

Low carbon cities



Exploring new crediting approaches to deliver carbon and climate finance



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LIST OF ABBREVIATIONS AND ACRONYMS

°C	Degrees Celsius	G	GDP	Gross Domestic Product				
A	AV		GHG	Greenhouse Gas				
	Autonomous vehicles		GIS	Green Investment Scheme				
B	BAU		GPC	Global Protocol for Community-Scale GHG Emissions				
	Business-as-Usual		GPSC	Global Platform for Sustainable Cities				
C	CCFLA		GtCO₂	Gigaton of Carbon Dioxide				
	Cities Climate Finance Leadership Alliance		GtCO₂e	Gigaton of Carbon Dioxide Equivalent				
	CDM		I	ICLEI	ICLEI—Local Governments for Sustainability			
	Clean Development Mechanism			IEA	International Energy Agency			
	CER			IEA ETP	IEA Energy Technology Perspectives			
	Certified Emission Reduction			IPCC	Intergovernmental Panel on Climate Change			
	CO₂			J	JI	Joint Implementation		
	Carbon dioxide				K	km	Kilometer	
	CO₂e					L	LCC	Low Carbon City
	Carbon dioxide equivalent						LCCDP	Low Carbon City Development Program
	COP						LED	Light-Emitting Diode
	Conference of the Parties							
	CUD							
	Compact Urban Development							
	CURB							
	Climate Action for Urban Sustainability							
D	DSM							
	Demand-Side Management							
E	ESMAP							
	Energy Sector Management Assistance Program							
	ETS							
	Emissions Trading System							
	EV							
	Electric Vehicle							

M	MAC	Marginal Abatement Cost	T	t	Ton (note that, unless specified otherwise, ton in this report refers to a metric ton = 1,000 kg)
	MRV	Monitoring, Reporting and Verification		tCO₂	Ton of Carbon Dioxide
	MtCO₂e	Megaton of Carbon Dioxide Equivalent		tCO₂e	Ton of Carbon Dioxide Equivalent
N	NDC	Nationally Determined Contribution		TGO	Thailand Greenhouse Gas Management Organization
P	PMR	Partnership for Market Readiness		TOD	Transit-Oriented Development
	PoA	Programme of Activities		TRACE	Tool for Rapid Assessment of City Energy
	PPP	Public-Private Partnership		T-VER	Thailand Voluntary Emission Reduction Program
	PV	Photovoltaic			
R	RBCF	Results-Based Climate Finance	U	UCCRN	Urban Climate Change Research Network
	RBF	Results-Based Finance		UK	United Kingdom
S	SBSTA	Subsidiary Body for Scientific and Technological Advice		UNEP	United Nations Environment Programme
	SCP	Scaled-up Crediting Program		UNESCO	United Nations Educational, Scientific and Cultural Organization
	SDG	Sustainable Development Goal		UNFCCC	United Nations Framework Convention on Climate Change
				US	United States
			W	WRI	World Resources Institute

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EXECUTIVE SUMMARY

By 2050, two-thirds of the planet's population will live in urban centers, and nearly 90 percent of the 2.5 billion new urban dwellers will live in Africa and Asia.¹ The world's urban areas were responsible for around 70 percent of greenhouse gas (GHG) emissions in 2013, and that number could grow by 50 percent by 2050 if current trends continue.²

In 2015, world leaders committed to limiting the global temperature increase to well below 2°C and to pursuing efforts to reach a 1.5°C limit in the context of the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement invites cities to scale up climate action, and over two-thirds of participating countries' Nationally Determined Contributions (NDCs) mention urban action.

According to the International Energy Agency (IEA), cities will represent 70 percent of the cost-effective abatement potential of energy-related GHG emissions by 2050.³ Cities play various roles in supporting urban mitigation, from policy maker, to regulator, service provider, and partner. Scaling up urban mitigation will require action within and across sectors to replicate and broaden the scope of impacts. Studies have highlighted the potential for emission reductions in cities in the energy production, buildings, transportation, land use, and waste management sectors. The interconnected nature of potential urban mitigation measures means that scale-up can be realized at multiple levels:

- ▶ *By replicating discrete measures* at sectoral and subsectoral levels, e.g., dedicated investment in mass transit, building energy efficiency programs, or low energy street lighting.
- ▶ *By broadening the scope of action to interconnected sectors* to encourage synergy between measures, and facilitate a holistic approach to service provision, e.g., community-level energy programs that include smart buildings, energy-efficient appliances, LED street lighting, and renewable energy.
- ▶ *By focusing on policy levers that lead to transformational impacts* in cities. Urban planning that promotes compact cities, transit-oriented development (TOD) and mixed land-use zoning is an example of such a policy lever.

More than 70 percent of the global low emissions and climate-resilient infrastructure will be built in urban areas, at an estimated cost of US\$4.5 to US\$5.4 trillion per year.⁴ As highlighted by the Cities Climate Finance Leadership Alliance (CCFLA), scarce climate finance resources must be used strategically to both increase the amount of funding available and as part of a process of enabling and leveraging existing and new financing to flow from a broad range of sources, most importantly from the private sector. It is essential for cities to diversify and blend their sources of finance and tap the full spectrum of resources available to raise funds for climate action. However, successful funding for climate action—notably in developing countries—needs to overcome barriers such as the lack of creditworthiness of subnational governments, insufficient access to capital markets and international mechanisms, and lack of financial and technical skills and human resources.

1 Source: United Nations. 2018. *2018 Revision of World Urbanization Prospects*.

2 Source: IEA. 2016. *Energy Technology Perspectives 2016—Towards Sustainable Urban Energy Systems*. Paris: IEA.

3 Source: IEA. 2016.

4 Source: CCFLA. 2015. *State of City Climate Finance 2015*. New York: Cities Climate Finance Leadership Alliance (CCFLA).

The complex and diverse modes of governance, service delivery, infrastructure investment, and asset ownership of cities mean that there is no simple approach to prioritize, finance, and implement urban mitigation policies and actions, and to quantify their mitigation impacts. The report contributes to research on the ways to use the new generation of crediting approaches to deliver carbon and climate finance and nudge cities to incorporate climate change considerations in urban planning, policy formation, and regulation. Embedding climate-related issues in city strategies can help align investor decisions and consumer choices with transformational low-carbon urban pathways. Cities need to work with public and private partners, including different municipal organizations and national authorities, to scale up mitigation. This ensures compatibility of policy incentives and regulations and enables a holistic vision for low-carbon and resilient urban development. The shape this collaboration will take needs to consider how individual system operators (energy, water, transport, etc.) operate. Cities also need international support to develop appropriate financial instruments; strengthen capacities at the urban level to plan for action; help improve urban-scale GHG metrics, data collection, and analysis methods; and bring implementation programs close to the investable grade.

The Paris Agreement shapes the way forward for a new generation of international collaborative approaches to achieve climate change mitigation, both under its finance (through Article 9) and market (through Article 6) pillars. Crediting approaches rely on a baseline-and-credit technique to quantify the GHG emission reductions/avoidance resulting from mitigation actions. They can be applied to support sectoral programs and policies that have demonstrable mitigation impact. Crediting approaches can be used both in the international carbon markets, in market mechanisms, and as a modality to disburse results-based climate finance (RBCF) when the GHG emission reduction metric (tCO₂e) is used to demonstrate the achieved outcomes of the activities supported by RBCF.⁵ Therefore, crediting approaches can contribute to efficiently allocate financial support to mitigation actions and leverage private finance.⁶

Crediting approaches, mainly through the internationally regulated carbon market mechanisms under the Kyoto Protocol of the UNFCCC, have supported billions of emission reductions so far, but their application to cities has been limited. Most notably just under 2 billion tCO₂e have been reduced under the Clean Development Mechanism (CDM) of the Kyoto Protocol. However, out of those, just over 109 million tCO₂e were reduced in an urban context.⁷ Most existing crediting mechanisms focus on a project-by-project approach. Such an approach is limited in its ability to provide effective incentives for the creation and enforcement of a conducive policy environment and to account for the GHG outcomes of combined interventions. Combined with the complexity and uncertainty of the crediting mechanisms, this resulted in limited success in supporting mitigation measures in cities.

The role that a new generation of crediting approaches could play in supporting urban mitigation at scale needs to evolve from a narrow, marginal carbon-centric incentive toward a more integrated form of financial support, cognizant of a broader policy environment and policy objectives at the urban and national levels. Urban climate action is part of a broader policy and investment framework that covers economic and social development goals established at the national or urban levels, such as for job creation, environmental and health protection, and energy performance. The alignment of a scaled-up mitigation portfolio with wider priorities can facilitate both effective operational and institutional design and mobilize sustained political and financial support.

5 As per World Bank and Frankfurt School of Finance and Management. 2017. *Results-Based Climate Finance in Practice: Delivering Climate Finance for Low-Carbon Development*. Washington, DC: World Bank. RBCF programs differ in the way they define "results" and can use quantitative disbursement-linked indicators (e.g., MWh of installed renewable energy capacity, and energy saved by a group of rehabilitated buildings) and qualitative ones (e.g., the implementation of a policy or the strengthening of MRV capacity) or a mix between unit-based indicators and qualitative milestone indicators.

6 While there is no recognized definition for climate finance, it usually covers financing flows directed toward climate change mitigation or adaptation activities.

7 Only registered CDM projects considered. Urban context defined as the following project types: Landfill gas, household energy efficiency, energy distribution, transport. Based on analysis of the UNEP DTU CDM pipeline: <http://www.cdmpipeline.org/>, accessed 10 April 2018.

The insights gained by RBCF—as a modality of climate financing where funds are disbursed upon the achievement and verification of the pre-agreed set of climate action results—can bring useful elements to help achieve such an alignment. By encompassing a full cycle of structural change from inputs to results, RBCF has demonstrated its ability to facilitate carbon pricing and market building, support policy process to achieve NDCs, and leverage private sector activity and financing.⁸ If properly incorporated into the design and implementation of crediting approaches, these RBCF features could be instrumental in formulating recommendations for the effective use of crediting, further enhancing

their contribution to combating climate change and pursuing low-carbon urban development pathways. **Crediting approaches could in turn support RBCF to identify and measure the GHG emission reductions/avoidance that currently typically represent the targeted outcome of the RBCF.**

The success factors for crediting approaches relate to the design of the supported programs, to the capacities of both the finance provider and recipient, and to the ability to combine financial support provided through crediting with other sources of financing at different stages of the program cycle (see Figure 1).

Figure 1: Preconditions for effective use of crediting approaches in cities in the context of the Paris Agreement



⁸ Source: World Bank and Frankfurt School of Finance and Management, 2017.

The report suggests that preconditions for the effective use of crediting approaches to promote urban mitigation and leverage private sector involvement include:

1. Ensure an appropriate incentive structure to promote the most efficient allocation of financial resources and mitigation actions at the urban level and crowd-in private finance.
2. Go beyond technology-based interventions to achieve mitigation at scale and to facilitate transformational impacts.
3. Complement other climate-related and broader sectoral policy and financial instruments and be part of the urban policy processes to achieve transformational impacts while contributing to the overall efficiency of public resources.
4. Be embedded from the planning stage onwards to support the institutional capacity to implement evidence-based climate action planning and

monitoring of performance of climate actions, and ensure consistency with the approach to track progress toward the achievement of the NDC at both local and national levels.

5. Distribute risks so that actions can be taken at a level of governance where they would be most efficient, both from economic and institutional perspectives.
6. Plan for the future to build readiness for more comprehensive climate-related policy instruments at the city or national levels, including carbon pricing approaches, while minimizing transaction costs and ensuring environmental integrity.

Given the intrinsic features and risks of the crediting approaches, the use of crediting could be more effective to support interventions with reasonable urban risks, well embedded with other urban development priorities (see Table 1).

Table 1: Scaling up urban mitigation: the impact on crediting and urban risks

		Replicating discrete measures at (sub-) sectoral level	Broadening scope of action to interconnected sectors	Focusing on transformational actions
Crediting risks	Institutional capacity: ▶ Capacity requirements to design and implement a credible intervention to deliver results as per pre-agreed set of rules and planning	 Low-Medium	 Medium-High	 High
	Aggregation: ▶ Capacity to deliver pre-agreed mitigation outcomes within expected timelines and manage associated performance risks	 Low	 Medium	 High
	Regulatory risks: ▶ Compliance risk in relation to pre-agreed regulatory requirements and rules of crediting approaches	 Low	 Medium	 Medium-High
	Monitoring: ▶ Ability of the recipient to measure, monitor, and verify results in a robust and transparent way.	 Low	 Medium	 Medium-High
Urban risks	Planning uncertainty: ▶ Risk associated with deviations from the pre-agreed implementation plans	 Low-Medium	 Medium-High	 High
	Extended delivery periods: ▶ Performance risk associated with the length of the period required to achieve mitigation impacts at scale	 Low-Medium	 Medium	 High
	Vertical/horizontal coordination: ▶ Required amount of vertical/horizontal coordination between sectoral, municipal, and/or metropolitan and national institutions	 Low	 Medium	 High
	Financial and investment barriers: ▶ Risk associated with the limited access to finance to implement the mitigation activity	 Medium-High	 Medium-High	 High

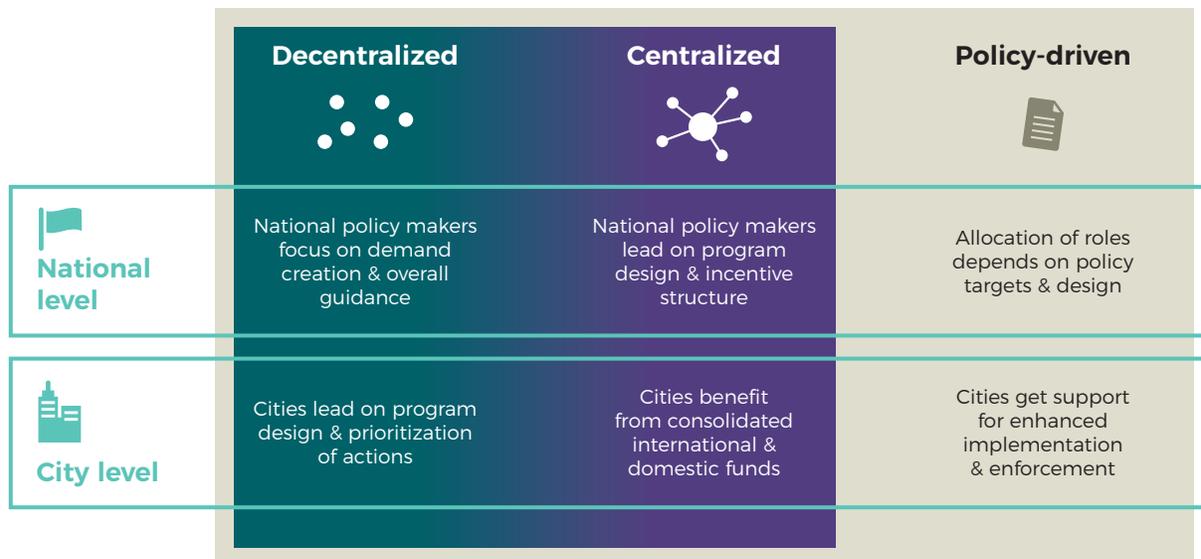
Such interventions include actions that prioritize and focus on the replication of discrete measures at the (sub-) sectoral level (e.g., end-of-pipe mitigation options such as building retrofits or street lighting) and on interventions with a broader scope of action, including the interconnected sectors (e.g., low-carbon communities and distributed renewables in the building sector). Table 1 shows how the risks would evolve under a crediting approach for each of the three scaling-up options introduced earlier. The risk profile relates to both the characteristics of urban mitigation and the crediting approach itself. Risks are defined here as factors that might impact the ability of the carbon or climate finance recipient to deliver emission reductions of quality (i.e., that represent real emission reductions and maintain the environmental integrity of the instrument), in quantities as were planned, and as per the agreed schedule and costs.

Wider transformational interventions, such as compact urban development (CUD) and TOD, call for a substantial revisit to the way crediting approaches can be combined with other sources of financing for cities. Without such an integrated, strategic approach to financing, covering the entire lifecycle of structural change and policy processes to support the long-term delivery of results, transformational interventions

are likely to be supported more effectively by another type of mechanism.

Recognizing the diversity of cities, crediting approaches can be used by mitigation programs/interventions that can take various forms, from a centralized modality led by the national government and implemented by the city to a decentralized modality led and implemented by the city, or a modality more explicitly focused on policy levers (see Figure 2). Mitigation programs should ensure that the selected implementation modality allocates risks related to the use of result-focused approaches to finance in an appropriate manner. They should also ensure that policies and actions are taken at a level of governance where they would be most efficient, both from economic and institutional perspectives, to avoid complex coordination issues where possible. It is important to recognize that while the incentives provided by the crediting approaches may be the most important in lower income countries, which are likely to be the ones urbanizing the fastest, their capacity to utilize these financing instruments effectively may also be the lowest. This reality underscores the significant amount of effort needed to build capacities and ensure pragmatic governance and institutional solutions.

Figure 2: Implementation modalities for urban programs using new crediting approaches: addressing diversity



Crediting approaches need to be embedded in the design of climate-related actions from the start and combined with other climate-related and broader policy and financing instruments through their lifecycle, starting with planning to monitoring of the performance of climate-related actions. Climate-related action is understood here as any action that helps mitigate and/or adapt to climate change. The actions can be implemented through policies and interventions that target climate change specifically and sectoral policies and actions that help achieve climate goals, such as energy policies, urban planning, land-use regulations, and transport policies. Crediting approaches need to be part of the urban policy processes to have transformational impacts, including city planning. This can help plan and develop implementation strategies and bring projects/interventions to investment readiness. To achieve this, international support is needed to help improve urban-scale GHG metrics, data collection, and analysis methods, and to develop appropriate financial instruments and strengthen capacities at the urban level to plan for action and bring implementation programs close to the investable grade. The application of crediting approaches can be supported by the growing body of tools that cities can use to account for GHG emissions and track their climate action, with the most notable examples of urban climate action planning tools and inventories including the Global Protocol for Community-Scale GHG emissions (GPC), the Climate Action for Urban Sustainability (CURB) tool, Calthorpe Rapid Fire/Urban Footprint, Compact of Mayors Emissions Scenario Model, City Climate Planner, City Performance Tool, and Tool for Rapid Assessment of City Energy (TRACE).⁹ These tools, however, were not designed to track GHG impacts. As such, while existing tools can provide an initial

useful basis for tracking and have made significant progress over the past few years, further work is needed to use them for crediting approaches both under carbon market mechanisms and as a technique to measure and monitor mitigation outcomes under RBCF.

Taking action now to integrate crediting approaches as a vehicle for delivering carbon and climate financing for urban mitigation could help cities as follows:

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- ▶ Building readiness for crediting facilitates cities' contributions to national mitigation action by mobilizing their mitigation potential and triggering transformation impacts at the local level. It thereby integrates cities in national efforts toward NDC implementation and helps increase the ambition of mitigation action at both the city and national levels. It also helps avoid cities locking in carbon-intensive infrastructure and moves toward a low-carbon and resilient urban development pathway.
- ▶ The result-focused actions can help reveal abatement costs of a variety of measures in different urban sectors, in particular, those that are the main contributors to urban GHG emissions (transport, buildings, waste, and water). This focus can also incentivize better quantification of impacts of more complex levers of urban emissions such as CUD and TOD.
- ▶ The carbon price signal set through crediting approaches helps leverage private finance and allocate efficiently the financial resources, both public and private, at the urban level. Crediting approaches need to blend with other instruments of (climate) finance and effectively complement other climate-related policy instruments. Support to policies that

⁹ For CURB see <http://www.worldbank.org/en/topic/urbandevelopment/brief/the-curb-tool-climate-action-for-urban-sustainability>; for Urban Footprint see <https://urbanfootprint.com/>; for Calthorpe Rapid Fire see http://getinsight2050.wpengine.com/wp-content/uploads/2015/07/RapidFire_V_2.0_Tech_Summary_0.pdf; for the Compact of Mayors Emissions Scenario Model see https://www.wri.org/sites/default/files/Compact_of_Mayors_Emissions_Scenario_Model.pdf; for City Climate Planner see <https://cityclimateplanner.org/>; for the City Performance Tool see <https://www.siemens.com/global/en/home/company/topic-areas/intelligent-infrastructure/city-performance-tool.html>; for TRACE see <http://www.esmap.org/node/235>.

create an enabling environment and target behavioral change should also be covered by blended instruments to allow for effective implementation.

- ▶ The establishment and use of monitoring, reporting and verification (MRV) for GHG emissions and mitigation outcomes can improve the capacity to track achieved performance and level of enforcement of policies and actions, and provide feedback for future planning and additional policy reforms. MRV can also serve broader policy objectives of cities and bring multiple benefits by creating readiness to access other types of climate finance.
- ▶ By exploring new market mechanisms now, urban actors have an early opportunity to help design and pilot future market mechanisms, including under Article 6 of the Paris Agreement. Importantly, the experience learned from the implementation of Kyoto flexibility mechanisms can inform future design. This maintains momentum between the key actors and informs broader discussions about the limitations of current approaches and potential solutions. More widely, the city's experience with crediting approaches can pave the way for using other market mechanisms and other forms of carbon pricing in the future.

To realize these benefits and progress, further research is needed to fill some important remaining methodological gaps, and piloting is needed to test options on the ground (see Figure 3). Further research could be carried out under a global work program that would bring together leading urban initiatives, such as the C40 Cities Climate Leadership Group (C40), ICLEI—Local Governments for Sustainability (ICLEI), Global Platform for Sustainable Cities (GPSC), and CCFLA, as well as urban actors including cities, academia, think tanks, and financial institutions. Collaboration will help ensure that the proposed solutions are simple, and practicable, and that they build on the existing practices.

The proposed new global work program could cover issues such as:

- ▶ Design of flexible implementation modalities that capture the diversity of cities, with a particular focus on opportunities to ensure greater impacts of crediting approaches on the key levers of urban development and infrastructure, such as urban planning and TOD, and particularly in rapidly developing cities in developing countries.
- ▶ Targeted policy and methodology research to (i) fill in methodological gaps, (ii) improve understanding of the economics of urban mitigation with a focus on the costs and revenues of different types of urban mitigation activities and relevant financing models, including public-private partnerships (PPPs) for urban infrastructure investments, and (iii) explore how the crediting approaches would need to look to make a difference as a financial instrument that provides an additional revenue stream, depending on pricing of the mitigation outcomes and (in the case of RBCF) monetization of other results.
- ▶ Piloting to test the suggestions on the ground, build capacity at different levels in the government and individual system operators, inform in-depth evaluation of the broader policy impacts of carbon and climate finance delivered by crediting approaches, and give insights into how new crediting approaches could look.

Piloting activities have the potential to test some transferrable elements of the crediting approaches but already show a significant commitment to a policy outcome.¹⁰ Such transferrable elements can include institutions and methodological issues and tools such as setting baselines, assessing the contribution of the city climate action to the implementation of the NDC, refining emission

¹⁰ Source: Partnership for Market Readiness (PMR). 2015.

Figure 3: Enabling a new generation of crediting approaches in cities in the context of the Paris Agreement



reduction calculation methods, and implementing MRV systems in line with national tracking tools. Cities around the world are working on defining and implementing climate action plans, either unilaterally or under international cities initiatives. Including crediting approaches in existing climate action programs or key result-focused sectoral interventions and policies under development could help fast-track the testing.

Such a global work program, combined with piloting, would help build capacities on the use of new crediting approaches as a vehicle to deliver finance through carbon markets or a RBCF approach to leverage private sector finance contributions in cities. It would also strengthen the dialogue between cities and national governments to align efforts, policies, and instruments, and to communicate on their contribution to NDC implementation.

While crediting approaches bring benefits that go beyond mitigation, their success in cities will ultimately rely on the demand for mitigation outcomes (demand for credits for carbon finance and willingness to pay for results in the form of emission reductions for climate finance). At the international level, this will depend on countries' willingness to engage in international cooperative actions, where crediting approach is used as a modality of climate finance, and international transfers of mitigation outcomes in case of market mechanisms. In the context of limited international demand for transferrable mitigation outcomes used for compliance, crediting approaches can be further explored under the financing pillar of the Paris Agreement, in particular RBCF, and domestically to help compliance under a carbon tax, an emission trading system, or other forms of domestic carbon pricing, and/or to complement other sectoral urban policies and financing instruments.

1. INTRODUCTION

In 2015, the global community pledged to limit the global temperature increase to well below 2°C compared to preindustrial levels and to pursue efforts to reach a 1.5°C limit in the context of the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement. However, despite the commitment countries have put forward, there remains an emissions gap between the current emissions targets of countries and the required amount of emission reductions to achieve the 2°C goal.

With dense populations and a diverse range of emitting industries, activities, and services, as well as being a locus of consumption of goods and services by their residents, cities are the origin of considerable greenhouse gas (GHG) emissions and can contribute significantly to bridging the global emissions gap. Bloomberg found that action in cities could close the emissions gap by at least 10 percent in 2030 and by approximately 15 percent in later years. Cities can design and implement local policies and have influence over policy levers which national actors may not have access to, for example urban planning and public transportation. They can also directly implement national policies or enhance the effectiveness of policies enacted at the national level through independent action.¹¹ Therefore, cities can be important partners in reducing emissions to achieve and go beyond the reductions pledged at the national level.

Yet the complex urban policy and emissions-related environment of cities often makes financing these mitigation measures—including accessing climate finance—a challenge, and **further support is needed if they are to achieve their potential in meeting the goals of the Paris Agreement.**

1.1. Objectives and scope of the report

This report discusses the use of crediting approaches to support global urban mitigation and to facilitate cities' contributions to achieving climate change goals established by countries in their nationally determined contributions (NDCs) and in the Paris Agreement. To do so, the report focuses on the opportunities to increase the impact of the financial support that can be provided through crediting approaches, by using it as an effective complement to other financial and policy instruments in urban sectors. These instruments shape urban development choices and the behavior of individual infrastructure system operators, investors, and consumers in key sectors that include, for example, urban development, transport, energy, and buildings.

