>50%</td> </tr> <tr> <td>Chinese leaders</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>100%</td> <td>0%</td> </tr> <tr> <td>Emerging economies</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>40%</td> <td>60%</td> </tr> <tr> <td>Established cities</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>10%</td> <td>90%</td> </tr> <tr> <td>Global economies</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>0%</td> <td>10%</td> <td>90%</td> </tr> </tbody> </table>	GDP typology	Citizens	Civil Service	Municipal/City Government	Regional Government	National Government	Government	Boom cities	0%	0%	0%	0%	45%	50%	Chinese leaders	0%	0%	0%	0%	100%	0%	Emerging economies	0%	0%	0%	0%	40%	60%	Established cities	0%	0%	0%	0%	10%	90%	Global economies	0%	0%	0%	0%	10%	90%
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Timing	<p>Institutional, Regulatory and Legislative challenges are relatively evenly distributed across the first three stages of the project delivery cycle, particularly during the development of options for climate action (37%) and implementation (34%). Different institutional challenges are more common at different stages.</p> <table border="1"> <caption>Timing Distribution Data</caption> <thead> <tr> <th>Stage</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Understand local climate change priorities</td> <td>1%</td> </tr> <tr> <td>Develop options for climate action</td> <td>37%</td> </tr> <tr> <td>Implement climate action</td> <td>34%</td> </tr> <tr> <td>Monitor and evaluate impact</td> <td>28%</td> </tr> </tbody> </table>	Stage	Percentage	Understand local climate change priorities	1%	Develop options for climate action	37%	Implement climate action	34%	Monitor and evaluate impact	28%				
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Monitor and evaluate impact	28%														
Interconnectedness	Most strongly connected to Resources and Funding challenges, as well as Political and Leadership and Technology and Infrastructure challenges.														
Cost of addressing challenges	<p>Cities have been unable to identify approaches to address 22% of their Institutional, Regulatory and Legislative challenges – a higher proportion than the other intractable challenge types. Only 20% of challenges in this group have been successfully overcome.</p> <table border="1"> <caption>Cost of Addressing Challenges Data</caption> <thead> <tr> <th>Outcome</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Minimal resource invested and overcame barrier</td> <td>7%</td> </tr> <tr> <td>Significant resource invested and overcame this barrier</td> <td>13%</td> </tr> <tr> <td>Significant resource invested with poor results in overcoming barrier</td> <td>13%</td> </tr> <tr> <td>Not tried any approaches to overcome barrier</td> <td>18%</td> </tr> <tr> <td>Minimal resource invested with poor results in overcoming barrier</td> <td>27%</td> </tr> <tr> <td>Unable to identify approach to overcome barrier</td> <td>22%</td> </tr> </tbody> </table>	Outcome	Percentage	Minimal resource invested and overcame barrier	7%	Significant resource invested and overcame this barrier	13%	Significant resource invested with poor results in overcoming barrier	13%	Not tried any approaches to overcome barrier	18%	Minimal resource invested with poor results in overcoming barrier	27%	Unable to identify approach to overcome barrier	22%
Outcome	Percentage														
Minimal resource invested and overcame barrier	7%														
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Minimal resource invested with poor results in overcoming barrier	27%														
Unable to identify approach to overcome barrier	22%														
Longevity	Mostly last longer than 5 years.														
Impact	No examples have been uncovered of Institutional, Regulatory and Legislative challenges that completely prevented climate action. This challenge type tends to delay action from taking place.														

A2: GLOSSARY

Challenge	An obstacle that challenges a city's ability to deliver climate action. The obstacle may be permanent or temporary, originating within or outside the city, and may have the effect of preventing, delaying, limiting or diverting a city's implementation of climate action.
Solution	An intervention that can be made to remove, avoid or reduce the effects of a challenge. This may include a targeted investment of time, funding or skills by a given actor or group of actors to directly address a challenge. A solution may also be indirect, as a result of efforts to address another related challenge.
Climate action	Defined as the measures and initiatives cities take to reduce the severity of climate change (mitigation), or their exposure to the effects of climate change (adaptation).
Sector	Individual sectors of activity in which climate action is being taken by cities. This includes: Adaptation, Buildings, Community-scale Development, Energy Supply, Finance, Food & Agriculture, Mass Transit, Outdoor Lighting, Private Transport, Waste, Water.
Scale	Identifies the extent to which an action is introduced across the city. The scales are; <ul style="list-style-type: none"> - Transformative (city-wide) - Significant - Pilot - Under consideration
Power	The degree of control or influence mayors exert over assets (such as buses) and functions (such as economic development).

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