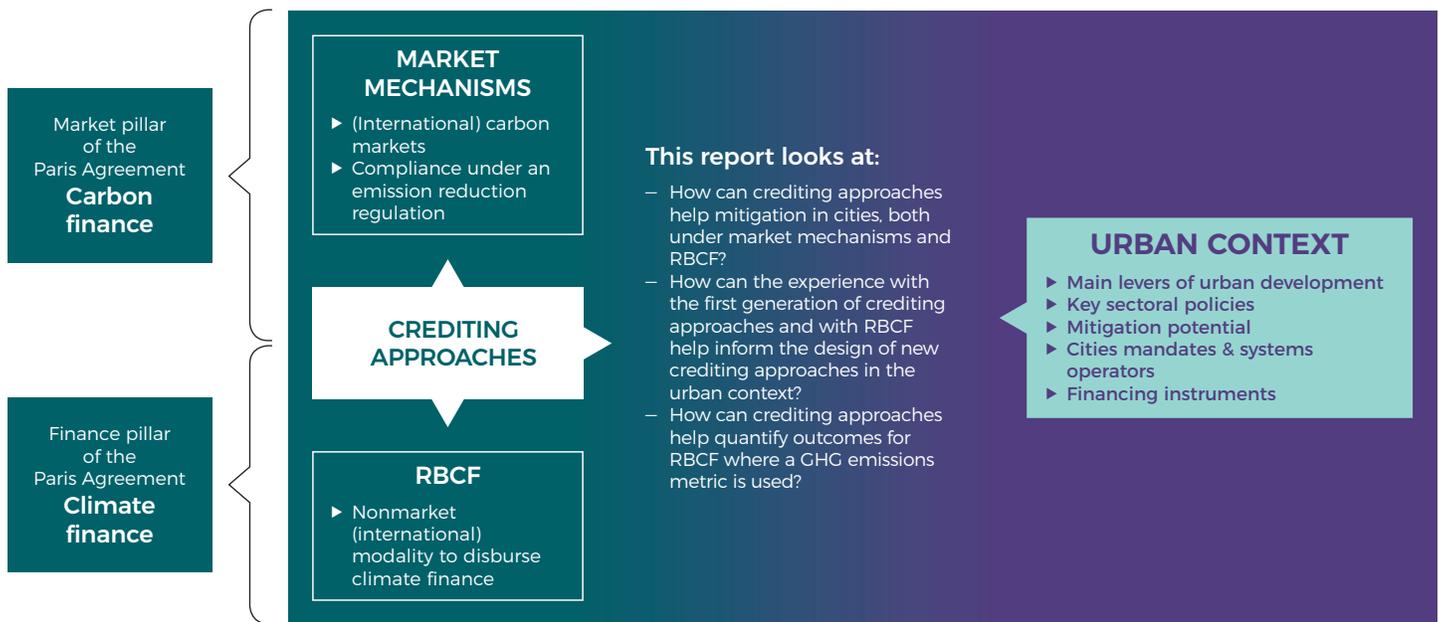
The intent of the report is to provide preliminary options on how to use crediting approaches to deliver carbon and climate finance (see Figure 4) and to identify areas that need further investigation.¹² Specifically, the report explores the following questions:

- ▶ How can crediting approaches help mitigation in cities, both under market mechanisms and results-based climate finance (RBCF)?
- ▶ How can the experience with the first generation of crediting approaches and with RBCF help inform the design of new crediting approaches in the urban context?
- ▶ How can crediting approaches help quantify outcomes for RBCF where a GHG emissions metric is used?

¹² This report does not consider the blended use of climate finance and carbon finance in detail. This topic will be addressed in a separate report currently under preparation by the World Bank.

¹¹ SEI, Bloomberg Philanthropies, 2015.

Figure 4: Scope and objectives of the report



Crediting approaches rely on a baseline-and-credit technique to quantify the GHG emission reductions/avoidance resulting from mitigation actions. They can be applied to support projects and sectoral programs and policies that have a demonstrable mitigation impact. Crediting approaches can be used both in the international carbon markets, in **market mechanisms**, and as a modality to disburse **RBCF** when a GHG emission reduction metric (tons of CO₂ equivalent [tCO₂e]) is used to demonstrate the achieved outcomes of the activities supported by RBCF.¹³ Therefore, crediting approaches can contribute to efficiently allocate carbon and climate finance to mitigation actions and leverage private finance.¹⁴

Carbon finance. Historically, crediting approaches have been used mostly in **market mechanisms** to provide flexibility to comply with mitigation targets at reduced cost, compared to a (market)

carbon price set by an emissions trading system (ETS) or a carbon tax. Most notably, crediting instruments have been used successfully at the international level under the Kyoto Protocol. Dedicated, internationally regulated mechanisms—Clean Development Mechanism (CDM) and Joint Implementation (JI)—have been used to ensure environmental integrity of international transfers of the mitigation outcomes (carbon credits) of investment projects and programs. Crediting approaches are also increasingly used at the domestic level to provide flexibility under domestic carbon pricing instruments. The Paris Agreement, through its Article 6, is viewed by many as providing a new impetus for the use of crediting approaches among other market and nonmarket mechanisms as a modality of international cooperative actions. The report aims to investigate how crediting approaches can support urban mitigation in new market mechanisms, including under Article 6 of the Paris Agreement.

Climate finance. The report also aims to explore how crediting approaches can lend themselves to other international collaboration instruments that relate to the finance pillar of the Paris Agreement (Articles 5 and 9). Out of those, **RBCF** represents one of the financing modalities that is considered in the literature to be particularly suitable to climate

13 As per World Bank and Frankfurt School of Finance and Management. 2017. *Results-Based Climate Finance in Practice: Delivering Climate Finance for Low-Carbon Development*. Washington, DC: World Bank. RBCF programs differ in the way they define “results” and can use quantitative disbursement-linked indicators (e.g., MWh of installed renewable energy capacity, and energy saved by a group of rehabilitated buildings) as well as qualitative ones (e.g., the implementation of a policy or the strengthening of MRV capacity) or a mix between unit-based indicators and qualitative milestone indicators.

14 While there is no recognized definition for climate finance, it usually covers financing flows directed toward climate change mitigation or adaptation activities.

mitigation.¹⁵ Under RBCF, a donor or investor disburses funds to a recipient with the achievement and independent verification of a pre-agreed upon set of mitigation and/or adaptation outcomes. Crediting approaches can be used to identify and measure the GHG emission reductions/avoidance that are currently the typical outcome in RBCF.

Finally, the report also aims to bring some of the insights gained by RBCF to expand the discussion on how to design new crediting approaches for cities. By encompassing a full cycle of structural change from inputs to results, RBCF has demonstrated its ability to facilitate carbon pricing and market building, support policy process to achieve NDCs, and leverage private sector activity and financing. Therefore, these RBCF features could usefully inform the new ways of design and implementation of crediting approaches and help formulate recommendations for the effective use of these approaches, further enhancing their contribution to combating climate change and pursuing low-carbon urban development pathways.

This report mainly targets the carbon finance and RBCF community interested in urban mitigation, and governments willing to explore the new opportunities of using crediting approaches to mobilize carbon and climate finance. In the past decades of carbon markets, the use of crediting approaches for urban mitigation programs has been perceived as high risk and low reward. However, given the importance of urban mitigation to achieve global climate goals and the new context set by the Paris Agreement and the NDC framework, this report explores possible arguments in favor not only of further exploring the potential for and possible forms of crediting approaches for urban mitigation, but also of piloting to test these concepts and contribute to efforts around the important topic of urban mitigation.

It should be noted that crediting approaches focus on GHG emission reductions as the outcome. However, it is important to explore in parallel

RBCF instruments based on different metrics (i.e., other than tons of GHG emissions) to provide flexibility for cities and influence a broader range of policy levers and actions. Such policy levers and actions are critical to the adoption of low-carbon urban development pathways, for example urban planning, compact urban development (CUD), transit-oriented development (TOD), deep decarbonization of urban energy supply, and new infrastructure for electric transportation. Including other metrics can also help countries include adaptation actions to improve urban resilience in their NDC implementation.

1.2. Structure of the report

Section 2 of this report discusses how the Paris Agreement and its adoption decision create a favorable environment for climate action in cities. Section 3 provides an overview of the role of cities in urban mitigation and the challenges cities face to ramp up climate action. It also highlights some tools that facilitate the planning, delivery, and tracking of climate action in cities. Section 4 examines why the first generation of crediting approaches had limited success to scale up urban mitigation and what risks scaled-up crediting approaches bring when used in the urban environment. Based on this analysis, Section 5 identifies the preconditions for the effective use of crediting approaches in cities, especially in the context of Article 6 of the Paris Agreement and building on lessons learned by deploying RBCF approaches in other sectors. While this report emphasizes that demand for the mitigation outcomes is one precondition for the success of crediting approaches, it also assumes that the drive for increased ambition under the Paris Agreement will contribute to creating such demand both at the domestic and international levels. Finally, Section 6 suggests possible ways to implement mitigation programs/interventions using crediting approaches in cities, and highlights gaps that need to be addressed to operationalize these approaches, and potential solutions.

15 Source: World Bank and Frankfurt School of Finance and Management, 2017.

2. NEW OPPORTUNITIES OFFERED BY THE PARIS AGREEMENT

2.1. Explicit invitation to scale up mitigation in cities

The Paris Agreement was signed in December 2015 at the 21st Conference of the Parties (COP21) to the UNFCCC and entered into force in November 2016, less than 1 year after its initial adoption. World leaders agreed to keep the global average temperature increase to well below 2°C for this century. Ambition was ramped up, with consensus reached on pursuing efforts to hold the increase to 1.5°C.

Under Decision 1 on the Adoption of the Paris Agreement, the cities are called to scale up their efforts and support actions to reduce emissions, build resilience, and decrease vulnerability to the adverse effects of climate change. Decision 1 also recognizes the important role of providing incentives for emission reduction activities, including through tools such as domestic policies and carbon pricing.¹⁶ As shown in Box 1, carbon pricing is increasingly used by national and subnational jurisdictions, including cities, to incentivize cost-effective mitigation.

2.2. Urban climate action included in Nationally Determined Contributions

The Paris Agreement introduces several new elements that create a substantially different dynamic for domestic action and international cooperation as compared to the Kyoto Protocol.¹⁷ One of the most significant is that all signatory countries (Parties) are now required to adopt commitments. These are communicated through the NDCs. NDCs are voluntary commitments made by each Party to reduce national emissions and adapt to the impacts of climate change. To ensure that countries' commitments are sufficient and are delivered, the Paris Agreement requires each Party to prepare, communicate, and maintain successive NDCs, and to strengthen their efforts at key stocktaking points. NDCs are therefore a critical component to achieve the goals of the Paris Agreement.

The exact roadmap to implement NDCs is being worked out at both the international and national levels. This includes the actual content of NDCs, the timeline for implementation, the definition of what qualifies as a conditional/unconditional commitment, the distribution of the mitigation efforts required to achieve the NDC commitment (e.g., between sectors, actors, technologies), and the modalities to track and report progress.

¹⁶ Source: UNFCCC, COP21. 2015. *Adoption of the Paris Agreement* UNFCCC. <https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>; Paragraph 135 of Decision 1.

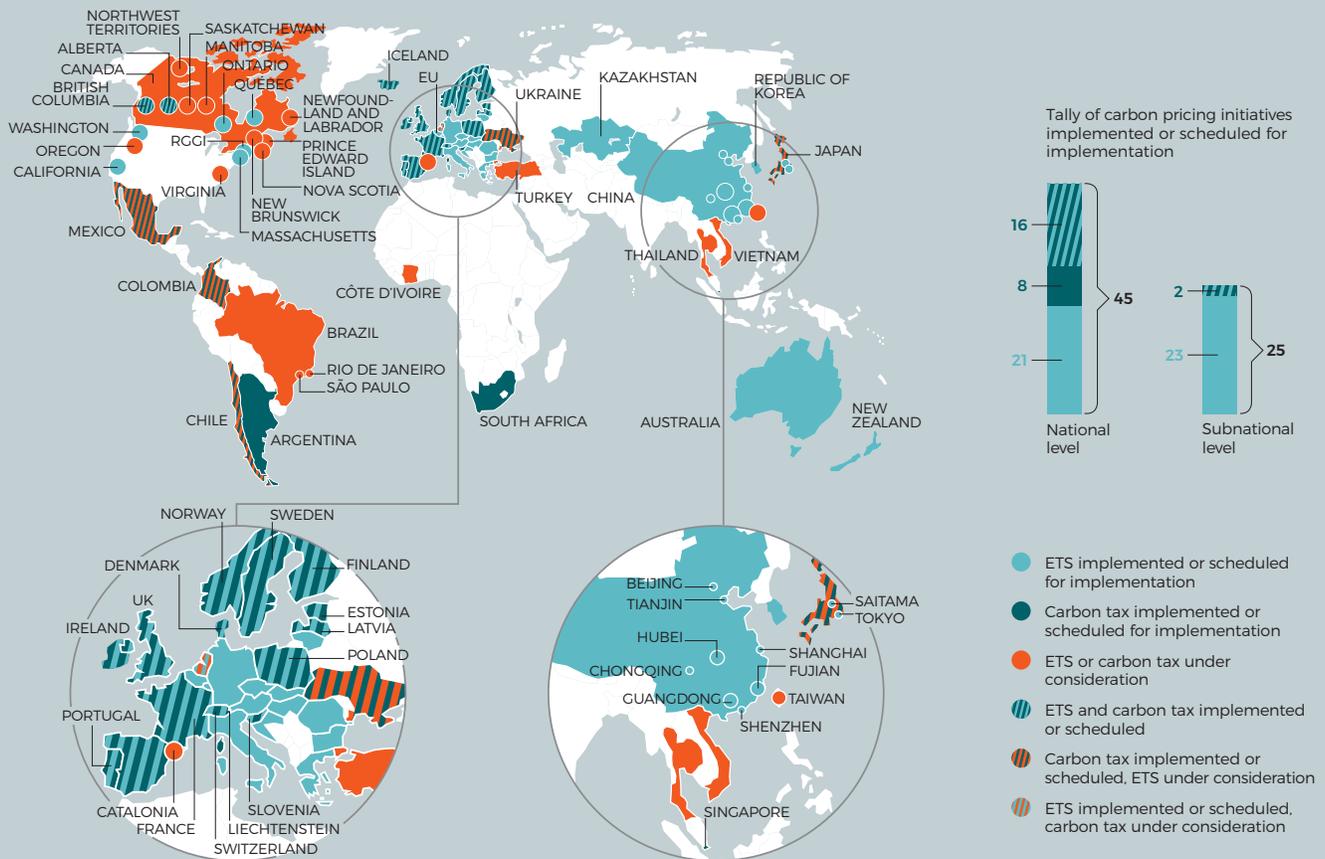
¹⁷ Source: UNFCCC. 2018. *The Paris Agreement*. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.

Box 1: Expanding coverage of carbon pricing

In 2018, about 45 national jurisdictions and over 25 subnational jurisdictions are putting a price on carbon (see Figure 5). These include cities such as Saitama and Tokyo in Japan, and Beijing, Chongqing, Shanghai, Shenzhen, and Tianjin in China. Together,

these carbon pricing initiatives implemented or scheduled for implementation would cover about 20 percent of annual global GHG emissions. This figure represents a fourfold increase over the past decade.

Figure 5: Summary map of regional, national, and subnational carbon pricing initiatives implemented, scheduled for implementation and under consideration (ETS and carbon tax)¹⁸



The circles represent subnational jurisdictions. The circles are not representative of the size of the carbon pricing instrument, but show the subnational regions (large circles) and cities (small circles).

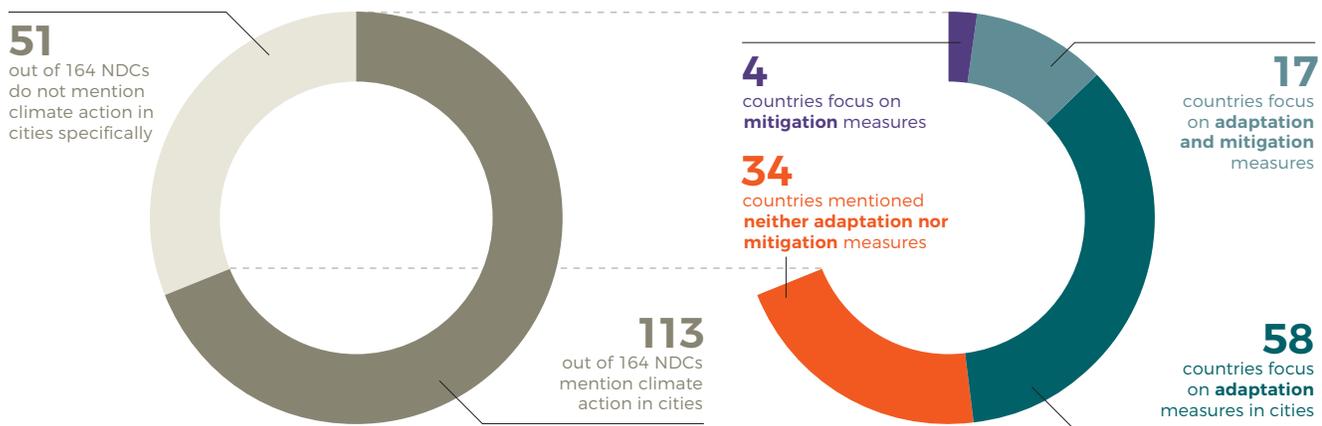
Note: Carbon pricing initiatives are considered “scheduled for implementation” once they have been formally adopted through legislation and have an official, planned start date. Carbon pricing initiatives are considered “under consideration” if the government has announced its intention to work toward the implementation of a carbon pricing initiative and this has been formally confirmed by official government sources. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS not only refers to cap-and-trade systems, but also baseline-and-credit systems as seen in British Columbia and baseline-and-offset systems as seen in Australia. The authors recognize that other classifications are possible. Due to the dynamic approach to continuously improve data quality, changes to the map not only reflect new developments, but also corrections following new information from official government sources, resulting in the addition of the carbon tax covering only F-gases in Spain.

The combination of carbon pricing instruments (taxes, ETSs, and offset crediting) is also becoming more popular. In South Africa and Mexico, for example, carbon taxes permit the use of offset credits. Another combination is where revenues from

carbon taxes and/or other market instruments (e.g., crediting instruments) are used to support mitigation policies and activities that are less responsive to a carbon price (e.g., in the transport sector, and compact city development policies).

18 This map is taken from World Bank and Ecofys. 2018. *State and Trends of Carbon Pricing 2018*. Washington, DC: World Bank.

Figure 6: Status of NDCs with considerations for actions in cities¹⁹



About two-thirds of the NDCs submitted as of the end of 2017 mention planned action in cities.²⁰ This sends a strong long-term signal for urban climate action. The majority of the NDCs refer to adaptation actions in cities rather than mitigation (see Figure 6). Adaptation is fundamental in cities given the concentration of population and rapid economic growth. However, as highlighted in Section 3, cities have the potential to reduce emissions significantly and adopt a climate-resilient, low-carbon urban development pathway. The limited focus on mitigation in NDCs might suggest that both urban and national decision makers need support to identify, plan, and realize urban mitigation measures.

2.3. New impetus for international cooperation through Article 6 mechanisms

The Paris Agreement recognizes that countries can voluntarily cooperate on the implementation of their NDCs to facilitate higher ambition in mitigation and adaptation actions. It reinstates market instruments as a key instrument for achieving climate change mitigation. Specifically, **Article 6 of the Paris Agreement shapes the way forward for a new generation of international collaborative mechanisms:**

- ▶ Articles 6.2–6.3 cover cooperative approaches between countries, under which countries can opt to meet a part of their NDCs by using internationally transferred mitigation outcomes.
- ▶ Article 6.4 establishes a mechanism under the authority of the COP for countries to contribute to the GHG emissions mitigation in one country and have the outcomes used to meet the NDC targets of another, while contributing to sustainable development and resulting in overall global emission reductions. The latter requirement means that mitigation outcomes cannot be used purely to offset existing emissions.

The main principles of Article 6 are environmental integrity, robust accounting to avoid double counting, sustainable development, transparency including in governance, and, for Article 6.4, overall mitigation in global emissions.

The regulatory and implementation framework for Article 6 and any associated mechanisms are still being developed in the form of the Paris Agreement guidelines. These guidelines are expected to be adopted at COP24 in Katowice, Poland, in December 2018, and to come into effect from 2020 onward. **Although market mechanisms are not explicitly referred to in the text of Article 6, it is commonly understood that voluntary cooperation under Article 6 will allow and build upon, among other instruments, crediting approaches.** Cooperative approaches can include international scaled-up

¹⁹ Source: UN-Habitat. 2017.

²⁰ Source: UN-Habitat. 2017. *Sustainable Urbanization in the Paris Agreement—Comparative review for urban content in the Nationally Determined Contributions (NDCs)*. Nairobi: United Nations Human Settlements Programme (UN-Habitat).

crediting under Article 6.4²¹ (eventually going beyond project-by-project approaches) and other instruments that involve the use of internationally transferred mitigation outcomes toward NDCs under Article 6.2.

As of April 2018, 76 NDCs from Parties that account for about 28 percent of global GHG emissions state intentions to use international carbon pricing initiatives (e.g., as sellers and/or buyers of mitigation outcomes).²² This makes crediting approaches under Article 6 of key importance as a potential source of financing to help countries achieve their NDC pledges.

As mentioned in Section 1.1, crediting approaches can be used to efficiently allocate not only carbon finance through market mechanisms, but also climate finance through RBCF. Article 9 of the Paris Agreement reaffirmed that developed country Parties should continue to take the lead in mobilizing climate finance from a wide variety of sources, instruments, and channels to assist developing country Parties with respect to both mitigation and adaptation. These instruments can include RBCF, as highlighted in the context of Article 5 for forests. Section 4.1 provides a more detailed explanation of crediting approaches for both carbon and climate finance.

2.4. Summary

The new framework created by the Paris Agreement represents a fundamental change in the overall drive for mitigation efforts at the local, national, and international levels. Governments at all levels can consider mobilizing carbon or climate finance through new crediting approaches to include cities as an integral part of NDC implementation. They can use these approaches as one of the levers to achieve cost-effective mitigation, mobilize the private sector, and grow ambition.

21 Source: SBSTA. 2018. *Informal document containing the draft elements of the rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement*. UNFCCC. <https://unfccc.int/resource/docs/2018/sbsta/eng/sbsta48.informal.3.pdf>.

22 Source: World Bank and Ecofys. 2018. *State and Trends of Carbon Pricing 2018*. Washington, DC: World Bank.

From the cities' perspective, the national targets under the NDCs and the set of policies and actions that will be used to implement them post-2020 create a favorable (upward) environment to promote and focus on scaled-up, transformative mitigation actions:

- ▶ Cities, through sectoral policies and regulations, may receive a carbon price signal or may be assigned a mitigation target as part of the effort sharing by the national authorities between different sectors and subnational entities to contribute to the NDC targets.
- ▶ Even in the absence of a clear, shared effort between different sectors and subnational entities, cities may perceive a stronger incentive to prepare themselves for the carbon-constrained future. The leadership and voluntary action may pay off later on different levels and bring benefits beyond mitigation. These include a city's competitiveness and attractiveness for businesses, e.g., through reduced energy costs but also lower infrastructure costs and higher productivity (see Section 3).
- ▶ Cities will be influenced by the national policies that target urban sectors of the economy. They could contribute to incentivizing and enforcing compliance with such national policies (e.g., energy efficiency codes, renewable energy generation, waste management). Interactions and policy complementarity between all levels of government are expected to progressively improve and become more aligned.
- ▶ Cities may be called in to contribute to the implementation of national market mechanisms, for instance through dedicated offset programs that would serve as a cost containment tool under a domestic ETS or carbon tax.

This suggests that the new context created by the Paris Agreement could be conducive to the use of crediting approaches—both under market mechanisms and as a climate finance modality—to effectively and efficiently facilitate mitigation in cities. The following sections seek to investigate how this new context can help mitigate the perceived risks about the sustainability and feasibility of comprehensive urban mitigation actions embedded in a longer term low-carbon resilient urban development pathway.

3. CITIES AND CLIMATE CHANGE MITIGATION

3.1. The importance of cities for climate change mitigation

3.1.1. An urban world

By 2050 the world's urban population will have reached 6.3 billion, and two-thirds of the people on the planet will be living in urban centers. Nearly 90 percent of the 2.5 billion new urban dwellers will live in Africa and Asia, and three countries alone—China, India, and Nigeria—will account for 35 percent of the increase. Although more than half of the world's urban citizens live in Asia today, the continent is only 50 percent urbanized, and only 43 percent of Africans live in cities. By 2050, Africa will be 54 percent urbanized and Asia will have reached 64 percent.²³

The importance of cities to the development of a sustainable, global economy that can address the need to increase prosperity, address climate change, and ensure the well-being of all communities is widely recognized. There is an immense opportunity for climate change mitigation in the world's cities. Equally important, mitigation can be closely aligned with other transformational programs that will ensure the resilience, safety, and health of a burgeoning urban population. Health benefits, for example, may alone justify urban mitigation actions that contribute to improved air quality.²⁴

23 Source: United Nations. 2018. *2018 Revision of World Urbanization Prospects*.

24 Source: IISD Reporting Services. 2018. *CitiesIPCC Bulletin*. Vol. 172 No.42. 10 March.

3.1.2. The GHG mitigation potential of cities

It is estimated that cities currently account for 71–76 percent of global emissions and 67–76 percent of global energy use.²⁵ The world's urban areas were responsible for around 24 gigatons of CO₂ (GtCO₂) emissions in 2013, and if current trends continue that could grow by 50 percent to 35.7 GtCO₂ in 2050.²⁶ Overall, the potential emission reductions related to urban energy use by 2050 are equivalent to 70 percent of the total energy-related reductions required to meet the International Energy Agency's (IEA's) 2°C scenario for climate mitigation.²⁷

Rapid urbanization, the role of cities in the world economy, and expanding demand for infrastructure, goods, and services in emerging countries mean that cities are important focal points for mitigation. A series of studies have shown that transformative action in cities could significantly contribute to the mitigation required to achieve a 2°C target for global warming. It has been estimated that actions within cities, using policy levers currently at their disposal, could contribute up to 15 percent of the global GHG reductions required to stay on a 2°C pathway. This contribution corresponds to reducing annual GHG emissions by up to 3.7 GtCO₂e by 2030 and 8.0 GtCO₂e by 2050.²⁸

25 Source: IPCC. 2014. *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Human Settlements, Infrastructure and Spatial Planning*.

26 Source: IEA. 2016. *Energy Technology Perspectives 2016—Towards Sustainable Urban Energy Systems*. Paris: IEA.

27 Source: IEA. 2016.

28 Source: Broekhoff, Derik, Peter Erickson, Carrie Lee. 2015. *What cities do best: Piecing together an efficient global climate governance*. Working Paper. Stockholm Environment Institute (SEI); Erickson, Peter, Kevin Tempest. *Advancing climate ambition: How city-scale actions can contribute to global climate goals*. Working Paper. Stockholm Environment Institute (SEI).

The IEA has estimated that addressing key areas such as primary energy use, buildings energy, and transportation could reduce global urban emissions to 8.7 GtCO₂ by 2050, a 63 percent reduction on 2013 levels.²⁹ In the same period, the urban population is expected to grow by 67 percent and urban gross domestic product (GDP) by 230 percent.

The challenges and opportunities presented by urban emissions growth is most evident in emerging cities.³⁰ These cities are likely to account for over a quarter of global income growth and over one-third of energy-related emissions growth over the next two decades. The substantial emissions growth from cities in emerging economies is due to a combination of national economic drivers (e.g., growth in GDP) and local drivers (e.g., city size, population, economic structure, growth patterns, and the level of maturity of the urban infrastructure).³¹

The expansion of the urban population in emerging economies has huge implications for energy consumption and GHG emissions. In China, the average urban dweller emitted 1.4 times as much energy-related carbon dioxide (CO₂) as a rural resident. Focusing on just the buildings and transport sectors, urban residents emit 1.7 times as much as rural residents, on average.³² African cities have the lowest GHG emissions per capita of any region in the world with an average of 1.8 ton of carbon dioxide (tCO₂) per capita, but business-as-usual economic growth is fueling significant growth in aggregate emissions. Based on business-as-usual trends, emissions in the 69 African cities will grow by over 60 percent by 2030, reaching close to 400 million tons of CO₂ (MtCO₂) per annum.³³

3.1.3. The need to act: the problems of lock-in

The C40 Cities Climate Leadership Group (C40) estimated that 97 percent of the actions needed to achieve global emissions goals for 2050 will need to be implemented in the world's leading cities by 2030 if the goals set out in the Paris Agreement are to be met.³⁴

There is also a window of opportunity for emerging cities to embed mitigation plans into their infrastructure development. This is important if these cities are to avoid the problem of lock-in, which can have long-term negative impacts on their future emissions. The lock-in phenomenon refers to the effect of built structures in urban areas (i.e., roads and buildings) that establish a trajectory for GHG emissions in the near and medium term and can extend for a century or more.³⁵ Cities that fail to invest in low-carbon options to meet infrastructure demands will, as a result, be locked into an emission-intensive pathway for the long term.

Mature cities such as London, New York, Paris, and Milan have already experienced the impact of this phenomenon, which limits options for policy makers to achieve a transformative low-carbon development pathway. Emerging and expanding cities have the potential to avoid the lock-in phenomenon, as much of their urban infrastructure has yet to be built or reconstructed. Unlike mature cities, emerging and expanding cities can still influence the unbuilt urban infrastructure in such a way as to realize low-carbon development pathways. They therefore present an opportunity for decision makers to achieve effective transformational mitigation in urban environments.

29 2013: 24 CtCO₂. Source: IEA, 2016.

30 Classified by New Climate Economy as those that are rapidly expanding, middle-income, and mid-sized (population of 1-10 million) in China, India, and other emerging economies.

31 Source: The Global Commission on the Economy and Climate, 2014. *Better Growth Better Climate: The New Climate Economy Report*. Washington, DC: World Resources Institute (WRI).

32 Source: Fridley, David, Nina Khanna, Xu Liu, Stephanie Ohshita, Lynn Price, and Nan Zhou. 2015. *The role of Chinese cities in greenhouse gas emission reduction Briefing on urban energy use and greenhouse gas emissions*. Seattle: Stockholm Environment Institute (SEI).

33 Source: Godfrey, Nick and Xiao Zhao. 2015. *Technical Note: The Contribution of African Cities to the Economy and Climate Population, Economic Growth, and Carbon Emission Dynamics*. The New Climate Economy - The Global Commission on the Economy and Climate.

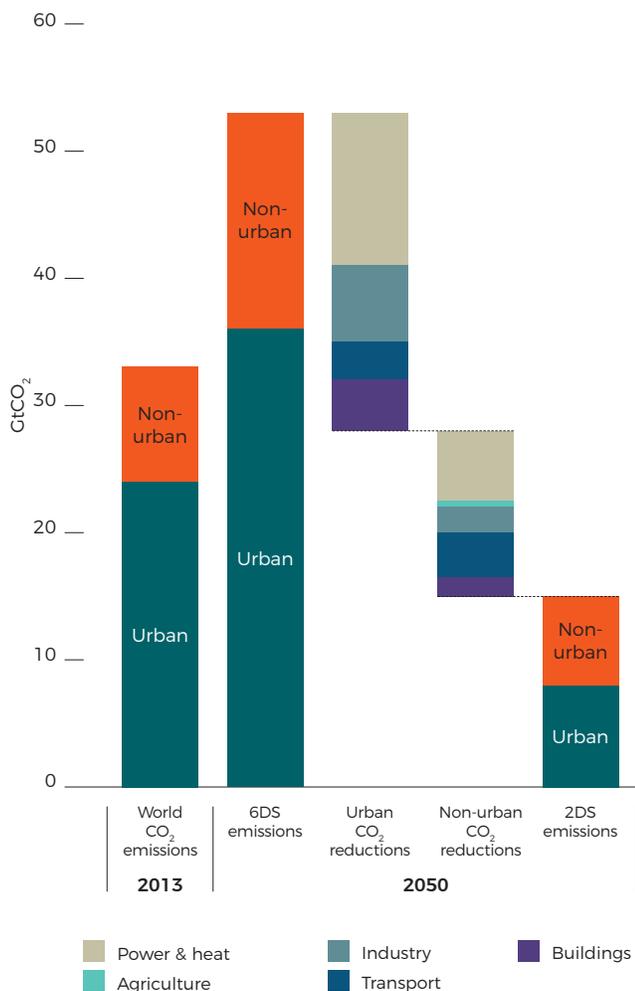
34 Source: C40 Cities and Arup. 2016. *Deadline 2020: How cities will get the job done*. London: C40 and Arup.

35 For more information about the lock-in phenomenon, see Unruh, Gregory. 2000. *Understanding carbon lock-in*. Energy Policy 28 (12): 817-830 or Maassen, A. 2012. *Heterogeneity of Lock-In and the Role of Strategic Technological Interventions in Urban Infrastructural Transformations*. European Planning Studies 20 (3): 441-60.

By avoiding carbon-intensive urbanization pathways, cities can not only reduce sunk costs and stranded assets that may represent a significant burden on the urban economy, but they can also contribute to a tangible reduction of the overall cost of national mitigation costs in the long run.³⁶ The long-lasting impacts of the lock-in phenomenon and the fact that rapidly growing emerging cities are best placed to avoid this phenomenon makes mitigating urban GHG emissions a matter of urgency in global mitigation efforts.

3.1.4. Opportunities for urban mitigation

Figure 7: Potential urban impact on global cumulative CO₂ reductions in the IEA Energy Technology Perspectives (ETP) 2 Degree scenario (2DS)³⁷



Key urban sectors. Various studies have highlighted the potential for emission reductions in cities in the key sectors of energy production, buildings, transportation, land use, and waste management (see Figure 7 and Figure 8). A report by C40 and the McKinsey Center for Business and Environment identified decarbonizing the electricity grid, optimizing energy use in buildings, enabling next-generation mobility (including better land-use planning), and improving waste management as the primary action areas, as shown in Figure 8. The IEA has similarly identified compact urban development, energy-efficient buildings, public transport, and renewable energy as main areas for urban action.³⁸

It has been estimated that investing in high impact areas such as public transport, building efficiency, and improved waste management facilities could save cities up to US\$17 trillion globally by 2050 based on energy savings alone.³⁹ A review of potential investments in low-carbon solutions in these sectors in five cities (Leeds, UK; Kolkata, India; Lima, Peru; Johor Bahru, Malaysia, and Palembang, Indonesia) showed that savings of 13–26 percent in energy use and GHG emissions relative to business-as-usual trends are possible in the next 10 years through investments, with payback periods of less than 5 years. The World Bank has identified at least 50 areas for action on urban climate emissions that can be integrated into city actions plans across six key sectors including transportation, buildings, and energy generation.⁴⁰

36 In the 2017 report from IEA and IRENA *Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy System*, stranded assets are described as “the capital investment in fossil fuel infrastructure which ends up failing to be recovered over the operating lifetime of the asset because of reduced demand or reduced prices resulting from climate policy.”

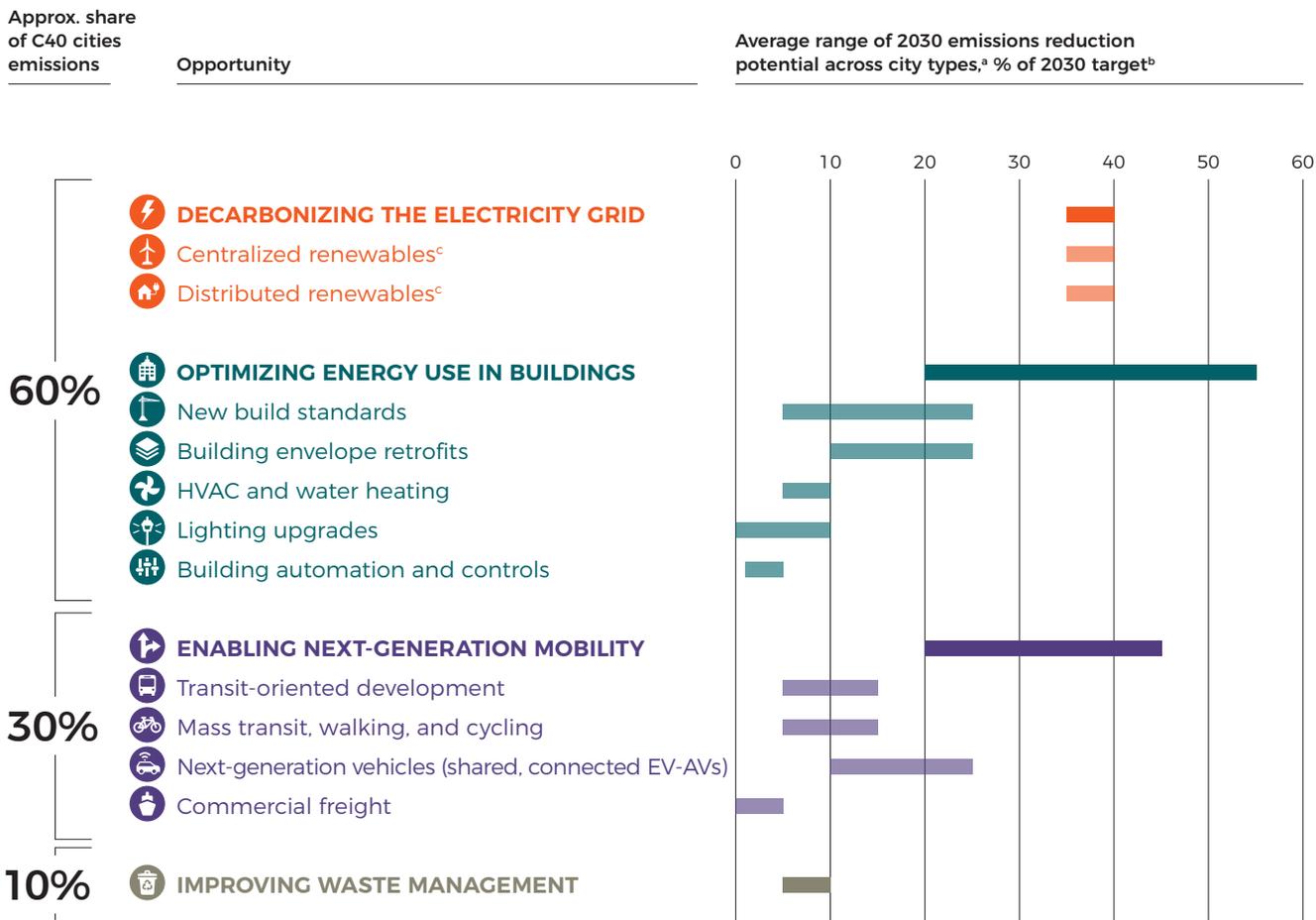
37 Source: IEA. 2016.

38 Source: IEA. 2016.

39 Source: The Global Commission on the Economy and Climate. 2014.

40 Source: The World Bank. 2016. *The CURB Tool: Climate Action for Urban Sustainability*. <http://www.worldbank.org/en/topic/urbandevelopment/brief/the-curb-tool-climate-action-for-urban-sustainability>.

Figure 8: Emission reduction potential from different mitigation measures by sector⁴¹



a Emission reduction potential as modeled for a “focused acceleration” scenario across six illustrative city types, with highest and lowest outliers removed.
 b 2030 target is based on *Deadline 2020* pathways for specific city types.
 c Percentages given are for system level mix. Balance between centralized and distributed generation will vary by region.

Source: McKinsey analysis

The mitigation potential within key sectors such as buildings and transportation is important, but so is the potential for cross-sector reinforcement, for example, through linking building and transport innovation, and from an integrated planning approach that encourages CUD.

Improving urban building stock. Buildings are responsible for around 30 percent of global final energy use and around one-third of GHG emissions. Urban areas account for around 60 percent of building energy consumption globally.⁴² Steps to be taken in the buildings sector include strong building

energy efficiency standards for new urban buildings, energy retrofits for existing urban buildings, and stringent performance standards for urban building lighting and appliances.

One of the reasons that buildings are so important to the urban energy picture is the challenge of providing space heating and, increasingly, cooling to buildings. The greater use of renewable sources for heating is therefore an important step forward. Space cooling is responsible for a relatively small portion of building energy use, around 5 percent, but according to the IEA it is the fastest-growing end use and could increase by a factor of 10 in some regions if aggressive action is not taken.

41 Source: C40 and The McKinsey Center for Business and Environment. 2017. *Focused acceleration: A strategic approach to climate action in cities to 2030*.

42 Source: IEA. 2016.

In terms of cross-sector benefits, urban building improvements can have an impact on air quality, comfort, economic productivity, energy costs, and local job creation. Land-use planning can support increased densification and connectivity of the urban landscape. Building regulations can also reinforce initiatives to reduce transport emissions through closer integration with mass transit and support for electric vehicle (EV) infrastructure.

Shifting to low-carbon transportation. Around 20 percent of a city's GHG emissions can be attributed to private and public transportation, and approximately 70 percent of that amount can be attributed to road transportation. Urban transport emissions are growing at 2 to 3 percent annually. The majority of emissions from urban transport is from higher income countries. In contrast, 90 percent of the growth in emissions is from transport systems in lower income countries. This also means there is considerable potential to act before these countries lock in to a dependency on cars, offering multiple trajectories for future transportation provisions.⁴³

The need to provide clean, decarbonized, and efficient transportation is key to many challenges facing cities and is increasingly connected with developments in urban energy systems. There are three recognized pathways for cities to reduce transport emissions: avoiding (e.g., through urban planning policies that reduce the need for car use), shifting (developing a multimodal public transport infrastructure), and improving (through a shift to low-carbon transportation including EVs).

To address these issues, cities are promoting the adoption of low-carbon vehicles and a greater emphasis on other mobility options. In an increasingly connected environment, cities have become the focal point for a range of new vehicle mobility options such as carsharing, bikesharing, and rideshare applications. Leading cities are taking this multimodal approach to transportation a step further by connecting these different modes to create on-demand, sustainable, personalized, and flexible urban transportation systems.

TOD is also recognized as an important policy tool for driving more sustainable development. TOD involves the integrated design of urban places to bring people, activities, buildings, and public space together, with easy walking and cycling connections between them and near transit services to the rest of the city.⁴⁴

Managing municipal waste. According to a study by the World Bank, the amount of urban waste generated is growing faster than the rate of urbanization.⁴⁵ It estimated that roughly 3 billion urban residents in 2012 generated 1.43 billion tons of waste per year. By 2025, this is expected to increase to 4.3 billion urban residents generating 2.4 billion tons per year. This represents an increase of 992 million tons in a little over a decade, a near doubling of the total volume of waste generated.

Up to 3 to 5 percent of global GHG emissions come from improper waste management. The majority of these emissions are methane produced in landfills. Even though waste generation increases with affluence and urbanization, GHG emissions from municipal waste systems are lower in more affluent cities. In Europe and North American cities, GHG emissions from waste sector account for 2 to 4 percent of the total urban emissions, while in African and South American cities, emissions from the waste sector are 4 to 9 percent of the total urban emissions.⁴⁶

Studies have shown that measures such as improved recycling, landfill gas capture, and enhanced composting of waste can help reduce the growth in waste-related emissions. In Kolkata, India, for example, waste-related GHG emissions

43 Source: IEA. 2016.

44 Source: Institute for Transport and Development Policy, *What is TOD?*. <https://www.itdp.org/library/standards-and-guides/tod3-0/what-is-tod/>.

45 Source: Hoornweg, Daniel, Perinaz Bhada-Tata. 2012. *What a Waste: A Global Review of Solid Waste Management*. Urban Development Series Knowledge Papers No. 15. Washington, DC: World Bank.

46 Source: Rosenzweig, Cynthia, William Solecki, Patricia Romero-Lankao, Shagun Mehrotra, Shobhakar Dhakal, Tom Bowman, and Somayya Ali Ibrahim. 2018. *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Other. In *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*, edited by Cynthia Rosenzweig, William D. Solecki, Patricia Romero-Lankao, Shagun Mehrotra, Shobhakar Dhakal, and Somayya Ali Ibrahim, xvii-xlii. Cambridge: Cambridge University Press.

could be cut by 41 percent by 2025, relative to a business-as-usual scenario, through investments of INR13.1 billion (US\$224 million) that would generate annual savings of INR1.1 billion (US\$18.8 million).⁴⁷

The importance of recognizing cross-sector benefits. While there is significant potential for reducing urban emissions on a sectoral basis, much of the potential for urban mitigation comes from cross-sectoral policy initiatives that link land use, urban development, transportation, and buildings. Land-use zoning policies, for example, influence the demand for transportation, reduce or increase commuting times, and improve integration with low-carbon mobility options. Similarly, the ability to reuse waste heat from industrial processes or the provision of district cooling systems can reduce the energy required for heating and cooling buildings. Transportation policies are also increasingly linked with improvements in the energy infrastructure (e.g., EVs can be part of active grid management services to help integrate renewable energy).

Mitigation projects can also promote greater efficiencies, not only through reduced energy costs but also lower infrastructure costs (e.g., through reduced road building and better coordination of cross-sector investments),⁴⁸ health improvements (e.g., through improved air quality), and productivity (e.g., through reduced congestion). According to the IEA, the gradual evolution of urban transport systems to encourage walking, cycling, and public transit could save US\$21 trillion by 2050, while at the same time making a significant dent in GHG emissions.⁴⁹ Integrated policies that reduce urban sprawl and encourage more compact, connected development could reduce the required global urban infrastructure investment by more than US\$3 trillion over 15 years (2015–2030).⁵⁰

Going beyond mitigation benefits. Improving air quality is one of the key benefits of a reduction in GHG emissions and associated pollution from urban traffic and industrial processes. The World Health Organization estimates that, globally, 3 million premature deaths can be attributed to outdoor air pollution.⁵¹ A World Bank study estimated that exposure to ambient and household air pollution cost the world's economy US\$5.11 trillion in welfare losses in 2013. In the worst affected regions in Asia this accounted for around 7.5 percent of the regional GDP.⁵²

Urban mitigation programs are closely linked to broader urban government and environmental priorities. There are close links, for example, between potential climate actions and other sustainable development goals (SDGs) as agreed upon by UN members in 2015. The SDGs place an emphasis on the role of cities, notably in SDG 11, which commits world leaders to “make cities and human settlements inclusive, safe, resilient, and sustainable.”

A study by the Urban Climate Change Research Network (UCCRN) identifies five pathways for urban transformation to support climate action, including the need to make a close link between adaptation, resilience, and mitigation in urban planning, urban design, and urban architecture.⁵³ The study highlights how increased resilience at the heart of adaptation can also have positive outcomes for social equity, economic development, and human well-being.

Cities will also need to explore new delivery models to commission design and maintain infrastructure and services that are robust in the face of complex environmental risks. As urban infrastructure assets have long operational lifetimes, they are sensitive not only to the existing climate at the time of

47 Source: The Global Commission on the Economy and Climate. 2014.

48 Source: IRP. 2018. *The Weight of Cities: Resource Requirements of Future Urbanization*. Swilling, M., Hajer, M., Baynes, T., Bergesen, J., Labbé, F., Musango, J.K., Ramaswami, A., Robinson, B., Salat, S., Suh, S., Currie, P., Fang, A., Hanson, A., Krut, K., Reiner, M., Smit, S., Tabor, S. Nairobi: United Nations Environment Programme (UNEP).

49 Sources: IEA. 2016.

50 Source: The Global Commission on the Economy and Climate. 2014.

51 Source: World Health Organization. 2016. *Ambient air pollution: A global assessment of exposure and burden of disease*.

52 Source: World Bank. 2016. *The Cost of Air Pollution: Strengthening the Economic Case for Action*.

53 Source: Rosenzweig C., W. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, T. Bowman, and S. Ali Ibrahim. 2015. *ARC3.2 Summary for City Leaders*. Columbia University. New York: Urban Climate Change Research Network (UCCRN).

their construction but also to climate variations over the lifetime of their use. These environmental and climate risks require cities to look for new ways to commission design and maintain urban infrastructure, and to consider ways to integrate and bolster capacity via the co-delivery of services.

Looking at climate change mitigation in relation to increasing resilience reinforces the need to assess each city's complex and interconnected infrastructure and institutional systems spanning the physical, economic, institutional, and socio-political environment.

Consumption-based emissions and demand-side action. Most studies on the role of cities in mitigation focus on local energy use and GHG emissions. Work by Arup and C40 has looked at the consequences of taking a consumption perspective on urban GHG emissions. For the 79 cities examined, there was a 60 percent increase in total emissions when consumption-based emissions were factored in (emissions from imported goods and services). However, there are wide differences between cities. Cities in emerging countries more often showed a positive imbalance between consumption and production emissions figures, while cities in high income countries showed the highest increase in emissions totals once consumption was accounted for.

Although cities have a limited influence on the carbon footprint of goods manufactured outside their boundaries, the study highlights the significance of cities in addressing demand-side policies and actions that can promote behavioral changes toward lower carbon lifestyles and consumption patterns including: "resource productivity strategies and consumer policies, targeting carbon-intensive consumption categories and lifecycle phases with the highest emissions, and supporting shifts in consumption to goods and services with lower emissions, including through public procurement."⁵⁴

Achieving urban mitigation at scale. The interconnected nature of potential urban mitigation actions means that scale-up can be realized at multiple levels:

- ▶ By *replicating discrete measures* at sectoral and subsectoral levels, e.g., through dedicated investment mass transit building energy efficiency programs, or low energy street lighting.
- ▶ By *broadening scope of action to interconnected sectors* to create positive synergies between individual measures, integrated into a holistic approach to service provision, e.g., community-level energy programs that include smart buildings, energy-efficient appliances, LED street lighting, and renewable energy.
- ▶ By *focusing on policy levers and interventions that lead to transformational impacts* in cities. Urban planning that promotes compact cities, TOD, and mixed land-use zoning is an example of such a policy lever.

The incentives provided by the additional revenue stream through crediting approaches can be deployed in a targeted manner, aiming to change the way individual system operators (energy, water, transport, etc.) do business and therefore leverage private or public-private investments in low-carbon options and practices. At the same time, the ability of cities to realize the opportunities for scaled-up mitigation will depend on their level of control over urbanization processes and resources. There also needs to be sufficient coordination between different municipal organizations, as discussed in Section 3.2. Cities and national authorities need to work together to ensure compatibility of policy incentives and regulations and to enable a holistic vision for urban development. It also requires city climate financing to be linked with these deeper structural changes in urban form and transport infrastructure if the value of investments is to be realized and the adoption of mitigation measures accelerated.

⁵⁴ Source: C40, 2018. *Consumption-based GHG emissions of C40 cities*. London: C40.

3.1.5. The finance gap

Inevitably, the financial requirements to support the transformation of cities to low-carbon paths for development are significant. According to a report by the Cities Climate Finance Leadership Alliance (CCFLA) on the state of city climate finance, it is estimated that approximately US\$93 trillion will need to be invested in low-emission and climate-resilient infrastructure globally. More than 70 percent of this infrastructure will be built in urban areas, at an estimated cost of US\$4.5 to US\$5.4 trillion per year.⁵⁵ Overall climate finance flows were just under US\$54 billion in 2014.⁵⁶ The average portion of overall climate finance that was channeled to urban areas was 31 percent. But even if all climate finance was targeted at cities, it would still only address a small portion of the overall investment requirement. As the CCFLA emphasizes, it is important that the deployment of such finance is “as catalytic as possible” in driving investment for low-emission, climate-resilient urban infrastructure. Climate finance must be seen as a movement not only to increase the amount of funding available but as part of a process of enabling and leveraging existing and new financing to flow from a broad range of sources, most importantly from the private sector. It should also be recognized that climate finance in cities has co-benefits such as helping develop climate compatible industries, facilitating technology transfer, and ensuring capacity building,⁵⁷ as are highlighted in the next sections.

Figure 9 shows the different sources that can provide funding at the municipal scale, from local financing (land-value capture, local taxes, etc.) to the traditional role of banks, and the more innovative use of capital markets and international finance that can be dedicated to climate change. It is essential for regional jurisdictions and municipalities to diversify and blend their sources of finance and tap the full spectrum of resources

available to raise funds for climate action. However, successful funding for climate action, notably in developing countries, needs to overcome barriers, such as the lack of creditworthiness of subnational governments, insufficient access to capital markets and international mechanisms, and lack of financial and technical skills and human resources. Investors are often unfamiliar with mitigation measures in cities and find it difficult to incorporate GHG emission reductions, improvements in air quality, increased resilience, and other relevant factors into their cost/benefit analyses, in particular in the absence of a clear price signal for these public goods.⁵⁸

Due to the number of potential stakeholders, capacity constraints of the city authorities and the diffuse nature of the emission sources, mitigation measures and policy interventions in cities can be complex, both in design and implementation. Even where proven funding models for climate-related infrastructure projects to exist, many investors feel the returns do not compensate for the perceived higher delivery risks (the risk that the results will not be achieved) with mitigation measures in cities.⁵⁹

In their report *Measurement for Management*, C40 found that municipal governments of C40 cities (which are predominantly megacities) finance 64 percent of their mitigation measures from their own budgets. Only 7 percent of mitigation measures are supported by externally-funded grants and specific subsidies. The private sector provides 14 percent financing and the development banks less than 1 percent. This demonstrates a gap in terms of mobilizing private sector investment and therefore optimizing the use of scarce financial resources of cities.

How new crediting approaches can help address the funding gap is examined in detail in Sections 4–7. However, there are a number of issues related to the specific nature of urban interventions that need to be considered and addressed to successfully promote scaled-up urban mitigation.

55 Source: CCFLA. 2015. *State of City Climate Finance 2015*. New York: Cities Climate Finance Leadership Alliance (CCFLA). While there is no recognized definition for climate finance, it usually covers financing flows directed toward mitigation or adaptation activities.

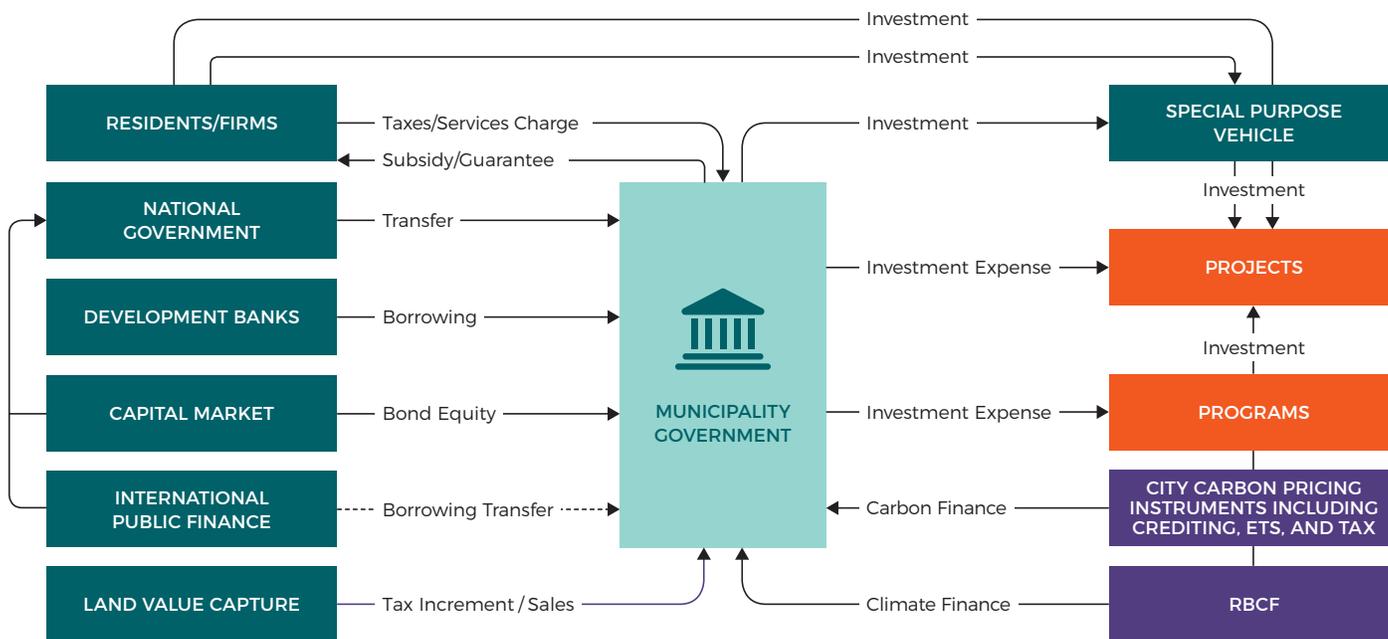
56 Source: CCFLA. 2015.

57 Source: UN-Habitat. 2017.

58 Source: CCFLA. 2015.

59 Source: CCFLA. 2015.

Figure 9: Potential sources of finance for municipalities to finance climate-related projects



Source: Based on UCCRN, 2015⁶⁰

In particular, there is a need to address issues around governance (improved vertical coordination and alignment of national and city policies and actions, and horizontal, cross-sectoral integration) and the specific challenges of GHG accounting in an urban environment.

3.2. Governance, control, and coordination

3.2.1. Levels of action

The significant mitigation potential of cities presents both national and urban policy makers with the opportunity to mobilize considerable contributions to global climate action. However, there is huge variation in cities in terms of their size, maturity, economic development, infrastructure, environment, and governance models. The different local priorities also play an important role in the

choice of climate actions by cities, considering the range of co-benefits that mitigation can bring to meet these other priorities.

Cities are potentially in control of a vast portfolio of potential mitigation policies and actions ranging from sector-specific activities (e.g., energy efficiency in buildings, fuel efficiency of public transport fleet, efficient street lighting) to cross-sectoral, combined policies that influence fundamental drivers of city-wide GHG emissions (e.g., planning, CUD policies, land-use zoning, TOD). The complication for cities is that there is considerable variance in the control or influence that local government may have over these emission drivers.

Policy tools and actions available to cities alone may not be sufficient to deliver the level of scaled-up mitigation that will allow cities to pursue the low-carbon development pathway consistent with the 2°C trajectory. There is a potential gap between top-down models of what cities could achieve and the planned or implemented measures that are

60 Source: Rosenzweig C., W. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, T. Bowman, and S. Ali Ibrahim. 2015.

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Under an ideal policy scenario to achieve deep GHG reductions, “national, state, and local governments could coordinate policies for maximum ambition, efficiency, and effectiveness.”⁶¹

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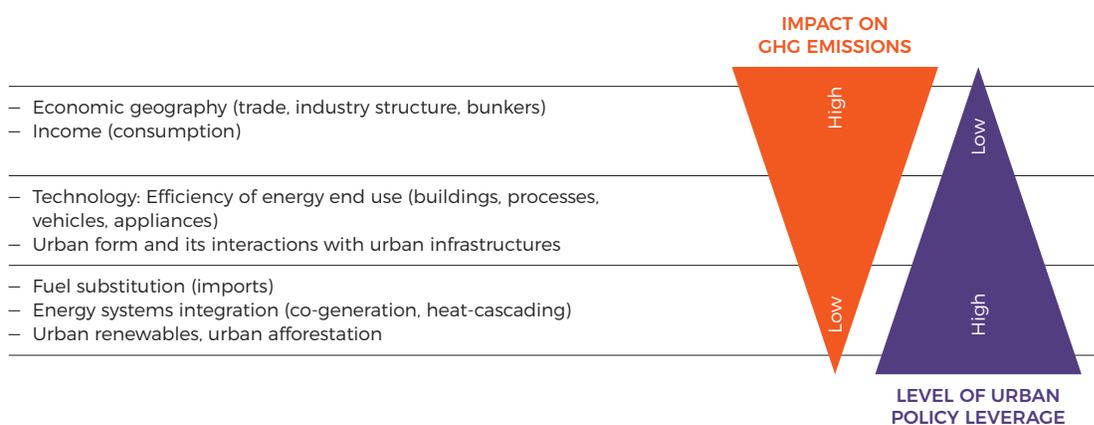
feasible in many cities to achieve transformation. City mitigation programs need to address the major emitting sectors in the city, but these may not be the areas where the city itself has significant traction. Cities therefore rely on close cooperation with other government agencies (national, sectoral, regional, or local) and their ability to incentivize and effectively regulate a range of private sector players and align consumer choices to ensure participation in and deployment of climate actions.

Figure 10 shows the Intergovernmental Panel on Climate Change’s (IPCC’s) summary of how leverage over particular urban mitigation policies compares with the policy’s impact on GHG emissions from the major emission drivers. Local government has little control over some of the most important drivers of emissions, including those associated with national and international infrastructure, trade, and economics. At the other end of the spectrum, cities have considerable leverage over areas that

have a smaller or less quantified impact on GHG emissions, including energy systems integration, urban renewables, and urban afforestation. In the middle are policy areas commonly identified as central to urban mitigation strategies, including technology efficiency requirements in building and transport, urban infrastructure, and shaping urban forms toward low-carbon pathways (e.g., through a prioritization of compact urban development).

While this representation generalizes the urban mitigation policy landscape and will vary depending on the local context, it does show the complex relationship between the impact of cities on GHG emission drivers and the amount of leverage available solely at the urban policy level. **It is vital that any action at the local level needs to be vertically integrated with national and subnational policies and programs, and needs to be designed efficiently in a way that respects and maximizes the influence of each governance level.**

Figure 10: Hierarchy of drivers of urban GHG emission and policy leverages by urban-scale decision making⁶²



⁶¹ Source: Broekhoff, Derik, Peter Erickson, Carrie Lee. 2015.

⁶² Source: Seto K. C., S. Dhakal, A. Bigio, H. Blanco, C. C. Delgado, D. Dewar, L. Huang, A. Inaba, A. Kansal, S. Lwasa, J. E. McMahon, D. B. Müller, J. Murakami, H. Nagendra, and A. Ramaswami. IPCC. 2014. *Human Settlements, Infrastructure and Spatial Planning*. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom and New York, NY, USA: IPCC.

3.2.2. Vertical and horizontal integration

How the integration of policy actions is achieved will depend on the established relationship between different levels of government and how far this can adapt to better support effective climate action. The institutional and governance structures of cities vary significantly, leading to different levels of control over the GHG emissions and their drivers. The ability of different levels to implement mitigation policies is also dependent on respective administrative capacity. C40 and Arup identify six categories that characterize the differences between cities' capacities and mandates to implement mitigation actions via regulation, project implementation, service delivery, and partnerships.⁶³ In examining the relationship between national and local government, SEI⁶⁴ identifies three core roles for cities that allow them to focus on roles and actions for which they are highly capable and best positioned:

- ▶ As policy leaders and architects—notably through spatial planning and transport policy interventions.
- ▶ As critical implementers of nationally applied policies—particularly with regard to residential and commercial buildings sectors.
- ▶ As strategic partners—taking actions to enhance the effectiveness of policies enacted at higher levels of government. For example, cities can enhance national efforts through local regulation, permitting, economic and fiscal incentives, infrastructure development, and more broadly, through education and information sharing.

It is not only a question of coordination with national government. In many cases, state or provincial governments, as well as individual system

operators (energy, water, transport, etc.), also have significant responsibilities that are key to influencing urban climate-related actions. In addition, given the restricted and highly variable scope of local policy control, relationships with other municipal agencies—including within the metropolitan areas—and private sector service providers are also a major factor determining the range of action available to city governments.

These two different aspects of local multilevel governance can be distinguished as:

- ▶ Vertical integration, which refers to the coordination across multiple levels of government at national, state, regional, and city levels, and a recognition of the appropriate allocation of responsibility.
- ▶ Horizontal integration, referring to the coordination of activities and responsibilities across different sectors of urban economy including local governments, the private sector, civil society, and grassroots organizations.

An example of an important area where vertical integration needs to be improved is the allocation of funds between national and city government. A study by C40 and Arup⁶⁵ found that Mexico City, Rio de Janeiro, and Johannesburg all highlighted issues around the lack of devolved funding to the city from the federal level, particularly for environmental and climate-related projects. The study also noted that, even when funding is made available, restrictions on how it can be used limit local flexibility. Lack of power to raise local revenue for climate action is also an issue. The same report notes how Amman, the capital of Jordan, faces challenges in securing international funding as income from tax revenue and is affected by taxes that are controlled nationally, in a way that makes

63 Source: C40 and Arup. 2015. *Climate Action in Megacities 3.0: Networking works, there is no global solution without local action*. London: C40 and Arup

64 Source: Broekhoff, Derik, Peter Erickson, Carrie Lee. 2015.

65 Source: C40 and Arup. 2015. *Potential for Climate Action: Cities are just getting started*. London: C40 and Arup.

it difficult to forecast the amount of public funding available to match to international funds. In combination, these and other funding challenges related to national and local cooperation restrict the opportunity for cities to access sufficient funds for mitigation measures.

Often the absence of coordinated, vertically aligned processes can result in slow or inconsistent implementation of mitigation actions. Coordinating the design and implementation of actions effectively across multiple levels of government can be challenging. Nevertheless, a growing body of knowledge suggests that improving integration of efforts between layers of government brings potential for enhanced impact and efficiency of mitigation efforts.

One of the biggest opportunities to improve horizontal integration is to enable closer coordination across metropolitan authorities. In policy areas such as regional transportation, collaboration across neighboring authorities is essential given the often highly fragmentary nature of local responsibilities. Of the 59 municipalities in the metropolitan area of Mexico City, for example, only 16 are controlled by the Mexico City government. The lack of an overarching framework for collaboration across municipal boundaries means that it is difficult to coordinate actions on a larger scale. Similar issues have also been found in Amman in relation to the coordination of regional transport, potentially hampering improvements to public transport services.⁶⁶

Integration across the decision levels is needed to deliver effective action on climate change in cities. This requires better collaboration, coordination, and communication between national governments, the private sector, and other actors.

3.3. GHG accounting and tracking climate action

GHG accounting and understanding urban emissions trajectories (baseline setting) is critical to supporting evidence-based climate action planning and performance monitoring. To effectively contribute to and demonstrate their role in achieving NDC targets, cities need to ensure consistent tracking and reporting of GHG emissions data and mitigation outcomes with the methods used at the national level.

To define a city's carbon footprint, identify mitigation measures, and quantify and evaluate the impacts of climate-related policies and actions at the urban level, cities need to first define their boundaries and then determine the emissions occurring within them. However, for cities this is not a trivial task due to several challenges, which include:

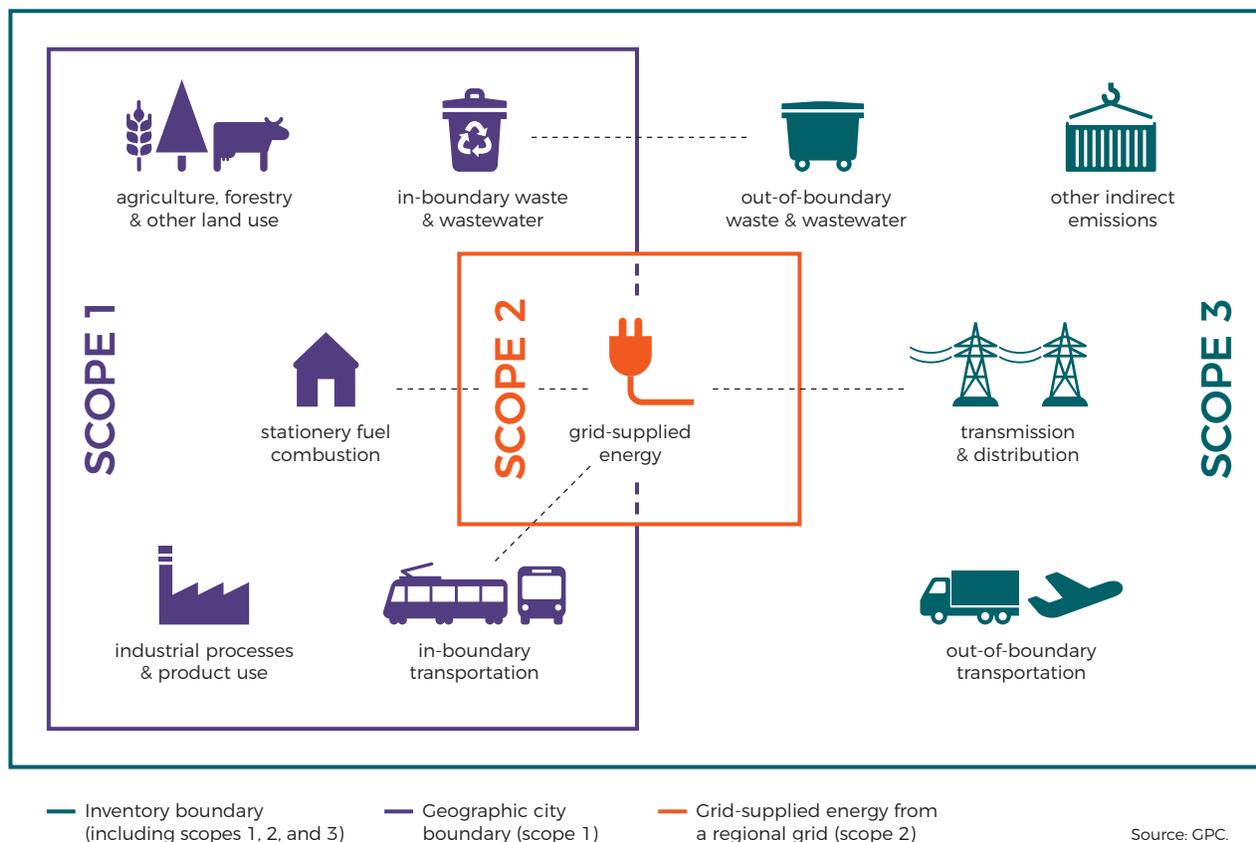
1. A lack of consensus on how to delineate a city and its boundaries.
2. Complexity of determining key emission drivers within city boundaries.
3. Data limitations to allow for accurate calculation of emissions from cities.
4. Issues with attributing the mitigation outcomes to actions given the high level of integration and interaction of the actions.

3.3.1. Defining cities' boundaries

To date, there is no internationally agreed upon approach to defining a city's boundaries or urban areas.⁶⁷ For the purpose of reporting GHG emissions, cities can be defined according to their political boundaries, their interactions such as economic activity, commuting etc., or based on the structure of land use/land cover of the built environment. Different definitions of a city's boundaries can have a substantial influence on the final calculation of GHG emissions and emission reductions.

⁶⁶ Source: C40 and Arup. 2015. *Potential for Climate Action: Cities are just getting started*. London: C40 and Arup.

⁶⁷ According to the United Nations, Department of Economic and Social Affairs, Population Division there is no common global definition of what constitutes an urban settlement.

Figure 11: Sources and boundaries of city GHG emissions⁶⁸

Efforts to address the determination of city boundaries in the context of GHG accounting and in a way compatible with the approaches used at the national level are being explored by initiatives such as the Global Protocol for Community-scale GHG emissions (GPC). The GPC was developed by the World Resources Institute (WRI), C40 and ICLEI—Local Governments for Sustainability (ICLEI).⁶⁹ The standard provides guidance for cities on how to establish their GHG inventory, and how to account and report their emissions. Figure 11 summarizes the main sources of emissions and boundaries per the GPC. The GPC puts emphasis on ensuring consistent and transparent measurement and reporting of emissions between cities in accordance with internationally recognized GHG accounting

and reporting principles (summarized in the IPCC guidelines), and enabling city inventories to be aggregated at subnational and national levels.⁷⁰

Evolving from the work of the GPC, four broad approaches for assessing GHG emissions from cities can be identified:⁷¹

- **Purely Territorial (Geographic) Accounting:** Takes GHG emissions from all sources within the geographic area of an administrative boundary, focusing exclusively on source activities; that is, activities that are directly emitting GHG emissions (Scope 1).
- **Community Wide with Scope 1 + Scope 2 Accounting (GPC Basic):** Similar to the territorial approach but adding on the transboundary (Scope 2) GHG emissions from power generation for those communities that are importing electricity. The emissions associated with imported electricity are called Scope 2 emissions while direct emissions are called Scope 1 emissions.

⁶⁸ Source: WRI, C40, ICLEI, Greenhouse Gas Protocol, 2014.

⁶⁹ Source: WRI, C40, ICLEI, Greenhouse Gas Protocol, 2014. *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories. An Accounting and Reporting Standard for Cities.*

⁷⁰ Source: WRI, C40, ICLEI, Greenhouse Gas Protocol, 2014.

⁷¹ Source: Global Platform for Sustainable Cities (GPSC). Forthcoming. *A Review of Tools to Assess Integrated Urban GHG Mitigation Strategies Incorporating Land Use, Technology, and Behavioral Change.* Global Platform for Sustainable Cities.

- ▶ **Community Wide Infrastructure Footprinting Analysis (CIFA; GPC Basic Plus):** Builds upon Community Wide Scope 1 + Scope 2 accounting by adding on Scope 3 emissions associated with transboundary lifecycle production of fuels and key materials needed to support the provisioning of seven key infrastructure and food supply sectors in cities. The seven sectors are those that provide energy, water, waste/wastewater treatment, transportation, food, building construction materials and public/green spaces in cities.
- ▶ **Consumption-Based GHG Emissions Footprinting:** A conceptually different approach from the first three in that it focuses exclusively on final consumption activities, including consumption by government, households, and business capital. The consumption-based approach specifically excludes the energy use and GHG emissions associated with business/industry operations within a city that export to other parts of the world, e.g., businesses operations such as education, manufacturing, and others that export services/products to outside the city.

The complexity in determining key emission drivers and their elasticities to different climate-related actions and policies is yet another challenge in determining a city's carbon footprint.

3.3.2. Determining key emission drivers within city boundaries

Once a GHG accounting boundary has been defined, it is necessary to identify the relevant emission drivers to inform the definition of potential mitigation targets and strategies, and prioritize implementation actions. As discussed above, for cities, these drivers can be classified in different ways and vary according to city size, local climate, geography, population, urban economic structure (e.g., balance of manufacturing versus service sector), development level, energy mix, state and popularity of public transport, urban form and density, and maturity of the urban infrastructure.

Urban emissions are defined both by the economy-wide as well as by local emission drivers. There is no single model that can be used to define and identify key emission drivers in cities. Extensive data are required to determine a city's carbon footprint and foresee its evolution based on the type and scale of GHG sources, also considering the expected impacts of current and planned policies and actions. This makes the attribution of emission reductions to specific actions, and hence the monitoring process, complex. However, as the discussion of mitigation potential revealed, it is possible to broadly identify major sectors of emissions in cities, which are typically the buildings, transport, industry, waste, and agriculture/food sectors. Based on this, the IPCC distinguishes four clusters of emission drivers that affect urban GHG emissions through their influence on energy demand in buildings, transport, industry, and services:

- ▶ The economic geography and income, often expressed in terms of Gross Regional Product (i.e., GDP equivalent at the scale of human settlement normalized on a per capita basis).
- ▶ Sociodemographic factors (e.g., population size, age distribution, and household characteristics).
- ▶ The potential to deploy technology to support emission reductions.
- ▶ Infrastructure and urban form.

The relative impacts of the drivers on emissions differ depending upon whether urban areas are established and whether the city is mature or emerging/rapidly growing. Technology drivers as well as CUD, land-use, and urban form planning can help emerging or expanding cities drastically reduce emissions, but can have limited relevance among mature cities that are already experiencing the lock-in phenomenon. Economic geography and income, on the other hand, are considered equally important for both mature and growing cities. This is because mature cities in developed countries often have high income, high consumption, and are net consumers of goods and services with a large share of imports. In contrast, growing cities with energy intensive industries, for example, are likely to contribute a

higher total and per capita GHG emissions compared to those with an economic base in the service sector. Infrastructure and urban form as drivers of emissions are of medium to high importance for cities in emerging economies, whereas in mature cities, they have comparatively less impact on emissions due to slow growth and challenges to incentivize substantial behavioral patterns change (e.g., nudging residents to denser urban centers from suburbs). Sociodemographic drivers are of medium importance in rapidly growing cities and of relatively small importance in mature cities where growth is slow and populations are aging.⁷²

3.3.3. Data limitations

The third key challenge in defining a carbon footprint is data constraints. Major sectors responsible for emissions in cities tend to have diffuse sources (e.g., buildings and transport), which makes accurate accounting of the aggregate emissions challenging and resource intensive. The GPC is one of the most widely used frameworks for cities and local governments to identify, calculate, and report their emissions. Other existing frameworks include ICLEI's International Local Government GHG Emissions Analysis Protocol, Covenant of Mayors Sustainable Energy Action Plan Baseline Emissions Inventory (BEI), United Nations Environment Programme (UNEP) and the World Bank's International Framework for Reporting GHG Emissions from Cities, and GHG Regional Inventory Protocol. In general these are bottom-up approaches that use samples and then scale up the results or top-down approaches where global or national datasets are downscaled. The upscaling and downscaling can result in significant uncertainties in the final emission calculations. Available data may also be biased, since most of the urban GHG emissions estimates that exist do not include smaller and medium-sized cities and the data focuses on CO₂ and not all forms of GHG emissions, i.e., methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons,

and sulphur hexafluoride. Section 6.2 discusses how these tools can be relevant in the context on RBCF for the quantification and monitoring, reporting and verification (MRV) of emissions and emission reductions.

3.3.4. Tracking climate action

Tracking, defined here as the quantification and monitoring of the mitigation impacts of policies and actions on urban emissions, is imperative for cities to be able to quantify and report on their contribution to global climate action, and to benefit from RBCF. Tracking is also essential to enable better planning and management of urban climate-related policies and actions and to align incentives, including under NDCs. This section discusses the parameters that need to be tracked to quantify the mitigation impacts of policies and actions, e.g., under an RBCF instrument, and the tools and approaches that are available for cities.

The mitigation outcomes of supported policies and actions can be defined as follows:

Emission reductions resulting from supported policy/actions [results/impacts] = **Baseline emissions** [hypothetical] - **Emissions after implementation of policy/actions** [MRV-able parameter]

- ▶ **Emission reductions resulting from supported policies/actions** can either be calculated based on actual measurements ex post or estimated ex ante.
- ▶ **Baseline emissions** are a hypothetical parameter. They can be informed by snapshots provided by inventories complemented by projections of the expected evolution of economic, policy, and regulatory frameworks, i.e., aligned with the NDC targets. For policies, baseline emissions can also be back calculated using the inventory data, by modeling the emissions that would be observed without a supported policy.

72 Source: IPCC, 2014.

► **Emissions after implementation of policy/actions** can be directly monitored through GHG inventories (or direct measurements) or modeled on an aggregate level using the inventory data as well as appropriate benchmarks and/or default factors.

An aggregated, inventory-based approach to tracking climate action has been put forward as one of the most straightforward options, since the entire spectrum of policies and interventions undertaken by cities to achieve climate action plans can be reflected. The situation, however, quickly becomes complicated once there is a need to attribute the mitigation outcomes to a specific set of policies and actions, such as under crediting approaches. This is especially true given the high level of integration and interaction of the actions that is often observed in cities, as discussed in Section 3.2.

A growing range of urban climate action planning tools and methodologies are now becoming available to support ex ante calculations of impacts of urban interventions on GHG emissions/energy savings at different levels starting from individual measures and investment programs to sectoral measures and policies, and integrated urban planning. While these tools are not specifically designed to track GHG impacts under crediting approaches, they can provide an initial useful basis for tracking. These tools include, for example, the Climate Action for Urban Sustainability (CURB) tool (see Box 2 for an example of its application), Calthorpe Rapid Fire/Urban Footprint, Compact of Mayors Emissions Scenario Model, City Climate Planner, and City Performance Tool (Siemens).⁷³ Other tools, such as the Tool for Rapid Assessment of City Energy (TRACE)⁷⁴ and the GPC described in Section 3.3.1, also provide useful elements to set mitigation goals and track performance over time.

Box 2: Examples of application of CURB tool and EDGE

Byblos is a coastal city in Lebanon 42 km north of the national capital, Beirut. The city of Byblos is renowned as a UNESCO World Heritage Site, and one of the founding members of the Rockefeller Foundation's 100 Resilient Cities. The city of Byblos engaged the World Bank to conduct an analysis with CURB to identify scalable, low-carbon investments that can be implemented rapidly in Byblos, and later implemented in secondary cities across Lebanon. The CURB analysis evaluated six sectors and identified actions that could reduce the city's emissions by 40 percent. Key targeted

investments include energy efficient buildings, photovoltaic systems for buildings and street lights, and improved management of organic waste.

New Orleans is a city in the U.S. state of Louisiana, located on the Gulf of Mexico. The city was the site of the devastating Hurricane Katrina in 2005 and continues to be threatened by sea level rise. New Orleans previously took action through memberships with the Global Covenant of Mayors and the Rockefeller Foundation's 100 Resilient Cities

73 For CURB see <http://www.worldbank.org/en/topic/urbandevelopment/brief/the-curb-tool-climate-action-for-urban-sustainability>; for Urban Footprint see <https://urbanfootprint.com/>; for Calthorpe Rapid Fire see http://getinsight2050.wpengine.com/wp-content/uploads/2015/07/RapidFire_V_2.0_Tech_Summary_0.pdf; for the Compact of Mayors Emissions Scenario Model see https://www.wri.org/sites/default/files/Compact_of_Mayors_Emissions_Scenario_Model.pdf; for City Climate Planner see <https://cityclimateplanner.org/>; for the City Performance Tool see <https://www.siemens.com/global/en/home/company/topic-areas/intelligent-infrastructure/city-performance-tool.html>.

74 For TRACE see <http://www.esmap.org/node/235>.

program. The city launched a resilience strategy in 2005, and in 2017 it created a comprehensive climate action plan. As part of the city's climate action plan, CURB was used to create a GHG inventory and to identify carbon reduction strategies for the city. Three key areas of interventions were identified using CURB, including the modernization of energy use, improvement of transportation, and reduction of waste.

As part of the **China's Yangtze River Economic Belt** project of the World Bank, CURB was used to identify and design low-carbon investment projects across six sectors, including green buildings, landfill gas and capture, improving paper and organic waste management, and wastewater treatment and biogas recovery. Moreover, **Fuzhou**, the capital and one of the largest cities in Fujian province in China, estimated cost savings, energy reduction, and emission reduction investments

needs using CURB. Lastly, the city can estimate the potential contribution to China's NDC goal based on the various scenarios modeled by using CURB. To address the opportunities in the building sector, the EDGE tool was used to design the green buildings project component (including LED lighting, efficiency cooling systems, and solar photovoltaic (PV) panels on residential roofs). EDGE is an approved green building certification tool in China and has an advantage of facilitating the connection of projects with financial institutions. The overall estimated impacts from the identified actions are as follows:

- ▶ Up to US\$10 million saved in energy costs by Fuzhou by 2035.
- ▶ Consumption of fossil fuel reduced by the equivalent of burning 279,427 tons of coal.
- ▶ About US\$250 million of investments leveraged in the city.

The Global Platform for Sustainable Cities (GPSC) is currently reviewing tools to assess impacts of integrated urban planning on GHG emissions.⁷⁵ The main available modeling methods and tools have been assessed and compared based on several criteria including the specification of a baseline accounting methodology and coverage of different actions within various planning levers (CUD, single sector strategies, cross-sector strategies, and behavior change and policy). Table 2 provides a summary of this analysis, which gives useful insights for the development of the new generation of methodologies for crediting approaches to better

address urban mitigation. At the same time, these tools currently contain some significant limitations as in relation to the specific methodological needs of crediting approaches. For example, while CURB includes the possibility to qualify urban mandates by sector, most of the tools in Table 2 do not provide the possibility to single out the impact of a pre-identified set of policies and measures in the presence of the multiple vertical and horizontal policy interactions discussed above. Section 6.2 discusses how these tools might be used to support crediting approaches and identifies other gaps that need to be addressed.

75 Source: Global Platform for Sustainable Cities. Forthcoming.

Table 2: Summary of a review of tools to assess integrated urban GHG mitigation strategies ⁷⁶

Tool	Objective	Link with GHG inventories	Comparability and transparency of quantification	Coverage
CURB	Help cities identify and prioritize decarbonization actions	Consistent with GPC	Activity data are transparent with some parameters relying on user input with no guidance (e.g., elasticity—range of potential GHG reduction impact per unit of intervention, and participation rates in some programs, e.g., energy efficiency)	<ul style="list-style-type: none"> ▶ Single sector strategies: Y ▶ Cross-sector strategies: N
City Performance Tool (CyPT)	Develop technology-based scenarios for meeting GHG mitigation targets	Consistent with GPC for energy, buildings, and transport	Scenario development and estimates of activity demand are transparent Elasticity and algorithms not publicly available	<ul style="list-style-type: none"> ▶ Single sector strategies: Y for buildings energy, transportation, and energy generation ▶ Cross-sector strategies: district energy
UrbanFootprint/ Rapid Fire	Help assess whether transportation and land-use plans comply with GHG mitigation targets	Only scope 1 and 2 emissions	Travel demand elasticities and algorithms are transparent; growth scenarios and building energy models are documented but not descriptive	<ul style="list-style-type: none"> ▶ Single sector strategies: Y for buildings energy efficiency, transportation ▶ Cross-sector strategies: N
ClearPath	Forecast BAU and mitigation strategy impacts; inventory development tool	Consistent with GPC	Most component actions have documented assumptions of elasticity and participation rate	<ul style="list-style-type: none"> ▶ Single sector strategies: Y for buildings energy efficiency, transportation ▶ Cross-sector strategies: N
Urban Growth Scenarios	Help cities evaluate investment needs for infrastructure projects; Measure climate, energy infrastructure cost, and accessibility indicators	Only per capita GHG emissions	New model, well-documented	<ul style="list-style-type: none"> ▶ Single sector strategies: Y for buildings, waste ▶ Cross-sector strategies: N

3.4. Summary

The need and the potential for urban mitigation has been well documented. However, the modes of governance, service delivery, infrastructure investment, and asset ownership (reflecting a diversity of cities types and development phase) are complex. This means that there is no simple approach to identify mitigation policies and actions and assess their costs, prioritize and implement them, and quantify their mitigation impacts.

Local governments need to work with public and private partners to create holistic approaches that align with and are enabled by national frameworks and policies. Cities play various roles in supporting urban mitigation, from policy maker, to regulator,

service provider, and partner (see Figure 12). Scaling up urban mitigation will require action within and across sectors, and at the level of individual system operators to replicate and broaden the scope of impacts. It is important to continue exploring the ways to use carbon and climate finance to nudge cities to systematically incorporate climate change considerations. This starts with urban planning (which provides the basis for efficient and effective mitigation action). Cities also need to increase their focus on enabling policies and regulations that can help align investor decisions and consumer choices with the transformational low-carbon urban pathways. The financial support that can be mobilized through crediting approaches or other international collaborative actions needs to be developed in a way that reflects the complexity

⁷⁶ Source: Global Platform for Sustainable Cities. Forthcoming.

“The development of appropriate urban solutions requires a continued advance from purely sectorial approaches to the more integrated and holistic planning, construction, and management of cities, and a policy, legislative, and fiscal environment that supports action.”⁷⁷

and variability of the city context and allows a better fit with holistic, integrated approaches. This could help maximize cities’ use of private finance and the effective use of scarce public resources both at national and international levels.

To achieve this, international support is needed to strengthen capacities at the urban level to plan for action; help improve urban-scale GHG metrics, data collection, and analysis methods; develop appropriate financial instruments; and bring implementation programs close to the investable grade. More specifically, this support is critical in lower income countries facing rapid

urbanization, where the capacity to utilize carbon or climate finance instruments effectively may also be the lowest. International climate finance is increasingly used by cities but uptake remains limited.⁷⁸ This is also true for the crediting approaches that have been deployed in the past, as discussed in Section 4.1.

However, crediting approaches have the potential to become more feasible under the Paris Agreement if appropriately and flexibly designed. The following sections of the report discuss how such approaches can support urban mitigation in the context of the Paris Agreement.

Figure 12: Achieving urban mitigation at scale: a diversity of options



⁷⁷ Source: UN-Habitat. 2017.

⁷⁸ Source: Tänzler, Dennis, Annica Cochu, Rainer Agster, Belynda Petrie, Cristobal Reveco, and Bedoshruiti Sadhukhan. 2017. *Challenges and opportunities for urban climate finance. Lessons learned from eThekwin, Santiago de Chile and Chennai*. Bonn/Eschborn: GIZ.

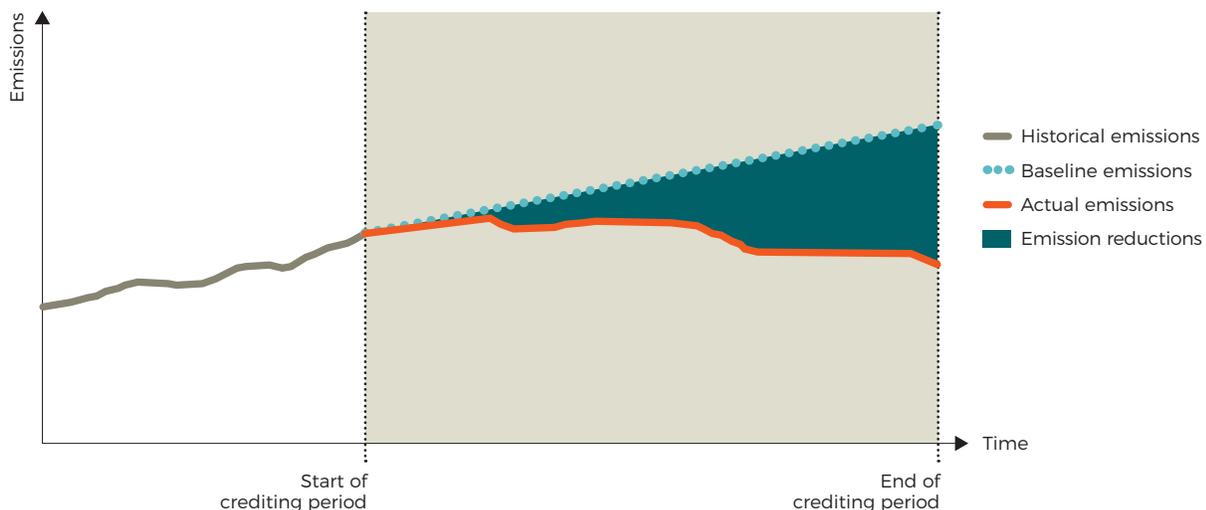
4. ROLE OF CREDITING APPROACHES TO SCALE UP URBAN CLIMATE MITIGATION

Crediting approaches to deliver carbon or climate finance have demonstrated that they are an effective tool for mobilizing private sector finance and delivering market change.⁷⁹ Yet, past applications of crediting approaches, mainly through international crediting mechanisms such as the UNFCCC Kyoto Protocol flexibility mechanisms (CDM and JI) have had limited success in cities. This section first gives further details on the use of crediting approaches for carbon and climate finance, building on the introduction in Section 1.1. It then discusses the lessons learned from the first generation of international crediting mechanisms and, more broadly, from RBCF that uses crediting approaches to disburse climate finance for achieved mitigation outcomes. It closes by exploring how the risks linked to the use of crediting approaches in cities evolve as climate action is scaled up to reach the goal of the Paris Agreement.

4.1. What crediting approaches are

As introduced in Section 1.1, crediting approaches rely on a baseline-and-credit technique to quantify the GHG emission reductions/avoidance resulting from mitigation actions (see Figure 13). They can be applied to support projects and sectoral programs and policies that have a demonstrable mitigation impact. Crediting approaches can be used both in the international carbon markets, in market mechanisms, and as a modality to disburse RBCF when a GHG emission reduction metric (tCO₂e) is used to demonstrate the achieved outcomes of the activities supported by RBCF.

Figure 13: Quantification of emission reductions/avoidance under crediting⁸⁰



79 Source: World Bank, Ecofys, and Vivid Economics. 2017. *State and Trends of Carbon Pricing 2017*. Washington, DC: World Bank.

80 Source: Authors

4.1.1. Market mechanisms

One of the most successful international carbon markets mechanisms—the CDM that was introduced under the Kyoto Protocol—relies on a crediting approach. The CDM enabled emission reduction projects in countries without emission reduction targets to earn carbon credits in the form of certified emission reductions (CERs), each equivalent to one tCO₂, for reducing emissions below an agreed business-as-usual scenario (or a benchmark) referred to as a baseline. These CERs can be traded and sold, and used by countries with an emission reduction target to meet a part of their target.⁸¹ The CDM created a carbon price signal to incentivize mitigation measures in developing countries while giving industrialized countries flexibility in how they meet their emission reduction targets.

The additional revenues from carbon finance enhance the overall financial viability of mitigation measures and/or contribute to overcome important barriers to low-carbon investment (e.g., consumer behavior, technology choices, poor operational practices, etc.). They also create a positive incentive for good management and operational practices that help to sustain emission reductions over time. As such, carbon credits are not designed to directly address the capital investment needs of mitigation measures as payments for emission reductions are available upon the project's completion and operation.

While rules can vary between market mechanisms using crediting approaches, apart from demonstrating that the emission reductions are **additional** to what would be generated under a business-as-usual scenario, rules generally also require proof that in creating mitigation outcomes:

- ▶ The mitigation outcomes are real, measurable, verifiable, and permanent.
- ▶ Environmental integrity is maintained.
- ▶ Double counting is avoided.

⁸¹ Note that when CERs are bought as a proof of emission reductions without being used to comply with an emission reduction target, the CDM is used to certify the mitigation outcomes (i.e., using a crediting approach) that are rewarded by RBCF, as described in Section 4.1.2. In this case the crediting approach is used to disburse RBCF.

Compliance with these conditions allows the mitigation outcomes to be converted into monetizable credits or other type of assets/units eligible for international transfers and compliance under respective crediting protocols and offsetting schemes. The requirement for permanence is unique to carbon sequestration activities (such as forestry and agricultural land-use projects) where CO₂ taken out of the atmosphere and sequestered (stored) must not be released back. It can also, in principle, be interpreted as a need to ensure the nonreversibility of mitigation outcomes in other types of interventions.

In the case of crediting, **environmental integrity** primarily means that market mechanisms (and other forms of international cooperation used for compliance purposes) should not result in higher global emissions than without crediting. The principle of **avoiding double counting** implies that no two entities can account for the same mitigation outcome to demonstrate emission reductions/compliance.⁸²

Market mechanisms using crediting approaches can be **project-based**, such as the CDM. In that case, emission reduction credits are mainly generated through technology-based interventions at one facility or a defined set of facilities.

In a **programmatic** crediting mechanism, such as Programmes of Activities (PoAs) under the CDM, emission reduction credits can be generated through the replication of a predefined set of similar measures within one of several sectors, e.g., the installation of solar water heaters in residential buildings and building envelope rehabilitation.

Finally, a **scaled-up** mechanism credits emission reductions “achieved across a (large) number of GHG sources, or across whole sectors of a country's economy. Key features that distinguish scaled-up approaches from project-based or programmatic crediting include the following:

⁸² Partnership for Market Readiness (PMR). 2017. *Establishing Scaled-up Crediting Program Baselines under the Paris Agreement: Issues and Options*. Washington, DC: World Bank.

- ▶ Baseline emissions are established collectively for a predefined group of GHG sources (for example, all sources within a sector or subsector of the economy).
- ▶ Credits are issued or recognized based on aggregate reductions achieved across all included GHG sources.
- ▶ Actions that reduce GHG emissions can be diverse and may be undertaken by multiple entities responding to incentives, rather than a single implementing entity.
- ▶ Credits may be issued to a single entity, such as a government body, responsible for establishing and implementing policy incentives or requirements (including government enacted policies, for example) that drive emission reductions across all included GHG sources.⁸³

4.1.2. RBCF

Crediting approaches can also be used under other instruments of international collaboration such as RBCF, which is one of the financing modalities to support climate mitigation.⁸⁴ Experience with broader RBCF, i.e., beyond RBCF using crediting approaches, can bring additional insights on how to design new crediting approaches for cities.

While there is no universally agreed upon definition of RBCF, it can be broadly defined as a financing approach where the RBCF provider (e.g., investor or donor) disburses funds to a recipient upon the achievement and verification of a pre-agreed set of climate action results achieved by the recipient (e.g., national, regional, or municipal government, implementers, and service providers).⁸⁵ These results are typically defined at the output level (e.g., development of specific low-carbon technologies) or outcome level (e.g., increase in renewable generation or decrease in emissions). As RBCF is based on the principle of providing payments if and when a climate action result is delivered, it provides incentives for climate actions to be taken.

⁸³ Source: Partnership for Market Readiness (PMR). 2017.

⁸⁴ Source: World Bank and Frankfurt School of Finance and Management. 2017.

⁸⁵ Source: World Bank and Frankfurt School of Finance and Management. 2017.

While relatively new for climate finance, results-based finance (RBF) is well-established as an approach, and has been used successfully in other fields such as health and education.⁸⁶

Literature on RBF⁸⁷ indicates that it can be a useful tool for disbursing subsidies or lending in support of climate-related policy, or for increasing the efficiency of procuring international support. At the center of the choice between RBF and conventional financing is a decision regarding the allocation of project risks between the provider and the recipient. The Energy Sector Management Assistance Program (ESMAP) notes that under an RBF approach, the risks borne by the provider are reduced, although the degree of autonomy of achieving defined goals is much higher than under conventional financing models: if the project fails to deliver the expected results, then the provider does not disburse financial resources. As a corollary, an RBF approach faces much greater risks than a conventional approach, as the recipient will only receive additional resources in the event that the desired results are provided.⁸⁸ Placing greater risks on the recipient is both an advantage and a disadvantage that will determine whether an RBF approach is to be preferred. This is further explored in the context of using crediting approaches for urban mitigation under the Paris Agreement in the rest of the report.

An RBCF can be designed in a number of ways. A simple model for how a RBCF mechanism would operate for a hypothetical solar PV program supporting the reduction of emissions through increased distributed solar capacity is shown in Figure 14.

Existing literature generally indicates that financing must meet the following four criteria to qualify as RBCF:

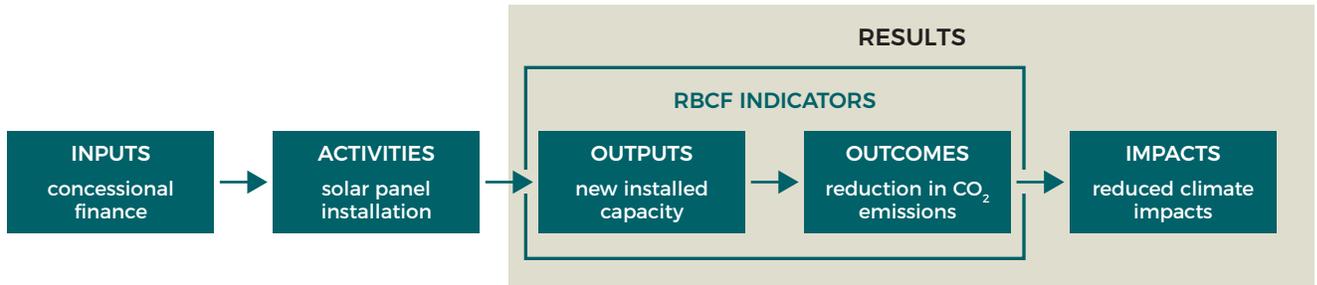
- ▶ Payments are made for climate change mitigation or adaptation results.
- ▶ Payments are made ex post.
- ▶ Payments are made once predefined results have been achieved.
- ▶ Reported results have been independently verified.

⁸⁶ Source: World Bank, Ecofys, and Vivid Economics. 2017.

⁸⁷ Source: Vivid Economics. 2013. *Results-Based Financing in the Energy Sector: An Analytical Guide. Energy Sector Management Assistance Program (ESMAP). Technical report 004/13*. World Bank, Washington, DC. <https://openknowledge.worldbank.org/handle/10986/17481>.

⁸⁸ Source: World Bank and Frankfurt School of Finance and Management. 2017.

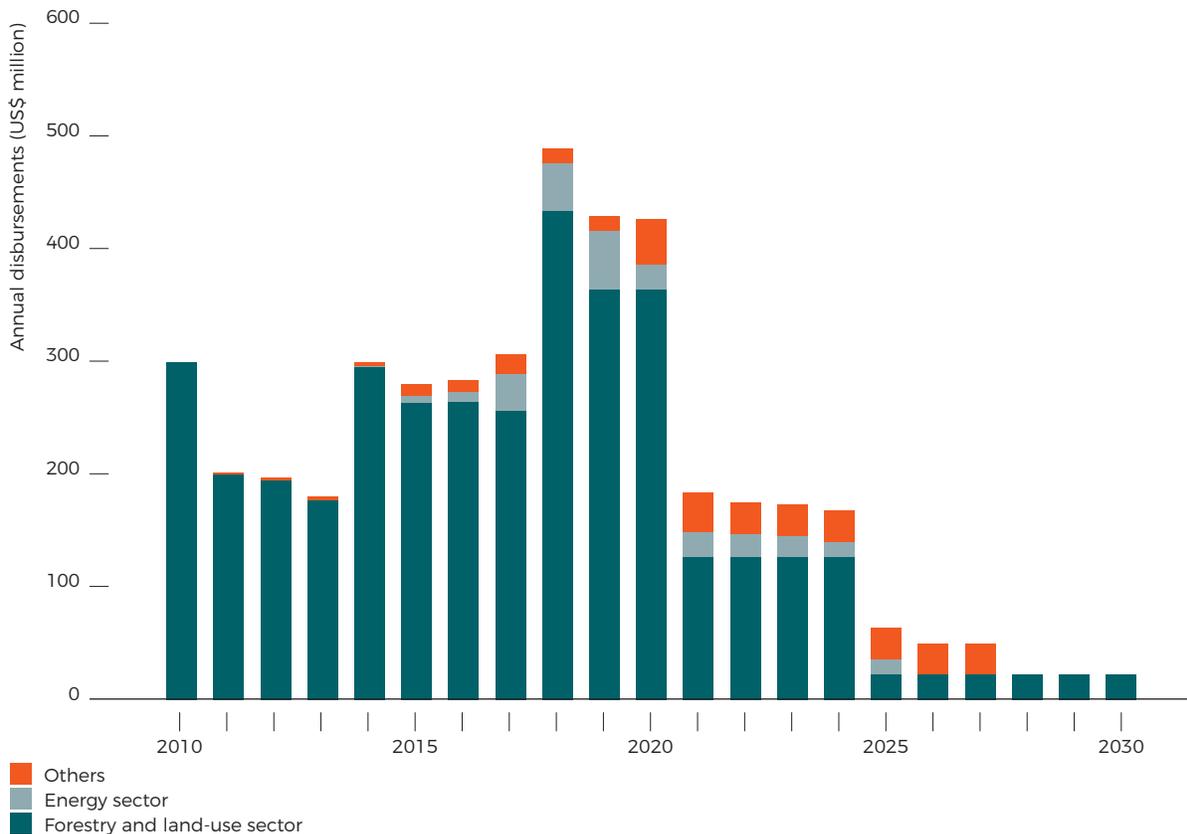
Figure 14: Example of a RBCF mechanism for residential solar power systems⁸⁹



An interesting feature of RBCF is its flexibility as a design element. It can be combined with other financial instruments—such as upfront grants, loans, or guarantees—and be a vehicle for delivering the funding associated with those financial instruments.⁹⁰ As such, RBCF does not compete with existing financial instruments but rather can complement them. This feature makes it difficult to accurately determine how widely applied the

RBCF approach is in the various climate change mitigation actions implemented around the world. However, as seen from Figure 15, RBCF is already well established in the forestry and land-use sector as the annual disbursements by the 12 largest RBCF funds globally are forecast to reach almost US\$500 million in 2018 (the decline in future disbursement is due to the respective funds' lifespan).

Figure 15: Estimated disbursements from the 12 largest RBCF funds⁹¹



⁸⁹ Source: World Bank, Ecofys, and Vivid Economics. 2017.

⁹⁰ Source: World Bank and Frankfurt School of Finance and Management. 2017.

⁹¹ Source: World Bank, Ecofys, and Vivid Economics. 2017.

By encompassing a full cycle of structural change from inputs to results, RBCF has demonstrated its ability to facilitate carbon pricing and market building, support policy process to achieve NDCs, and leverage private sector activity and financing.⁹² As highlighted in Section 1.1, while the crediting approaches that are at the center of this report focus on GHG emission reductions as the outcome, the use of different metrics (i.e., other than tons of GHG emissions), demonstrated by RBF in other sectors, could provide larger flexibility for cities and influence a broader range of policy levers and actions. Such policy levers and actions are critical to the adoption of low-carbon urban development pathways, for example urban planning, CUD, TOD, deep decarbonization of urban energy supply, and new infrastructure for electric transportation. Including other metrics can also help incentivize adaptation actions to improve urban resilience.

Besides exogenous factors such as demand for mitigation outcomes, the finance delivered through crediting approaches have some distinctive features that differentiate it from other conventional types of finance such as loans and grants. Therefore, the analysis of the first generation of crediting instruments, and most notably of the CDM, presented in the next section can help define when, why, and how crediting approaches may be suitable. Understanding these features is important for the subsequent discussion on the appropriateness and potential impacts of crediting approaches to support urban mitigation at scale.

4.2. Why the first generation of crediting mechanisms had a limited success to deliver in cities

The first generation of crediting instruments, with the CDM being the largest, was unable to support urban mitigation at any sensible scale, and the number of urban programs supported was limited (see Box 3). Understanding the reasons behind this can help determine what needs to change in the new mechanisms that use crediting approaches—including under Article 6 of the Paris Agreement—to unlock the mitigation potential in cities.

The limited success of the CDM to deliver in cities stems from some inherent limitations of this Kyoto Protocol flexibility mechanism, which were further amplified by the complexities and challenges of implementing urban mitigation, in particular:

- ▶ The complexity and regulatory uncertainty of the evolving rules of the mechanism.
- ▶ The strong focus on technology-based interventions and exclusion of broader sectoral or policy crediting.
- ▶ The marginal abatement perspective as the main rationale behind crediting.

Box 3: Urban CDM—Numbers and examples⁹³

As of end of March 2018, the CDM has successfully witnessed the registration of over 7,800 projects and has issued just under 2 billion CERs. However, out of those CDM registrations, just over 500 projects are likely to reduce emissions from cities, and they issued close to 109 million tCO₂e. That represents about 7 percent of the number of CDM projects and 6 percent of the generated reductions.

Out of the 533 projects registered in the CDM that likely reduce emissions from cities, 369 are landfill projects, showing the concentration of the CDM on one urban sector (solid waste management). The gap in urban coverage becomes more glaring when examined from a mitigation perspective: of the 109 million tCO₂e that came from projects likely to address urban mitigation, only 7.9 million tCO₂e (less than 0.5 percent of the total issued CERs) came from sectors other than landfills.

⁹² World Bank and Frankfurt School of Finance and Management. 2017.

⁹³ Based on analysis of the UNEP DTU CDM pipeline (<http://www.cdmpipeline.org/>), accessed 10 April 2018.

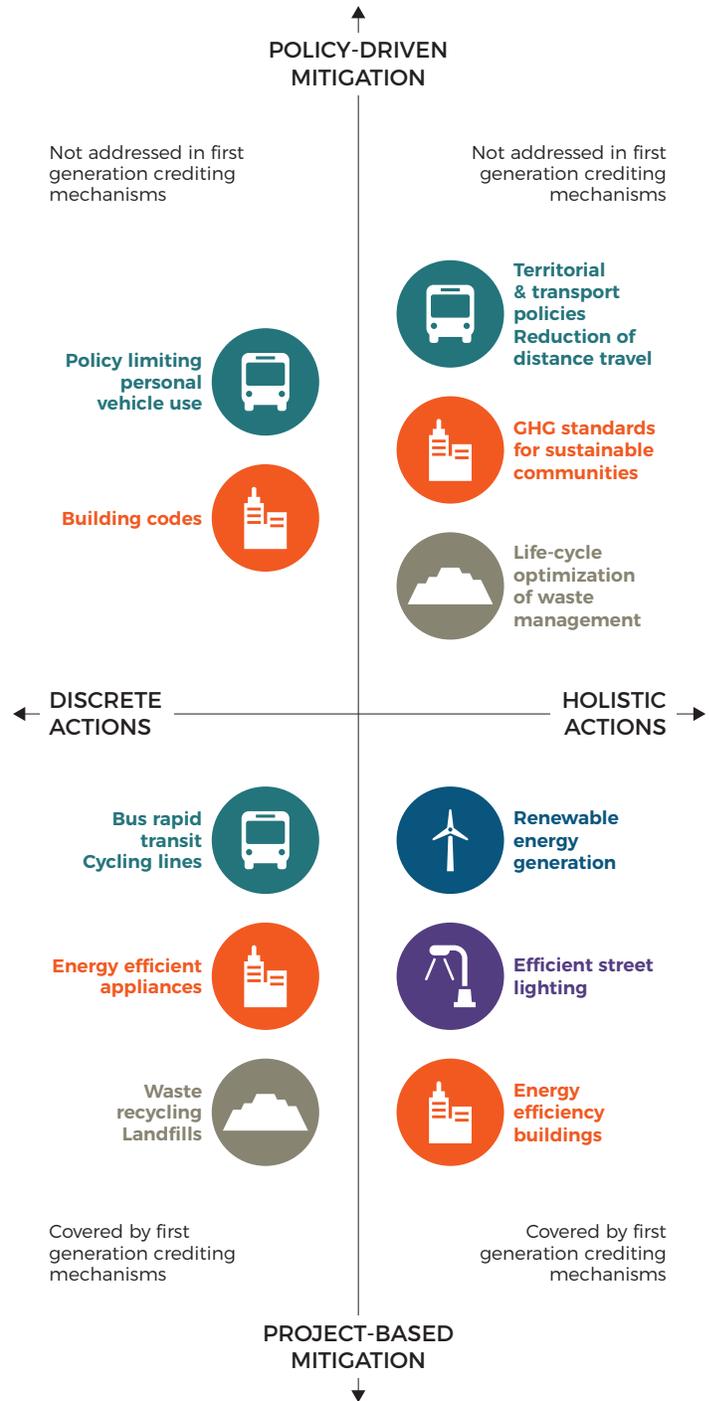
Figure 16: First generation crediting mechanisms: Focus on technology-based intervention and exclusion of sectoral and policy crediting

- The limited capacity of ex post payments associated with crediting to directly contribute to overcoming investment/financial barriers.

Complexity and regulatory uncertainty of the evolving rules of the mechanism. The CDM has been associated with regulatory complexity and uncertainty and heavy data requirement, resulting in high transaction costs.⁹⁴ Regulatory risks and restrictive eligibility requirements of crediting (e.g., financial additionality) reduced the predictability and attractiveness of carbon finance to local authorities and private service providers.

These high transaction costs tended to skew projects toward large, single-installation projects with high emission reduction volumes, comparatively simple MRV, and hence lower transaction costs.

Focus on technology-based interventions and exclusion of sectoral and policy crediting. Under the CDM, the methodological approaches to calculate emission reductions from an activity rely to a large extent on real measurement at facilities. This is hardly feasible for typical urban low-carbon policy measures, such as TOD, introduction of optimized mass transit transportation options, incentives to reduce waste generation at the consumer level, and establishment of building codes. This is largely because of the highly dispersed sources of emissions, such as multiple individual buildings or vehicles, and the small mitigation outcome of individual actions, for example, a single trip by one passenger. The methodologies developed under the CDM could not accommodate the complexities, data limitations, and lower level of accuracy linked to the evaluation of consumers' behavior changes. They also did not resolve the issue of the attribution of the mitigation impacts. This question is especially relevant for policy-driven actions, which were not addressed by the CDM in general, including for cities, as shown in Figure 16.



⁹⁴ Source: Ecofys and Climatekos. 2013. *CDM Market Support Study*. For Kreditanstalt für Wiederaufbau.

An important attempt to improve the CDM included the expansion of rules to include PoAs to accommodate a combination of several types of mitigation actions, for example, using different methodologies under a common PoA umbrella (see Box 4 for an example of a PoA).⁹⁵ As such, the PoA approach allowed the design and implementation of citywide approaches to carbon finance. Cities had the flexibility to combine relevant technology options across different sectors given their financial and institutional capacities, thus lowering the transaction and administration costs that would otherwise have been incurred to set up individual carbon finance projects.

However, while PoAs enabled the replication of predefined sets of similar measures, they did not address policy-driven mitigation where the exact mitigation measures and outcomes are not known *ex ante*. First-generation crediting mechanisms did not explore how to credit regulation/policies due to the difficulties in accountability and attribution of the impacts of these integrated measures, which are much more complex than clearly defined single supply- or demand-side efficiency projects with relatively small coverage (i.e., with limited potential to achieve the sectoral-level, transformational impacts). Under the CDM, this led to a prioritization of project-based measures that credit technical interventions (i.e., fuel switch, improvements in specific energy performance solutions in a building).

Rationale for crediting based on marginal abatement perspective. The CDM, as a market mechanism, was driven by marginal carbon abatement costs (MAC) and transaction costs minimization, and focused on the outcomes expressed in the GHG emissions metric. This meant a technology and installation-based focus, with mostly standalone projects in a single or a small

set of installations. Therefore, despite their ability to incentivize lower carbon choices of individual systems operators (e.g., in power supply, district heating efficiency, or building energy performance), CDM projects often lacked alignment with broader policy objectives of cities, and were rarely integrated at earlier stages of urban planning to support sectoral policies that create demand for low-carbon investments.

Despite the requirement to contribute to the sustainable development of the host country, carbon finance flows under the CDM had limited ability to account for and reward some of the important associated co-benefits of mitigation programs that directly contribute to the achievement of key urban developmental priorities and objectives (see Section 3).

This led to low implementation sustainability, a shortage in deployment, participation barriers, and limited use of available carbon finance resources. The main implementing agents for the CDM projects in cities were private investors and/or utilities prioritizing relatively small investment activities with low scalability. Although PoAs allowed for broader, larger programs that enabled economies of scale, their focus remained on maximizing emission reductions while minimizing costs.

Ex post payments not directly contributing to address investment/financial barrier. The revenues from the sale of project-based carbon credits were not designed to directly address the up-front capital investment needs as payments for emission reductions were typically available upon the demonstration of the mitigation results, during a project's operation. The so-called advance payments, which were disbursed up front in some CDM projects, represented a fraction of the expected overall amount of carbon finance and were essentially used to ensure the regulatory compliance of CDM projects and PoAs and set up the necessary MRV systems, and not to cover investment costs.⁹⁶

95 The World Bank was instrumental in supporting the development and piloting of the PoA approach. In the urban space this idea was relevant to design an innovative, holistic city-wide approach pursued by Amman municipality in Jordan (Green Growth program of the City of Amman) at the time of the introduction of the PoA approach. Today, the Great Amman municipality, with the support of the World Bank and its Carbon Partnership Facility, continues its pioneering efforts and works on designing and piloting a mitigation program under the new generation of crediting approaches under the Paris Agreement.

96 In addition to structural risks.

Box 4: Egypt Vehicle Scrapping and Recycling PoA⁹⁷

The Egypt Vehicle Scrapping and Recycling PoA is part of a national program where owners of taxis, buses, minibuses, and trailer trucks voluntarily surrender their old vehicles for managed scrapping and recycling in exchange for financial incentives used toward the purchase of new vehicles. The scrapping and recycling program is currently limited to taxi vehicles in the Greater Cairo Region, but there are plans to expand to other regions and vehicle types. All replacement vehicles are pre-approved by the government, in agreement with car dealers for cars that are manufactured or assembled in Egypt. The Ministry of Finance designed the project and collaborated in parallel with the World Bank's carbon funds to develop a PoA where the Ministry of Finance sells carbon credits for reduced emissions to the Carbon Partnership Facility.

Since 2008, Egyptian traffic law states that owners of mass transport vehicles older than 20 years cannot get new or renew their operating licenses. The law was designed to get old taxis off the streets to reduce GHG emissions, improve air quality, and decrease traffic accidents. Because the law did not specify how eligible vehicles were to be disposed of, owners could choose to sell their vehicles in regions where the law did not apply, convert their vehicles to private use (private vehicles are not affected by the law), or dismantle their vehicles and sell the engines for use in other vehicles. Without a scrapping and recycling program that encouraged older vehicles to be taken off the road and ensured that vehicle components were permanently (and safely) disposed of, the law would not have had its intended impact on safety, air quality, and GHG mitigation. The carbon finance revenue stream helped the Egyptian government get this first-of-its kind program off the ground. The World Bank provided an advance payment to the ministry to create data monitoring and management infrastructure. Future carbon payments will help finance the monitoring system throughout the lifetime of the program.

As a result of the PoA, more than 46,000 new taxis have replaced aging taxis in Cairo alone, some of which were over 50 years old. This represents over 90 percent of Cairo's taxi fleet. This has reduced accidents and emissions of

PM10 and other pollutants affecting air quality and human health. The equivalent of over 311,000 tCO₂ was avoided between 2013 and 2017 as a result of the program. Since all participating vehicle models must be assembled locally, the program also acts as an economic stimulus program, supporting the local auto industry. The Egyptian Ministry of Finance is planning to start the next phase of the program with an expansion to other areas outside of Greater Cairo.

The one-stop-shop created by the Ministry of Finance to manage the program is innovative and the key to its success. It streamlined the process for scrapping and replacing taxis and forced stakeholders to collaborate. It was paramount that taxi drivers not be without their source of income for too long, as that would discourage them from applying. By reducing the time between surrendering the old vehicle and receiving a new taxi to 5–7 working days, the process is not too cumbersome. The efficiency of the one-stop-shop and the incentives that the Ministry of Finance provided resulted in a great success, to the point where the scrapping site was overwhelmed.

The Ministry of Finance is authorized to disburse a subsidy of up to EGP 5,000 (US\$280) per eligible surrendered vehicle. The entire transaction takes place in one location, where bank representatives assist with loan applications and where the Ministry of Interior inspects old vehicles and issues registration documents for new cars that are available to be picked up onsite. Each stakeholder plays an important role in the program: the Ministry of Finance oversees the program, provides payments to old vehicle owners, guarantees loans against default, pays the vehicle sales tax, exempts customs duties on imported car components, and maintains the project database. The Ministry of Interior provides land for the scrapping facility and manages the vehicle inspections and licensing of new taxis. Four banks provide low interest loans. Five car dealers provide vehicles at a discounted rate, install meters, paint exteriors, and provide a 3-year warranty and maintenance. An insurance company provides insurance against all standard causalities (theft, fire, accidents, etc.).

97 CPF Fact Sheet, no date. *Egypt Vehicle Scrapping Program*.

Box 5: Caixa Solid Waste Management CDM PoA⁹⁸

Caixa Solid Waste Management CDM PoA provides both technical and financial assistance to the Brazilian municipalities to scale up the use of landfill gas collection systems and renewable energy generation technologies. Caixa Econômica Federal (Caixa) is the main agent of public policy for the Brazilian federal government and the second largest public bank in Latin America. Its network, the largest in Brazil, covers all 5,564 Brazilian municipalities with more than 17,000 service points. Caixa is involved in financing public infrastructure construction, mainly focused on sanitation, allocating resources to states and municipalities. Caixa also acts as a broker for federal government funding for the public sector. While Caixa is primarily a banking institution, it has developed the capacity to provide technical advice to its borrowers. Most of the municipalities in Brazil have limited capacity to prepare concession processes, deal with issues related to waste pickers, process environmental licensing, and conduct concession processes. From 2013–2018, the three projects under the program have collected and flared over 150 million m³ of methane, the equivalent of over 3 million tCO₂, reaching its emission reduction target several years ahead of schedule.

Financial innovation. The PoA introduced several innovative financial features from the onset, including the use of a strong sophisticated national financial intermediary (Caixa), the integration of carbon finance into the existing practices of the national financial intermediary, and the incorporation of the carbon finance performance into the definition of the financial cost faced by the municipalities and operators (blending of financial tools) as well as into the World Bank Group lending operation. To encourage

project developers of different levels of credit worthiness and technical capacity to join the PoA, Caixa considered various financing options. These included using the CER revenue from the CDM activities to reduce the interest rates and as partial guarantee for the loans.

Strong financial intermediary. The length of administrative and processing time at the level of the financial intermediary/national program coordinator may become a typical issue for programmatic approaches and may come on top of regulatory length and risks associated with the carbon finance requirements. An arbitrage is necessary between the advantages of the “one window approach,” such as used in this PoA, and the potential delays to operationalize this approach. The choice of an appropriate counterpart or a dedicated early effort to build readiness becomes critical. Such a counterpart is also able to get the incentive scheme operational on time to keep commercial and political momentum at the beginning of the operation to help mobilize response and adherence of targeted implementing entities to the program.

A pipeline of projects. The level of preparedness of the targeted portfolio of subprojects at the outset of the operation can be an issue for programmatic approaches. This is relevant to any future sectoral-level mitigation programs. A higher clarity on the subprojects can help better define the size of resources to be mobilized for the operation. At the same time, it may require mobilization of potentially significant preparation resources and could defy the purpose of the programmatic approach that allows for the progressive inclusion of activities.

In theory, carbon finance as a guaranteed source of return could create the conditions needed for mitigation activity implementers (developers) to approach lenders to secure the necessary up-front financing, based on the expected future revenues. In reality, this was rarely the case under the CDM/JI as both lenders and developers generally lacked experience with concrete carbon finance programs to allow for accurate costs and returns analysis, and accounting for the various risks.⁹⁹ Under the CDM, CERs were mostly deemed as

risky assets to many investors given the high uncertainty of actual CER generation (often lower than estimates in CDM project design documents), mainly due to CDM complex procedures and technical and regulatory uncertainties. These risks were compounded by uncertainty around CER prices due to market fluctuations. The Caixa Solid Waste Management CDM PoA is a good example of how an innovative financing structure leveraging expected CER revenues secured up-front payment (see Box 5).

98 Source: Own analysis and UNFCCC. PoA 6573: *Caixa Econômica Federal Solid Waste Management and Carbon Finance Project*. https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/Q9LW74OKAXMUZPCE3IJBVS16025HDT, CPF Fact Sheet, no date. Caixa Landfill and methane capture PoA.

99 Source: World Bank and Frankfurt School of Finance and Management. 2017.

For cities, sectors that hold important mitigation potential, such as transport or TOD, are likely to be caught by the initial financing barrier as their mitigation actions are often capital-intensive and associated with high MRV costs under the first generation of crediting mechanisms. The financing barrier is also exacerbated in poor countries that face scarcity of long-term capital for project implementation and gaps in the enabling business environment that would be critical for a successful (and sustainable) investment. Securing sources of funding—both equity and debt finance—sufficient to meet capital investment for mitigation measures has proved to be a major constraint in advancing projects, and is reflected in the fact that 87 percent of CDM projects are located in four of the largest emerging economies (China, India, Brazil, and South Korea).¹⁰⁰

4.3. How scaling up urban crediting approaches impacts risks

Section 4.2 highlighted that to have a transformational impact in cities, urban programs using crediting approaches need to go beyond a project-based, technology-focused approach. This section examines how the risks of crediting approaches would evolve for each of the three scaled-up options defined in Section 3.1.4 and summarized in Figure 12 (i.e., replicating discrete measures at [sub-] sectoral level, broadening scope of action to interconnected sectors, and focusing on policy levers that lead to transformational impacts in cities).

The risk profile of interventions using crediting approaches in cities relates to both the characteristics of urban mitigation and the crediting approach itself. A summary of the level of these risks for each of the three scaling-up options is proposed in Table 3, and these risks are further discussed in

Sections 4.3.1 and 4.3.2. Risks are defined here as factors that might impact the ability of the recipient to deliver emission reductions of quality (i.e., that represent real emission reductions and maintain the environmental integrity of the instrument), in quantities as were planned, and as per the agreed schedule and costs.

4.3.1. Risks related to the use of crediting approaches

Institutional capacity: Risk associated with the requirements for both the finance recipient and provider to design and implement a credible intervention using a crediting approach as per a pre-agreed set of rules and planning. These requirements include capacity for technical/economic planning and managerial capacity to map out meaningful mitigation goals and achieve them, overcome the barriers of vertical/horizontal coordination, and align incentives. The recipient needs to be able to establish climate action plans and implementation strategies (e.g., mitigation trajectory and/or carbon budget and link with the NDC coverage) and a robust and transparent system against which payments can be made (e.g., performance metrics, delivery milestones).

As discussed in Section 3, scaling up mitigation action typically requires the involvement of a larger set of actors. As a result, the institutional setting becomes more complex, and may require the creation of an implementation or coordinating agency for the activities supported by the crediting intervention. This brings up the risk insufficient institutional capacity. This risk increases with the complexity of the interventions supported by crediting, the level of vertical/horizontal coordination required for implementation, and the length of delivery periods. This institutional capacity risk may also increase in the case of limited technical support and should be assessed at the different stages of program development.

100 Source: UNEP DTU CDM pipeline, <http://www.cdmpipeline.org/>, accessed 10 April 2018.

Table 3: Scaling up urban mitigation: the impact on crediting and urban risks

		Replicating discrete measures at (sub-) sectoral level	Broadening scope of action to interconnected sectors	Focusing on transformational actions
Crediting risks	Institutional capacity: ▶ Capacity requirements to design and implement a credible intervention to deliver results as per pre-agreed set of rules and planning	 Low-Medium	 Medium-High	 High
	Aggregation: ▶ Capacity to deliver pre-agreed mitigation outcomes within expected timelines and manage associated performance risks	 Low	 Medium	 High
	Regulatory risks: ▶ Compliance risk in relation to pre-agreed regulatory requirements and rules of crediting approaches	 Low	 Medium	 Medium-High
	Monitoring: ▶ Ability of the recipient to measure, monitor, and verify results in a robust and transparent way.	 Low	 Medium	 Medium-High
Urban risks	Planning uncertainty: ▶ Risk associated with deviations from the pre-agreed implementation plans	 Low-Medium	 Medium-High	 High
	Extended delivery periods: ▶ Performance risk associated with the length of the period required to achieve mitigation impacts at scale	 Low-Medium	 Medium	 High
	Vertical/horizontal coordination: ▶ Required amount of vertical/horizontal coordination between sectoral, municipal, and/or metropolitan and national institutions	 Low	 Medium	 High
	Financial and investment barriers: ▶ Risk associated with the limited access to finance to implement the mitigation activity	 Medium-High	 Medium-High	 High

It is also important to recognize that institutions in lower income countries, which are often the ones urbanizing the fastest, typically have the lowest capacity to use these financing instruments effectively. This reality underscores the significant amount of effort needed to build capacities and ensure pragmatic governance and institutional solutions.

Aggregation: Risk associated with the capacity to deliver pre-agreed upon mitigation outcomes within expected timelines and manage associated

performance risks of a targeted set of mitigation measures, including multiple technologies, interventions, and policies within and/or across sectors. The aggregation of activities and/or their cross-sectoral nature can increase performance risks, which are closely linked with planning uncertainty and extended delivery periods. Nevertheless, if well designed, aggregation can also ease risk management through portfolio management, for example, through an appropriate flexible incentive structure and an appropriate mix of activities with different risk profiles and schedules.

In the case of broadening interventions across sectors, such as the development of low-carbon sustainable communities (including building construction, water supply, transportation solutions, and municipal service provision), more complex planning solutions and a higher level of vertical and horizontal coordination may be required. The lead time to deploy the activities and demonstrate achieved results in terms of energy savings or emission reductions may also increase. Therefore, the associated risks may be significantly higher compared to the replication of discrete activities, and aggregation may come at the cost of increased complexity and coordination/integration for the recipient of funds delivered through crediting approaches. However, aggregating the different risk profiles—technological, financial, and carbon intensity—of covered mitigation actions may also allow for the diversification of performance risks and give more flexibility to achieving pre-agreed aggregate results (i.e., the community carbon footprint).

Regulatory risks: Risk associated with the design of and compliance with the pre-agreed upon eligibility requirements and rules of the crediting approaches and the required standards and protocols.

For example:

- ▶ **Compliance with methodologies** to quantify ex ante the emission reductions expected from the supported program/policy and to monitor the achieved emission reductions ex post. The regulatory risks are associated with the complexity of methodologies and their changes over time, and the capacity to duly implement monitoring and reporting requirements (see also monitoring risk, below). Noncompliance with methodologies, such as a design not covered by the methodology or development of inappropriate baselines, can lead to under- or over-quantification of mitigation outcomes. In the former case, it may have a direct, negative impact on the revenues expected from the crediting approach for the recipient, as the technology or policy might not generate as many mitigation outcomes as anticipated. In the latter case it can put at risk the environmental integrity of the intervention if the baselines are set higher than the emissions level that would occur in the absence of the crediting approach. This risk is exacerbated for the mitigation programs in the rapidly growing cities in developing countries. In such cases, baseline emissions may continue to grow significantly before reaching the peak or plateau to satisfy the increasing needs in energy accompanying urban development. In the short term, the main impact of mitigation programs may be demonstrated in terms of reduced carbon intensity of activities, and in the longer term in absolute emission reductions or avoided emissions.
- ▶ **Double counting:** Risk related to the inconsistent definition of boundaries due to the lack of appropriate accounting boundaries when quantifying emission reductions, robust registries and tracking systems, and procedures to account for transfers of emission reductions.¹⁰¹ For the crediting approaches used under the market mechanisms of Article 6—implying international transfers of mitigation outcomes—and where the urban mitigation programs cover sources that are included within a country's NDC, there is an additional risk of over transferring emission reductions to another country. This risk can jeopardize the country's achievement of its NDC. It can be managed through a combination of different approaches to baseline setting and/or to restricting the transfer of GHG reductions,¹⁰² which requires coordination between the local and national governments.
- ▶ **Attribution:** Risk associated with the attribution of emission reductions to specific policies and actions in presence of broader (complementary) national policies. In case of horizontal/vertical policy interactions and overlaps, both the provider and recipient may have limited ability to manage the attribution of outcomes to a crediting-supported intervention.

¹⁰¹ Source: Partnership for Market Readiness (PMR). 2017.

¹⁰² Source: Partnership for Market Readiness (PMR). 2017.

Monitoring: Risk related to the ability of the recipient to measure, monitor, and verify results in a robust and transparent way. In practice this risk may be associated with several factors, including:

- ▶ Poorly defined performance metric or delivery milestones against which to disburse additional revenues using crediting approaches.
- ▶ Complexity of the methodological approaches that prevent the recipient from implementing monitoring in due form and may result in lower levels of verified results; this risk is inherently linked with the regulatory risks.
- ▶ Inappropriate monitoring system, faulty monitoring equipment, or misuse of the monitoring equipment.

4.3.2. Urban risks

Based on the discussion of challenges and gaps of mobilizing urban mitigation at scale presented in Section 3, this section looks at the main risks associated with the use of crediting approaches by cities specifically.

Planning uncertainty: Risk associated with possible delays at the start, or other deviations from the pre-agreed implementation plans for the mitigation measures. As for the institutional capacity required for the intervention supported by crediting approaches, reducing planning uncertainty requires the development of sustainable climate action plans and efficient implementation strategies, but also the capacity to deliver—e.g., to secure construction permits on time or build a transport infrastructure. This risk increases with the complexity and level of vertical/horizontal coordination required to implement the activity and with the extended delivery periods.

Extended delivery periods: Risk associated with the performance of mitigation measures over the period of time that is required to achieve mitigation impacts at scale. The performance of mitigation measures is influenced by legal (e.g., operation permits), technical/commercial (e.g., delays in construction, underperformance of equipment, failure, environmental disaster, insufficient demand for the product), and capacities (e.g., to plan, build, and operate the equipment). This risk increases for mitigation programs that include numerous mitigation measures and/or measures that are implemented over a long period of time. The longer, extended delivery period to deploy, implement, and demonstrate the mitigation outcomes means longer exposure to uncertainty in terms of delivery performance. This may induce the escalation of other risks.

Vertical/horizontal coordination: Risk associated with the need to ensure vertical/horizontal coordination between different sectors, municipal and/or metropolitan institutions, and national institutions. This may lead to delays and weak performance of the activities. This risk may be particularly high in the context of city-level actions, including where cross-sectoral or transformative actions are targeted (see Section 3.2.2).

Financial barrier and investment risk: Risk associated with the limited access to finance to implement the mitigation activity. The crediting approach alone is not well suited to reduce this type of risk that would remain comparable to the situation without the revenue stream mobilized via a crediting approach, unless the financial institutions are ready to accept these future revenue streams as collateral for the future repayments.

4.4. Summary

The first generation of international crediting mechanisms provides insights into what future crediting approaches under the Paris Agreement will need to address, both from a design and a capacity perspective. Such instruments will need to:

- ▶ Keep rules simple and predictable while ensuring environmental integrity.
- ▶ Enable a scale-up from technology-based interventions to sectoral and policy-driven actions.
- ▶ Be combined with continuous support to capacity building to help planning and development of implementation strategies, and bring projects/interventions to investment readiness.
- ▶ Prioritize interventions with reasonable (urban) risks, well embedded with other urban development priorities and avoid short-term choices that may prevent achieving scale.

The move from technology-based interventions to sectoral and policy-driven actions is crucial to scale up mitigation in the urban context. The level of scaling up will affect the risks borne by both the recipient and provider of finance, and their ability to deliver the planned emission reductions (i.e., inter alia quality, quantity, schedule, costs). These risks include crediting risks (institutional capacity, aggregation, regulatory risks, and monitoring) and urban risks (planning uncertainty, extended delivery periods, vertical/horizontal coordination, and financial and investment barriers). The high level assessment of the risk profiles for the various scaling-up options for urban mitigation

shows that crediting approaches are likely to be more appropriate and feasible to support urban climate actions that prioritize and focus on the replication of discrete measures at (sub-) sectoral level (e.g., end-of-pipe mitigation options such as building retrofits or street lighting) and on interventions with a broader scope of action, including in the interconnected sectors (e.g., low-carbon communities and distributed renewables in the building sector). Wider transformational interventions, such as CUD and TOD, call for a substantial revisit to the way crediting approaches can be combined with other sources of financing for cities. Without such an integrated, strategic approach to financing, covering the entire lifecycle of structural change and the policy process to support the long-term delivery of results, transformational interventions are likely to be more effectively supported by another type of mechanism.

Section 5 examines how these insights from the past can be translated into preconditions for the effective use of crediting approaches in cities.

5. PRECONDITIONS FOR THE EFFECTIVE USE OF CREDITING APPROACHES IN CITIES IN THE CONTEXT OF THE PARIS AGREEMENT

This section suggests preconditions for the effective use of crediting approaches in cities. The preconditions build on the findings of the previous sections, most notably the new impetus given to crediting approaches and urban mitigation by the new architecture of international collaboration under the Paris Agreement, the increasing availability of tools that enable cities to quantify emissions and emission reductions, and the lessons from previous use of crediting approaches (see Figure 17).

One overarching precondition for the success of crediting approaches is demand for the mitigation outcomes that are generated (demand for credits for carbon finance and willingness to pay for results in the form of emission reductions for climate finance). Both the upcoming rules for the implementation of the Paris Agreement, including Article 6, and countries' roadmaps for implementing their NDCs will shape how these mitigation outcomes can be used. This report assumes that the drive for

Figure 17: Preconditions for effective use of crediting approaches in cities in the context of the Paris Agreement



increased ambition under the Paris Agreement will contribute to creating demand for the mitigation outcomes, and that countries will put measures in place to avoid the double counting of these mitigation outcomes when international transfers of these outcomes occur.

To ensure effectiveness and efficiency, and to maximize their impact on urban action, the new crediting approaches for cities will need to be designed and implemented so as to:

1. Ensure an appropriate incentive structure
2. Go beyond technology-based interventions
3. Complement other climate-related and broader sectoral policy and financial instruments
4. Be embedded from the planning stage onwards
5. Mitigate and distribute risks
6. Plan for the future

These preconditions are an attempt to identify some of the questions to consider when designing new crediting approaches, including through Article 6 of the Paris Agreement, rather than a direct input to inform the design of the rules governing these crediting approaches.

5.1. Ensure an appropriate incentive structure

For some mitigation measures, crediting approaches should continue to provide a financial incentive (or carbon price signal) to private investors, directly or through financial intermediaries and blended financial instruments, and help in the efficient allocation of financial resources.

The direct financial incentive provided by the use of crediting approaches has demonstrated its efficiency for investment programs with a relatively low level of up-front capital investments—for end-of-pipe mitigation options (e.g., demand-side energy efficiency), or for options with rates of return close to the market expectations. This type of leverage

would probably remain the most effective in stimulating efficiency and innovation, and to bring in private sector investments.

Section 3 showed that the end-of-pipe mitigation options in the urban sectors account for a large share of the urban mitigation potential. These sectors include buildings, lighting and appliances, and some measures in transport and land use that do not imply heavy infrastructural investments, e.g., actions to shift mobility patterns such as parking restrictions, building of pedestrian walkways, and introduction of bike lanes. For these interventions, the incentives provided by the crediting approaches can effectively impact the investment choices and practices of individual system operators, and therefore leverage private or public-private investments. For example, based on the estimates by the New Climate Economy report, investments in energy efficient appliances and lighting in the residential and commercial buildings have short payback periods of 0.2 to 1 year, respectively. In the transportation sector, the shortest payback period of 4.5 years can be obtained for vehicle efficiency and electrification.¹⁰³

When designing interventions in urban sectors supported through crediting approaches, it is important to consider limitations that can be associated with prioritizing policy interventions with reference exclusively to financial returns and MAC.¹⁰⁴ For example, MAC models usually show that the up-front costs of energy efficiency measures in urban environments are more than offset by the present value of the lifetime energy savings. However, energy efficiency measures are notoriously hard to implement and finance at scale. This is due to hidden costs, including the transaction costs of developing a project or activity, closing finance, obtaining permits, and applying for grants. Other emerging approaches can be used to reflect transaction and policy costs that aim to

¹⁰³ These estimates are based on the aggregate data and are cumulated between now and 2030. Meanwhile, they are consistent with the estimates used by SEI for the evaluation of sectoral mitigation impacts referred to in Section 3.

¹⁰⁴ MAC curves are bottom-up models that are used to simulate the cost and potential of emission reduction measures associated with a climate change mitigation policy.

provide a more comprehensive assessment of the real costs faced by the investors and the impacts that policies may have on their investment choices and entrenched behavior.¹⁰⁵

The scaling up and prioritization of interventions using crediting approaches based exclusively on mitigation outcomes may also be less appropriate, in particular for urban authorities, since they ignore local environmental and co-benefits associated with mitigation actions. This includes building urban resilience, which is an important component of urban oriented action in the NDCs, improving air quality, job creation, etc. As mentioned in Sections 4.1.2 and 6.2, the use of different metrics for the outcomes can bring in additional benefits.

5.2 Go beyond technology-based interventions

Crediting approaches should be flexibly designed to support different types of—and relevant combinations of—mitigation policies and actions, beyond technology-based interventions.

In the urban context, the capacity of crediting approaches to support policy actions seems to be particularly relevant and should be further explored and piloted. As highlighted in Section 3, policy and regulation initiatives are key elements in realizing the mitigation potential within cities of different types and maturities. Rationale to support policy actions through crediting includes:

- ▶ Incentivize the setting of more ambitious objectives for urban climate action.
- ▶ Improve policy enforcement and performance tracking.
- ▶ Create a sustainable enabling environment for private investments, in particular by providing economic value to GHG reductions through carbon pricing.

For example, the financial support mobilized through crediting could encourage effective implementation of new building energy efficiency codes by rewarding emission reductions generated through an improved aggregate energy/GHG performance per major category of buildings. Instead of providing direct financial support to the investors (project subsidies or fiscal rebates) or in addition to such support, the incentive scheme could be designed to tackle major obstacles to the implementation of new building codes, therefore maximizing impacts on the investors choices and stimulating demand for compliance. For example, crediting approaches could deliver funds to cover the costs of market facilitation (accompanying measures) (see the example of the Building Energy Efficiency Policy Reforms in Morocco in Box 9 in Section 6.1.3), in combination with the support to municipalities to cover the costs of monitoring policy performance and GHG impacts (MRV of policy impacts).

5.3. Complement other climate-related and broader sectoral policy and financing instruments

Crediting approaches should be used in combination with other climate-related and broader policy and financing instruments and be part of the urban policy processes to have transformational impacts.

Climate-related policies are part of a broader policy and investment framework that covers economic and social development goals established at the national or subnational/city levels. Therefore, an isolated, carbon-focused optimization of a scaled-up mitigation portfolio may not be most attractive and should be aligned with other priorities to facilitate both effective operational and institutional design, and to mobilize sustained political support.

¹⁰⁵ World Bank. Forthcoming. *Aligning investor's perspective with the energy efficiency targets in the Moroccan building sector. Strategies for the implementation of Morocco's NDC.*

For crediting approaches to mainstream climate actions in cities and facilitate transformational impacts, the supported interventions will have to be part of the urban planning, design, and ultimately project financing process. This will require developing a framework that includes the planning process, elements of which are discussed in Section 5.4.

A more comprehensive cost-benefit analysis that reflects multiple benefits (for health, local pollution) and incorporates longer term policy perspectives—such as the alignment with the urban low-carbon and resilient transition at the stage of urban planning—could result in a different portfolio of actions. A combined use of financing provided through crediting with other financial resources could also contribute to reducing the financing barrier and improving leverage of the overall efficiency of public spending on climate actions (including by maximizing private investment). Such a holistic approach could, for example, provide better support to mitigation policies in urban transport that would otherwise be placed on margins due to a higher range of abatement costs. To succeed in scaling up urban mitigation, the discrepancy between the ambition to scale up and the rationale of carbon finance “at the margin” should be reduced.

The use of broader prioritization criteria for the allocation of carbon and climate finance should nevertheless take into account the potential increase in complexity of targeted interventions and possible implications for the overall cost efficiency of selected programs. Mitigation options would most often offer some form of economic and financial return (through energy savings or value capture) that can be required to incentivize private sector engagement. Other options, for example, with a stronger adaptation/resilience component may essentially be pure cost centers and may require different (economic) cost evaluation approaches and financing solutions. Specifically, under international market mechanisms, the inclusion of other co-

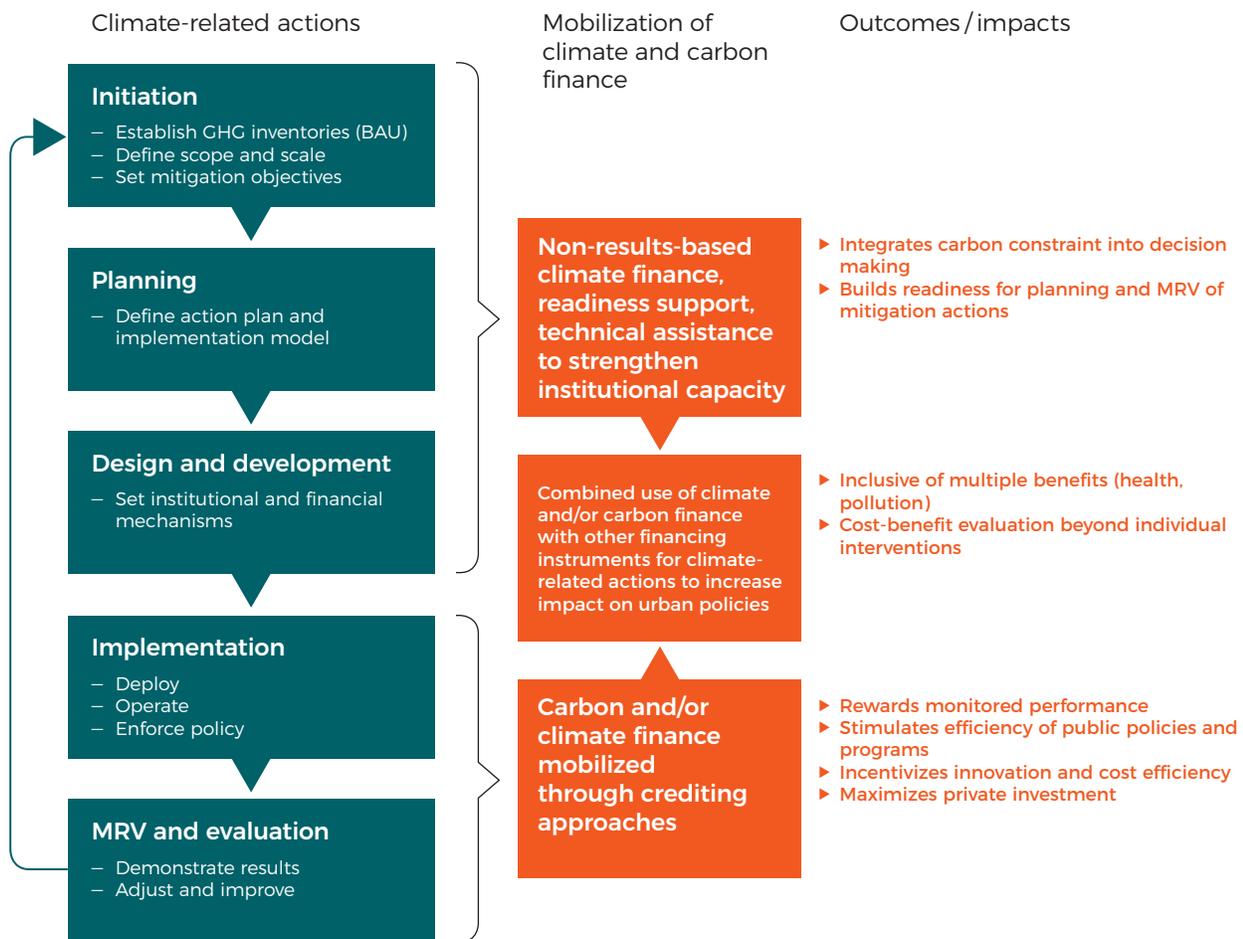
benefits, such as reduction of local pollution and health impacts, as outcomes of programs using crediting approaches may also represent challenges for the fungibility and transferability of mitigation outcomes between countries, in particular for the co-benefits that are linked to a location. Different implementation models could offer specific solutions to the issue of multiple priorities. One approach is to suggest a positive list of mitigation options that are consistent with the adaptation priorities in a given context (region, country, climatic zone, or city). In the future, if the connectivity of carbon markets materializes, it may be important to accompany such diversification with a system of equivalence between different asset classes based on different prioritization approaches.

When complementary policies are used, accounting and allocation principles should ensure transparency, but not necessarily prescribe approaches to allocate the outcomes of mitigation actions to different sources of finance. It may not be practical to define uniform rules of allocation and attribution of mitigation outcomes, in particular when different policies and instruments co-exist and have overlapping effects on the mitigation outcome.

5.4. Be embedded from the planning stage onward

Finance provided through crediting approaches should be combined with other financing instruments to support climate action through their lifecycle, starting from planning to monitoring of performance (see Figure 18). Climate action is understood here as any action that helps mitigate and/or adapt to climate change and can be implemented through policies and actions that target climate change specifically and sectoral policies and actions that help achieve climate goals, such as energy policies, urban planning, land-use regulations, and transport policies.

Figure 18: Full cycle of climate-related actions to be supported by multiple financial flows



This lifecycle perspective helps secure resources for cities to build comprehensive climate action plans and implementation strategies and to identify the institutional changes needed to make effective use of crediting approaches for both carbon and climate finance. It also helps ensure consistency in the approach to track progress toward the achievement of the NDC at the urban and national levels. Urban tools, such as the ones discussed in Section 3.3, can support each step of the climate action cycle.

For scaled-up transformative action, the initiation, planning, and design and development stages are as critical as the implementation and MRV. Cities

require initial (up-front) financial and technical support to help identify emission reduction options and their impacts and to support the deployment of urban GHG inventories and performance tracking systems along the program cycle. Therefore, even if the funds delivered by crediting approaches kicks in only at these two later stages, the full cycle needs to be supported through blended instruments. Efforts should be made to facilitate access of cities to the appropriate other sources of support (e.g., non-results-based climate finance, readiness, and technical assistance funds) to avoid an entrance barrier.

5.5. Mitigate and distribute risks

The design and implementation of programs using crediting approaches in cities should ensure that the risks related to the use of crediting approaches are mitigated and distributed between the actors so that policies and actions are taken at a level of governance where they would be most efficient both from economic and institutional perspectives.

Risk mitigation and distribution helps provide certainty for the investors and implementer, ensure cost efficiency, and promote participation in the

urban programs using crediting approaches. The risks, as introduced in Section 4.3, relate to both the characteristics of urban mitigation and the crediting approach:

- ▶ Crediting risks: Institutional capacity, aggregation, regulatory risks, monitoring
- ▶ Urban risks: Planning uncertainty, extended delivery period, vertical/horizontal coordination, financial and investment barriers

Examples of potential risk mitigation measures observed in existing interventions and programs that use crediting approaches are provided in Boxes 6, 7, and 8, and possible implementation approaches are discussed further in Section 6.1.

Box 6: The Low Carbon City Development Program (LCCDP) in Rio de Janeiro (Brazil)

The LCCDP was developed by the Rio de Janeiro municipality with the support from the World Bank, and was launched in June 2012. Later, the LCCDP was certified according to the LCCDP Assessment Protocol (including ISO 14064, ISO 14001, and the GHG Protocol). This initial application of the LCCDP approach became the basis for the development of a LCCDP guidebook that describes a systems approach to low-carbon development in cities,¹⁰⁶ and suggests a roadmap for designing and implementing a LCCDP available to other cities.

A distinctive feature of the LCCDP approach is its focus on mitigation measures that are under the ownership and/or control of the municipality, even partially, through either direct implementation or agreement with a municipal department (e.g., with a subcontractor, public-private partnership (PPP), or with a civil society organization). To encourage behavior change, the policy-based interventions are also eligible under the LCCDP. Given the LCCDP's main focus on measures implemented by the municipality, the eligible interventions are expected to be in a sector governed by the municipality. The main features of this model are presented in Table 4.

Table 4: Main features of the LCCDP in Rio de Janeiro

Main features	Description
Objectives/outcomes	▶ Support the implementation of city-level climate strategy at the level of individual actions
Incentive structure	▶ Carbon finance supports individual mitigation action and policies
Quantification and MRV	▶ Project-based quantification using existing crediting and offsetting standards
Performance indicators	▶ Project-based performance ▶ City-level target to achieve a predefined amount of emission reductions
Transaction costs	▶ Potentially high due to compliance requirements of various standards and protocols
Capacity requirements	▶ City-level inventory recommended to define city target ▶ Significant need for horizontal coordination and portfolio integration, registration at the level of municipality

106 Source: Authors and World Bank & DNV KEMA Energy and Sustainability, 2014. *The Low Carbon City Development Program (LCCDP) Guidebook*, IBRD.

While this implementation model mainly relies on project-by-project implementation, it offers several advantages compared to the use of individual project-based approaches. This example provides insights into potential ways to address some of the risks linked to a decentralized implementation modality for mitigation programs using crediting in cities (see Section 6.1.1):

The focus on activities that are under the ownership and/or control of the municipality helps **mitigate planning uncertainty and delivery risks, but also limits the exposure to vertical coordination challenges**. These risks are further limited through the LCCDP guidebook requirements for lifecycle coordination and integration to ensure that the LCCDP takes a strategic, comprehensive approach in selecting a city-level mitigation portfolio. The assessment of both policy and project-based interventions includes three main aspects: eligibility, feasibility, and risk profile.¹⁰⁷ An “optimal portfolio of interventions” is defined as “including interventions with different levels of implementation risks (in the short and long terms), different starting dates, and both policy and project interventions in different sectors.” The risks of **vertical coordination with higher levels of government** is reduced by ensuring that “the intervention is not legally mandated by higher levels of government, such as state or federal governments.”¹⁰⁸

To diversify regulatory (including methodology) risks, the LCCDP allows the use of different standards and protocols (beyond CDM) depending on the targeted mitigation measures to enable wider access to carbon market mechanisms. That also increases the diversity of actions (and, potentially, policies) that the LCCDP can accommodate within the urban mitigation portfolio.¹⁰⁹ This flexibility is managed and coordinated through a citywide project approval and registry system. While it somehow exposes the LCCDP to a higher horizontal coordination burden, this gives the possibility to increase the scope and coverage of the mitigation options and also could contribute to the diversification of risks of noncompliance with the overall objectives set at the level of the LCCDP. Such

flexibility could represent an interesting feature in the context of current uncertainty around the future international requirements for international transfers under Article 6 of the Paris Agreement.

To mitigate regulatory risks linked to the quantification of emission reductions and the monitoring risks, the LCCDP provides a pragmatic choice of quantification and MRV approaches among the existing protocols and international/bilateral standards. The choice of approaches, based on the availability of data and required monitoring capacities and costs, offers the possibility to make the program immediately operational while keeping the option to enlarge the scope of methodologies and tools adapted to the local circumstances and in line with the body of best practices. At the same time, it may require significant effort of alignment between protocols at the program level.

To increase the control over the aggregate performance, the LCCDP establishes a feedback loop approach based on the systematic performance monitoring and reporting. This process helps ensure timely improvements of the implementation and operational features of the program. This adjustment process is fully under control of the city.

On the flip side, the flexibility of the LCCDP requires significant **institutional capacity** to understand all eligible mitigation measures and standards, and ensure coordination.

Also, the LCCDP does not explicitly address the **vertical integration** of municipal and national decisions with regard to the use of emission reductions for crediting purposes under a market mechanism. In such cases, transferring mitigation outcomes generated at emission sources that are included within a country's NDC can jeopardize a country's achievement of its NDC if it over transfers emission reductions to another country. This risk can be managed through a combination of different approaches to baseline setting and/or restricting the transfer of GHG reductions,¹¹⁰ which requires coordination between the local and national government.

107 See Section 3.3.1 of LCCDP Guidebook.

108 The intervention could still be eligible if the legally mandate exists, but is not enforced. (See discussion in the LCCDP Guidebook, Section 3.3.1.1.)

109 Similar to what CDM multi-sectoral PoA was intended to do.

110 Source: Partnership for Market Readiness (PMR). 2017.

Box 7: Czech Green Investment Scheme (GIS) program

The Czech GIS program is an example of the use of a crediting approach to voluntarily recycle (“green”) the carbon revenues of transactions under Article 17 of the Kyoto Protocol (International Emissions Trading—IET). The program is based on a centralized implementation approach (see Section 6.1.2) that targets energy efficiency improvements in private housing. The features are all essentially designed and managed at the national level. This programmatic approach is accommodating the dispersed nature of small-scale individual actions by private homeowners.

Under GIS, countries sell excess Assigned Amount Units, but the revenues from the sales must be invested in “green” activities that reduce emissions (e.g., energy efficiency and renewable in buildings) and generate monitorable and verifiable emission reductions. Several countries in the Eastern Europe and Central Asia region used GISs. The main advantage of this approach is that it allows a full transfer of carbon revenues to the GIS implementing agent ex ante, at the moment of purchase of emission allowances. Such purchase and transfer is preceded by a legally binding agreement on the operational and MRV modalities of spending the carbon revenues.

The main features of the Czech GIS program are presented in Table 5. A distinctive feature of this model as compared to the other examples of implementation approaches (discussed in Section 6.1) is that the centralized approach allows for the better combination of different available sources of finance, and thereby obtains a higher leverage of carbon finance (see Figure 19). The project portfolio management at the central level by an

established National Fund for Energy Efficiency also allows for the reduced risk of underperformance of the program. The incentives are channeled through the local commercial banks in a form of preferential loan conditions and grants, and have a predefined minimum leverage ratio. While the capacity requirements at the project level (individual private investors) are limited, this model requires confident, strong program management.

Table 5: Main features of the Czech Building Energy Efficiency GIS

Main features	Description
Objectives/outcomes	<ul style="list-style-type: none"> ▶ Accelerated pace of program implementation due to the release of the capital (budgetary) constraint ▶ Increased stringency of efficiency requirements ▶ Ensure sufficient leverage of private finance through grant intensity
Incentive structure	<ul style="list-style-type: none"> ▶ Blending of carbon finance with other sources for the better leverage of domestic sources ▶ Grant for project preparation
Quantification and MRV	<ul style="list-style-type: none"> ▶ Unified nationally appropriate approach
Performance indicators	<ul style="list-style-type: none"> ▶ Aggregate performance set at the program level ▶ Performance of projects controlled through eligibility criteria ▶ Portfolio approach reduces risks of underperformance at the program level
Transaction costs	<ul style="list-style-type: none"> ▶ Savings in costs of program management, MRV, quality control
Capacity requirements	<ul style="list-style-type: none"> ▶ Limited at project level, but requires strong program management

Figure 19: Structure of the Czech Building Energy Efficiency GIS



Box 8: Low-Carbon City Voluntary Offsetting (LCC) Program in Thailand¹¹¹

The LCC Program, established by the Thailand Greenhouse Gas Management Organization (TGO), will assist provinces and cities to design and implement GHG mitigation actions through undertaking projects that will apply the national Thailand Voluntary Emission Reduction Program (T-VER) for certifying and issuing carbon credits, which has been functional since 2013. This model is designed to accommodate the high level of autonomy that cities have in Thailand. The program objective is to trigger participation of cities into the offset market supporting the domestic voluntary ETS currently under development.

One of the key requirements for cities to access a dedicated Urban Fund established by the LCC Program is to develop a comprehensive climate action plan at the city level. The projects selected by cities for support by the program have to be fully in line and contribute to these action plans (see Figure 20). The main features of the LCC Program are presented in Table 6.

This example provides insights into potential ways to address some of the risks linked to a hybrid implementation modality for urban programs using crediting approaches (see Section 6.1).

To manage planning uncertainty, the LCC Program requires a local GHG abatement plan (or City Climate Action Plan) that identifies GHG mitigation potential and assesses the economic attractiveness of specific options (based on a MAC assessment) and expected co-benefits.¹¹² This approach could bring clear advantages as compared to a pure, project-based approach. The development of climate action plans helps better prioritize the project portfolio, increases comparability between cities' programs, and enables the LCC Program to collect valuable information about the trajectories and expected mitigation potential in different cities. The Urban Fund will support the development of action plans through grants to avoid the entry barrier for cities.

To reduce planning uncertainty and address challenges of limited institutional capacities, the TGO is planning to facilitate the transparency, consistency, and comparability of City Climate Action Plans through the preparation of guidelines that cover four main elements: (i) the assessment of emissions sources (activities) and the quantification of emissions; (ii) emissions projections under a business-as-usual case to inform definition of the baseline; (iii) approaches to identify potential mitigation options and the criteria to select abatement technologies taking into account the feasibility of implementation, and their environmental and social impacts; and (iv) evaluation of project implementation, e.g., GHG emissions, co-benefit assessment, and sustainable development.

Table 6: Main features of the LCC Program in Thailand

Main features	Description
Objectives/outcomes	<ul style="list-style-type: none"> ▶ Support implementation of domestic offsetting scheme ▶ Purchase excess of offset supply to ensure sustainable implementation
Incentive structure	<ul style="list-style-type: none"> ▶ Carbon price provided by the domestic voluntary ETS ▶ Grant to support cost of developing city-level climate action plans
Quantification and MRV	<ul style="list-style-type: none"> ▶ Mainly at the level of individual interventions (national methodologies) ▶ National guidance for the development of city action plans (participation requirements)
Performance indicators	<ul style="list-style-type: none"> ▶ Project-based performance below business-as-usual ▶ Aggregate performance of the participating cities as defined in the climate action plans
Transaction costs	<ul style="list-style-type: none"> ▶ Potentially high at the initial stage of program design, leaner in the medium term
Capacity requirements	<ul style="list-style-type: none"> ▶ Increased requirements for cities (e.g., GHG inventory, MAC curves, climate action plan)

111 Source: Partnership for Market Readiness (PMR), authors.

112 This approach is expected to identify "no-regret" options (not eligible for the support by LCC) and the additional mitigation options.

Figure 20: Structure of LCC Program in Thailand



Furthermore, **to avoid creating a participation barrier, the TGO is planning to provide financial and technical support to the municipalities** to prepare inventories of city- or community-level GHG emissions, identify potential GHG emission reduction activities, and develop local GHG abatement plans.

The status of City Climate Action Plans could be strengthened further to reduce financial risks.

There is an expectation that, in the future, the GHG abatement plans developed under the LCC Program could be recognized as an integral part of the provincial environmental management, which is currently supported by the national budget. This could reduce the exposure of the local governments to the financial and investment risks under the LCC Program. This could also help ensure sustainable and consistent implementation of GHG abatement plans in the evolving local circumstances (electoral cycles, economic and financial situations, etc.), thereby addressing planning uncertainty and risk of delivery.

Another feature of the LCC Program that contributes to the limitation of the financial barrier

is the establishment of the LCC Fund administered by the TGO. This Fund aims to support the implementation of the LCC Program to deliver

carbon finance and comprehensive technical support to local municipalities and communities (e.g., in terms of the preparation of the project design document). The Fund serves as a one-stop service for buyers and sellers of approved carbon credits under the LCC Program.

To address regulatory risks and avoid double counting,

the TGO will include only Scope 1 and 2 emissions under the LCC Program. Scope 3 emissions are excluded due to the complexity of setting up the GHG accounting system for this scope. This approach is expected to avoid possible overlaps of accounting for direct and indirect emissions between the LCC Program, the national T-VER program, and the Energy Performance Certificates scheme. For the Scope 2 emissions related to the use of electricity, the TGO will set the standard reference value for the national grid emissions factor. The reference value will be fixed throughout the crediting period for individual projects. The national T-VER has developed provisions to avoid double counting with international standards (i.e., CDM, Verified Carbon Standard, or Gold Standard) through a dedicated registry and software to collect information on Thailand's GHG emission reduction projects. The same provisions will apply to the LCC Program.

5.6. Plan for future climate policy instruments

Crediting approaches could be a starting point or an intermediary stage in the development of the relevant broader climate policy instruments at the city or national levels and prepare for more ambitious future action.

The first generation of crediting approaches mostly focused on the emission reductions of a particular intervention, without systematic consideration given to how that intervention would fit with national targets or help the country increase its climate action (with the notable exception of large CDM PoAs where such attempts have been more prominent). Countries can frame the new generation crediting approaches under the Paris Agreement with the view of helping them achieve their NDCs and increase their ambition. For example, crediting approaches can be designed as a stepping stone toward other climate policy instruments, including an ETS or carbon taxes. The use of crediting approaches can become a stepping stone by building readiness around:

- ▶ Data collection, management, and analysis, including GHG emissions inventories.
- ▶ Baseline setting and mitigation outcomes quantification.
- ▶ Assessment of mitigation potential and discovery of costs and barriers to implementation.
- ▶ Instrument design.
- ▶ MRV systems and capacities both for the mitigation outcomes and financial flows.
- ▶ Institutional setup.
- ▶ Registries systems.¹¹³

5.7. Summary

Beyond demand for the mitigation outcomes, several factors impact the success of crediting approaches. These preconditions relate to the design of the urban programs and policies supported by crediting and to the capacities of the actors involved, including the finance recipient and provider. They anchor crediting approaches in a long-term and holistic perspective, across sectors and actors.

The key preconditions are as follows:

1. Ensure an appropriate incentive structure to promote the most efficient allocation of financial resources to mitigation actions at the urban level and crowd-in private finance.
2. Go beyond technology-based interventions to achieve mitigation at scale and facilitate transformational impacts.
3. Complement other climate-related and broader sectoral policy and financial instruments, and be part of the urban policy processes to achieve transformational impacts while contributing to the overall efficiency of public resources.
4. Be embedded from the planning stage onwards to support the institutional capacity to implement evidence-based climate action planning and monitoring of performance of climate actions, and ensure consistency with the approach to track progress toward the achievement of the NDC at both local and national levels.
5. Distribute risks so that actions can be taken at a level of governance where they would be most efficient both from economic and institutional perspectives.
6. Plan for the future to build readiness for more comprehensive climate policy instruments at the city or national levels, including carbon pricing approaches, while minimizing transaction costs and ensuring environmental integrity.

Section 6 looks at what is needed to operationalize the new generation of crediting approaches that include these preconditions.

¹¹³ Source: Partnership for Market Readiness (PMR), 2015. *Crediting-Related Activities under the PMR Status and Support for Implementation*. Washington, DC: World Bank.

6. WAY FORWARD

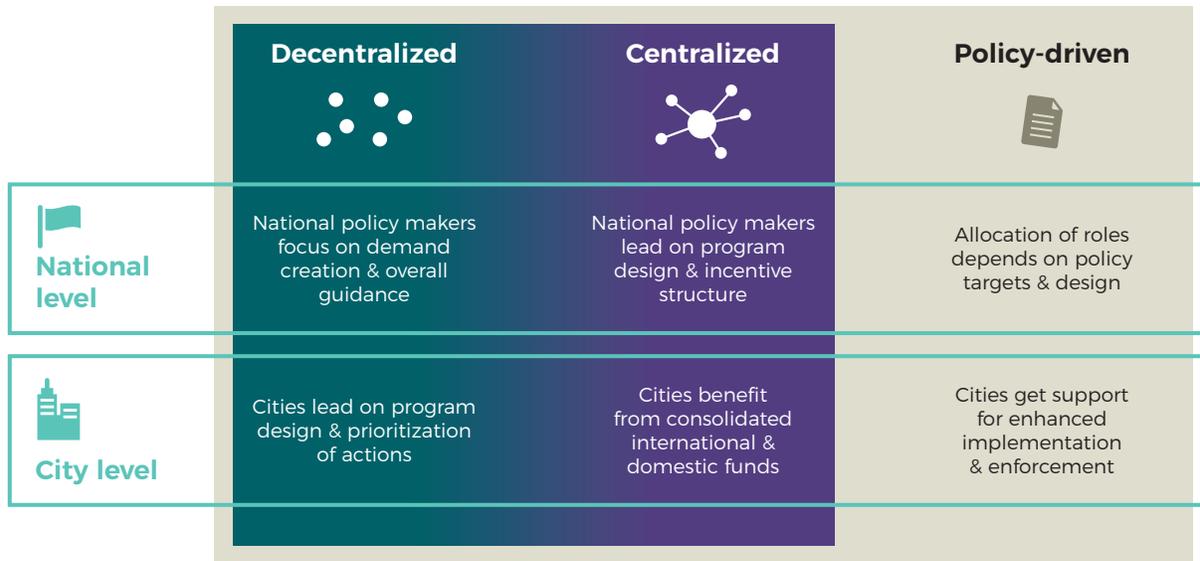
This section proposes a way to advance the discussion on the implementation of crediting approaches in cities—both under the carbon market mechanisms and through RBCF—to effectively deliver carbon and climate finance (see Figure 21). It suggests three priority areas for policy and implementation efforts to foster the agenda:

- ▶ Design of flexible implementation modalities capturing the diversity of cities, with a particular focus on opportunities to ensure greater impacts of crediting approaches on the key levers of urban development and infrastructure, such as urban planning and TOD, and particularly
 - ▶ Targeted policy and methodology research to (i) fill in methodological gaps, (ii) improve understanding of the economics of urban mitigation with focus on the costs and revenues of different types of urban mitigation activities and relevant financing models, including PPPs for urban infrastructure investments, and (iii) explore how the crediting approaches would need to look to make a difference as a financial instrument that provides an additional revenue stream, depending on pricing of the mitigation outcomes and (in the case of RBCF) monetization of other results.

Figure 21: Enabling a new generation of crediting approaches in cities in the context of the Paris Agreement



Figure 22: Implementation modalities for urban programs using new crediting approaches: addressing diversity



- Piloting to test the suggestions on the ground, build capacity at different levels in the government and individual system operators, inform in-depth evaluation of the broader policy impacts of carbon and climate finance delivered by crediting approaches, and give insights into how new crediting approaches could look.

Each of these priority areas is discussed in Sections 6.1 to 6.3, and Section 7 presents the potential benefits cities can derive from starting these activities now.

6.1. Design of flexible implementation modalities for urban programs using crediting approaches

This section proposes possible implementation modalities for programs using crediting approaches based on the findings presented in previous sections of the report. These findings include the changing urban drivers, the demand for a new kind

of crediting approach under the Paris Agreement, the progress with methodological tools, and the lessons learned from the past implementation of innovative forms of the first generation of crediting approaches.

As highlighted earlier, the diversity of cities calls for flexibility to maximize the impacts of financial flows that can be mobilized to support urban mitigation through crediting. To be effective and cost-efficient, crediting approaches must accommodate the specificity and ability of different actors in cities to manage risks, as described in Sections 4.3 and 5.5. The variety of possible distribution of mandates, roles, and risks between cities and national authorities, combined with the level of their institutional and implementation capacities, will imply different implementation modalities.

For simplicity, the modalities at the ends of the implementation spectrum can be called “decentralized” and “centralized” (see Figure 22). Policy-driven modalities can be conceptualized within this spectrum, depending on the most appropriate governance level of decision making and implementation of a policy.

Note that the potential for these modalities to deliver urban mitigation at scale would be different in the context of strong diversified demand for international collaborative actions (or for carbon credits) as compared to the current situation where the international demand for transferable mitigation outcomes is scarce and governments may need to refocus on domestic demand first.

Each of these stylized implementation modalities is described in more detail below. In reality, most urban scaled-up programs using crediting approaches are likely to be somewhere on the spectrum between decentralized and centralized. For example, a program/intervention might allocate a significant direct role to cities in the design and implementation of mitigation actions, recognizing the need to accommodate a high level of autonomy of municipalities and local communities. At the same time, it might also feature elements of centralized governance, responding to a relatively low level of readiness and capacities of the municipalities and local communities in terms of their understanding of the carbon footprint, mitigation options, and, potentially, emissions management. While the incentives provided by the crediting approaches may be the most important in lower income countries—which are likely to be the ones urbanizing the fastest—their capacity to utilize these financing instruments effectively may also be the lowest. This reality underscores the significant amount of effort needed to build capacities, and to ensure pragmatic governance and institutional solutions.

6.1.1. Decentralized modality

The decentralized modality assumes a leading role for a city along the entire lifecycle of the crediting program, including the design and prioritization of actions, in relation to the private and public investors, inner-city consumers, and service providers. The LCCDP in Rio de Janeiro, discussed in Box 6 in Section 5.5, is an example of decentralized implementation.

The national policy makers focus on the creation of demand and on the overall guidance and establishment of a conducive policy environment to promote mitigation actions in cities. Cities focus on the mitigation actions that may be specific to the main sectors of their urban economy, such as inner-city transportation, street lighting, spatial urban planning conducive to the TOD, and diversification of public transport options. They are responsible for establishing the conducive environment (regulatory and policy packages) and incentive schemes to align investment choices of private sector investors and service providers, as well as the consumption choices of the inner-city consumers with the overall municipal government's objectives in terms of mitigation. These objectives can be defined in different metrics, including emission reductions or energy savings, the share of final renewable energy consumption, or other indicators of energy intensity that can be translated into quantifiable GHG impacts over a predefined period.

In the presence of NDCs, the need for vertical coordination between jurisdictional levels may bring further uncertainty to the scope of eligible interventions. The decentralized implementation can offer a relatively simple solution to this issue by focusing on the interventions that are outside of the sectoral coverage of NDCs; such interventions would be screened out as not eligible, provided the boundaries of the NDC coverage can be established. Coverage of urban action can further be defined through other criteria related to the ownership and control of a municipality over an intervention (such as in the LCCDP). The counterbalancing aspect of such an approach is that the scope of eligible activities may be significantly reduced and may not necessarily satisfy the objective and the aspiration to achieve transformational impacts over urban emissions. While it is also possible for crediting instruments to cover emissions that are also covered by the NDC targets, the main concern—in case of the use of crediting approaches in market mechanisms—becomes to avoid over

transferring emission reductions, given that corresponding adjustments to NDCs will be applied to any transfers. The risk of over transferring can be managed through a combination of baseline settings and withholding emission reductions.¹¹⁴

6.1.2. Centralized modality

Under a centralized implementation modality, the national policy makers and implementation agencies lead on program design and provide necessary structure to incentivize implementation of mitigation actions by the inner-city economic actors and consumers. The Czech GIS, discussed in Box 7 in Section 5.5, is an example of centralized implementation.

Under this implementation modality, cities may benefit from international and domestic funds that can be more effectively consolidated at the national level to support implementation of cities' mitigation actions. In this case, cities essentially implement national climate change mitigation plans in line with national goals, policies, and targets, without necessarily identifying specific targets. This can help facilitate action in case of limited institutional capacities, for example. Depending on the design, the municipality could translate the national mitigation policies and objectives at the local level. This could include, for example, low-carbon procurement approaches, enhanced enforcement of energy performance standards (e.g., in the construction of buildings), or city-level regulations that may reduce perceived risks of low-carbon consumer choices or allow better access to renewable energy for the citizens.

Based on the experience with carbon finance operations, the use of a centralized modality often represents an effective and pragmatic option for urban mitigation programs/policy interventions targeting demand-side management (DSM). The example of Czech GIS is a good illustration for it (see Box 7). The use of a dedicated energy efficiency

vehicle under the overall urban mitigation program can provide an effective solution to consolidate the financial incentives available to the participating municipalities or private investors (for example, using participating commercial banks) and to streamline the participation requirements. The use of recognized certification schemes, such as EDGE (discussed in Box 2, Section 3.3.4), can also contribute to simplify compliance requirements, including the approaches used to quantify mitigation impacts.

The mitigation performance of such dedicated programs could be defined based on the information collected through climate action plans prepared by municipalities and local authorities (if this is an established planning instrument), or modeled at the level of the targeted energy efficiency segment. The performance indicators could be established at the aggregate level for the entire energy efficiency window, allowing for performance risk mitigation at the level of the portfolio and for a greater flexibility for participating municipalities to achieve pre-agreed mitigation outcomes.

Moving from project-based to policy-driven approaches, the government or the relevant implementation agencies could also consider adopting dedicated DSM policy interventions that would set ambitious targets (e.g., for buildings or for appliances) to be achieved in a predefined (crediting) period and the performance indicators of the energy efficiency program in accordance. Therefore, the program would contribute to achieving the policy targets at the national level. Methodological options could be considered to accommodate for top-down MRV of the policy impacts on urban GHG emissions.

6.1.3. Policy-driven modality

In the urban context, the capacity of crediting instruments to support policy actions seems to be particularly relevant as policy and regulations are the prominent type of mitigation actions in cities, as

114 Source: Partnership for Market Readiness (PMR). 2017.

demonstrated in Section 3. An important rationale for supporting policy actions through a new generation of crediting approaches would be to:

- ▶ Incentivize the creation of a sustainable and conducive enabling environment for urban mitigation investments and low-carbon consumer choices, for both private and public players. This could come in support of the national/energy sector policy reforms that are introducing carbon pricing such as fossil fuel subsidy removal, green fiscal reforms, etc.
- ▶ Improve policy enforcement and performance tracking.
- ▶ Support and incentivize the adoption of more aggressive standards and performance indicators (e.g., building codes or traffic regulation).
- ▶ Allow the adoption of more ambitious mitigation targets in line with the Paris Agreement cycle.

This approach would focus on rewarding the mitigation outcomes of policy interventions through scaled-up crediting and hence increasing the scope and coverage of these instruments beyond technology-based implementation. Depending on the specific context of each program, policy crediting could be deployed both through the decentralized or centralized implementation modality.

Policy crediting approaches could focus on supporting the effective implementation of a specific policy intervention, such as the implementation of a new building energy performance code. The objective of the intervention using crediting could be to support better compliance and enforcement of the building code in line with the pre-agreed rate of deployment, and in the medium term, to progressively increase the stringency of the code.

The crediting approach could be used as a vehicle for an additional, targeted financial incentive deployed in a way to maximize its leverage on private investments through addressing the major barriers to the implementation of the new building code. For example, the support may be provided to the following most important levers of policy implementation:

- ▶ Coverage of the costs of market facilitation measures (accompanying measures) through comprehensive financial packages provided to the implementation agencies in charge of providing better access to information, technical guidance, and deployment of the certification schemes for more performant materials and equipment for the domestic energy efficiency market (see Box 9 for an example of an innovative approach to assess financial costs and expected impacts of market facilitation measures for energy efficiency in buildings in Morocco).
- ▶ Direct support to the costs of designing compliant buildings, auditing, and, if applicable, certifying the performance outcomes achieved by the developers.
- ▶ Additional fiscal incentives to enhance the existing incentive structure of a policy, such as existing direct subsidies.
- ▶ Deepening of the financial services through the improved financial terms of loans dedicated to energy efficiency in the building sectors.
- ▶ Supporting national implementation agencies of municipalities to cover the costs of monitoring of policy performance and its GHG impacts (MRV of policy impacts).

The most appropriate and cost-efficient approach to the quantification of the mitigation outcomes and MRV could be to use aggregate impact

assessment protocols, building on the reputed building performance programs (for example, EDGE or other standards) calibrated to the local context, type of buildings, and energy saving opportunities. Building on the findings of the recent study for the Pilot Auction Facility on *Using the Climate Auction Model to Catalyze Energy, and Resource Efficient Buildings*,¹¹⁵ the primary metric for allocating RBCF could be the modeled percentage reduction in energy consumption per unit area versus a local benchmark. Given that the housing sector already uses unit area (usually square meters) as the basic input to assess projects, using the same metric for allocating climate finance incentives would be easy to understand, and would maintain the design and the MRV costs at a reasonable level. This metric of energy consumption is also directly linked to GHG emissions from buildings, providing a possibility to evaluate the mitigation outcomes. As such, based on this performance metric, the milestones for disbursement of carbon or climate financing using crediting approach could be defined in terms of aggregate energy/GHG performance per major category of covered building to be achieved by the end of a predefined period.

Alternatively, the financing delivered through crediting approaches could also be used as part of a blended financial package to support the integrated policy reforms with key sectoral and urban socioeconomic objectives resulting in lower carbon impacts. Using again the example of the building sector, this approach would have the features of centralized implementation, where the role of cities would depend—among other factors—on the level of autonomy of regional and urban governments. The focuses for this approach would be:

- ▶ To allow the government to use the crediting approaches strategically to reduce the cost of the integrated reforms for the national budget.
 - ▶ To use additional financial incentive mobilized through crediting approaches to increase the chances to find interagency consensus on the level of policy ambition (if the target is yet to be defined) or to increase the certainty to achieve the fixed objectives in the most cost-effective way for the budget.
- While the integrated nature of the reforms may significantly increase the challenges of attribution of mitigation outcomes to a specific intervention using crediting, it would provide essential flexibility to the government to strategically allocate these additional financial resources in line with urban priorities. This approach could also be more appropriate to recognize the behavioral impact and give the economic value of soft policy interventions. Such interventions include market stimulation that targets the creation of favorable conditions for energy efficiency investments through the reduction of transaction costs, additional financial services dedicated to energy efficiency investments (providing loans with longer repayment periods), and a reduction of the level of perceived risks of this type of investment through the removal of market barriers.
- The specific performance indicators could be defined at the level of cross-cutting or sectoral interventions to demonstrate that the targeted mitigation outcomes have been achieved. An illustrative example of how a crediting approach could be used as a climate finance modality to support the implementation of the NDC energy efficiency targets in the building sector in Morocco is given in Box 9. This hypothetical example shows that the performance indicators could be established based on the (modeled) mitigation outcomes of small renewable generation systems used at the building level, such as rooftop solar panels, efficient appliances, and thermal performance, which in combination, are expected to generate up to 90 percent of the energy savings in the short to medium term.

¹¹⁵ Source: World Bank and The Carbon Trust. 2018. *Study on Using the Climate Auction Model to Catalyze Energy and Resource Efficient Buildings*.

Box 9: Building Energy Efficiency Policy Reforms in Morocco: The potential to mobilize carbon or climate finance using crediting to support integrated policy approach¹¹⁶

In its NDC, Morocco committed to reducing its emissions by 42 percent below business-as-usual emissions by 2030 (conditional) and 17 percent below business-as-usual emissions by 2030 (unconditional). The Secretariat for Sustainable Development, the Ministry of Habitat, and the Ministry of Energy of Morocco, with the support of the World Bank, developed a bottom-up, agent-based economic model of the building sector in Morocco to assess the capacity of the building sector to contribute to the NDC commitments in terms of energy efficiency. The model provides a comparative assessment of impacts of different policy reform scenarios. These scenarios are evaluated in terms of achievable energy savings/mitigation outcomes, and budgetary costs that might be required to help align investors' and consumers' behavior with the NDC energy efficiency targets.

The modeling exercise is moving away from the macro economy-wide perspective to look at the investor perspective. The team used data on the building stock as inputs (e.g., number of buildings of different types, energy efficiency levels, heating and cooling systems, distribution over climate zones, etc.) and investor's decision-making criteria (e.g., actual transaction costs, hurdle rates for investors, turnover of building stock). These data are combined with various current and planned policies and the estimates of their transaction costs. The investors include households/homeowners, building energy service managers, and construction companies. The model includes a dedicated module that simulates the process of decision making by investors based on the type of investor (and its financial sophistication), entrenched behavior, and the evolution of the policy and regulatory environment.

This approach helps explore the impact of various policy options, including carbon pricing, market facilitation, technical assistance, and industrial strategy. It also provides quantitative data on expected performance of policy options in terms of achieved energy savings, emission reductions, cumulative cost of subsidies and other policy costs, and net present value for the investors. The modeling exercise, implemented in close consultation between relevant ministries and agencies, informs the development of the concrete policy recommendations and facilitates the coordination and dialogue between the line ministries in charge of the sectoral policies and NDC implementation.

This approach can provide useful insights into a potential way to conceptualize the policy-driven crediting approaches. First, it provides a quantified performance assessment of a "reference scenario" (status quo) based on a detailed analysis of existing challenges to effectively implement energy efficiency policies and regulations in the building sector, and identifies the marginal energy saving costs that reflect the investor perspectives on the commercial attractiveness of various energy saving options in the short, medium, and long term (i.e., from the period from 2015 to 2030). Second, the modeled scenarios demonstrate the essential role of creating enabling environments to stimulate demand for energy efficiency investments as part of integrated policy reforms. Finally, it allows for the simulation of energy savings/mitigation outcomes of a targeted use of carbon or climate finance incentive provided through a crediting approach, for example, to support measures at the margin of commercial attractiveness for investors.

¹¹⁶ Sources: World Bank. Forthcoming. *Aligning investor's perspective with the energy efficiency targets in the Moroccan building sector: Strategies for the implementation of Morocco's NDC*. Government of Morocco, 2016. *Morocco: Nationally Determined Contribution Under the UNFCCC*. <http://www4.unfccc.int/ndcregistry/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf>.

6.2. Targeted policy and methodology research

Section 3.3 presented some of the tools that cities can use to help them with GHG accounting and tracking of climate action. Important features of crediting approaches include the need to demonstrate environmental integrity of the mitigation outcomes and the accounting of the contribution of the urban mitigation actions to the implementation of the NDC targets, especially in market mechanisms. Tracking also enables better planning and management of urban climate-related policies and actions and to align incentives, which is imperative under NDCs.

The following methodological approaches can help in that direction:

1. Use of compatible inventories and registries between local (city, metropolitan area), subnational, and national levels to ensure consistent tracking of climate action and its impact.
2. Use of comparable and transparent GHG quantification tools for program design and planning (ex ante quantification of expected emission reductions through, e.g., modeling) and implementation (ex post quantification of emission reductions based on monitored and verified data, e.g., based on inventories).
3. Use of aggregate performance indicators that, e.g., capture transboundary, cross-sectoral, and lifecycle emissions as appropriate and facilitate quantification of contribution to NDC implementation.

This section looks at how current tools support these approaches and the gaps that remain. Table 7 discusses the advantages and gaps of the three approaches. It builds on some of the tools discussed in Section 3.3.4 and Table 1.

Table 7: Methodological approaches to ensure environmental integrity and facilitate the accounting of the contribution of urban mitigation actions to implement NDCs

Suggested approaches	Advantages	Gaps
Inventories and registries compatible between the local, subnational, and national levels	<ul style="list-style-type: none"> ▶ Enable comparison between cities ▶ Facilitate integration into national policies and help avoid double counting through the aggregation of local, subnational, and national emissions data ▶ This includes local inventories (and registries) feeding into national MRV or NDC performance tracking systems (e.g., GPC is a recognized tool consistent with the IPCC guidelines; which could help transversal transparency; see Section 3.3.4) 	<ul style="list-style-type: none"> ▶ Complex boundary setting ▶ Challenges in demonstrating impacts of mitigation actions in the rapidly growing cities in developing countries, with increasing energy consumption (e.g., definition of baseline emissions' picking point)
Comparable and transparent quantification of emission reductions ex ante and ex post	<ul style="list-style-type: none"> ▶ Climate action planning can inform the distribution of efforts to achieve national NDC targets (e.g., using the CURB Tool or other tools discussed in Table 2) ▶ Promote use of national assumptions (e.g., consistent baseline setting) and help integrate urban mitigation and communicate contributions of urban actions into the national effort ▶ Facilitate use of modeling for policy impacts assessment 	<ul style="list-style-type: none"> ▶ Challenges of quantifying impact of dynamic urban systems with transformational changes on GHG emissions ▶ Limited experience of integrated assessment ▶ Multiple interfering of vertical and horizontal policies impacts ▶ Long-term impacts poorly understood and/or under quantified
Aggregate performance indicators	<ul style="list-style-type: none"> ▶ Capture systemic impacts of complementary policies to facilitate sustainable implementation ▶ Use of different performance metrics that can be translated into CO₂e by the aggregator at the program level ▶ Help identify impacts of cross-sectoral mitigation strategies ▶ Enable aggregate quantification of contribution of city mitigation to NDC implementation ▶ Possible use of "city carbon budgets" aligned with NDCs to demonstrate sufficient level of ambition of urban action 	<ul style="list-style-type: none"> ▶ No available benchmarks to show ambition for policies ▶ Limited capacity to attribute impacts in the context of comprehensive policy reforms and cross-sectoral impacts ▶ Large data requirements to set a city-level carbon budget

Existing tools touch upon some of the points relevant in the context of crediting approaches, as shown in Table 2 in Section 3.3.4. However, this table also highlights that a more specific understanding is needed of how these tools can accomplish the following:

- ▶ Facilitate comparable and transparent ex ante quantification of mitigation potentials in cities and ex post measurement of impacts.
- ▶ Help simplify ex ante and ex post quantification, while preserving an acceptable level of transparency and environmental integrity.
- ▶ Identify priority actions that lead to mitigation at scale in each specific case.
- ▶ Track cities' contributions to the implementation of NDCs.

The improved quantification can in turn facilitate access of cities to carbon or climate finance through crediting. Specifically, a comprehensive mapping and review of the tools would help get insights into the following features:

- ▶ **Coverage.** Broad coverage is needed to address a variety of mitigation action and implementation approaches in cities. The assessment of the coverage will need to include:
 - Sectoral actions and limitations in terms of sectoral coverage.
 - Cross-sectoral impacts.
 - Linkage with urban planning to capture future transformative changes in sectors and urbanization patterns.
- ▶ **Modeling horizon.** The ability of the tool to assist decision makers to identify measurable, reportable, and verifiable mid-term milestones to monitor progress, take corrective actions, and manage delivery risk to allow for the disbursement of carbon or climate finance using crediting approaches.
- ▶ **Due account of local policy environment.** Whether the tool accounts for the impacts of current and planned local policies and sectoral or urbanization strategies, which are critical for setting up a credible baseline.

- ▶ **Ability to single out impacts of exogenous policies and measures.** This feature is important for tracing and allocating impacts of urban actions on GHG emissions or energy consumption in the context of national policies.
- ▶ **Comparability and transparency of quantification.** Tools that are compatible with IPCC inventories guidelines generally reflect higher quality assurance and are more likely to have adequate transparency of the mitigation outcome quantification process. Tools compatible with national approaches (quantification of impacts; inventories and registries) have advantages in that:
 - They facilitate climate action planning that can in turn facilitate the demonstration and allocation of efforts to urban mitigation action to achieve national targets (i.e., NDCs under the Paris Agreement).
 - They can help reduce double counting risks (relevant for the use of crediting approaches in market mechanisms).
- ▶ **Level of aggregation of impact assessment and performance indicators.** Aggregate performance indicators—different from tCO₂e—allow the use of different performance metrics and benchmarks and better capture systemic impacts of key sectoral policies.

Further research, for example, in the shape of a dedicated policy and methodology work program for crediting approaches in cities at the global level, could map the existing urban mitigation tools and investigate whether and how they could be used/amended to be used in crediting instruments. The work program needs to draw on and bring together leading urban initiatives, such as C40, ICLEI, GPSC, and CCFLA, and urban actors, including cities, academia, think tanks, and financial institutions. Collaboration needs to be at the heart of such a work program to ensure that the proposed solutions are simple, practicable, and build on the existing practices.

It should be noted that crediting approaches focus on emission reductions as the outcome. However, the use of alternative metrics (i.e., other than ton of GHG emissions), in particular where crediting approaches are used to design RBCF disbursement indicators, could facilitate the assessment of other policy outcomes and benefits. This would allow a better targeting of actions needed to influence a broader range of policy levels, and actions that are critical to the adoption of low-carbon urban development pathways (i.e., urban planning, CUD, TOD, decarbonization of urban energy supply, new infrastructure for electric transportation, etc.). Therefore, it is important to explore the use of such metrics to provide flexibility for cities and influence a wide spectrum of policy levers and actions, including adaptation, to help countries meet their NDCs.

6.3. Piloting

Piloting in the form of a limited-scale implementation of the new crediting approaches with some type of up-front funding would help test some of the design options and tools described in previous sections. This would still deliver mitigation results and possibly carbon finance under the new generation of market mechanisms established under the Paris Agreement. It would also help develop a practical understanding of what new crediting instruments could look like.

Cities around the world are working on defining and implementing climate action plans, unilaterally or under international city initiatives. Including crediting approaches in existing climate action programs or programs under design, rather than designing such piloting programs from scratch, could help fast-track the testing in countries with an ongoing engagement.

Beyond megacities in developing countries that may already have a relatively high carbon footprint, priorities for piloting should include urban programs in the developing countries with rapidly growing cities. The capacity to use these financing instruments effectively may be the lowest in such cities, and would warrant the design of appropriate, pragmatic approaches to governance, and institutional solutions to support the use of crediting approaches, accompanied by adequate capacity building.

Specific attention should be paid to piloting policy crediting approaches, both under the carbon market mechanisms and through RBCF, given their potential to improve the contribution of such approaches to deliver on key sectoral and urban socioeconomic objectives with lower carbon impacts. The innovative way to define financial costs and expected impacts of individual or integrated policy reforms in terms of energy savings and GHG emissions, as discussed in Box 9, has a replication potential for various sectors. This could be instrumental to integrate crediting approaches into other financing instruments, such as the World Bank's Program-for-Result lending instrument that is successfully used to support urban interventions. Useful insights could also be drawn from ongoing World Bank research, supported by the Carbon Partnership Facility, on the methodologies for policy MRV, which currently focuses on energy sector policies.¹¹⁷

Piloting activities have the potential to test some transferrable elements of the new crediting approaches while already showing a significant commitment to a policy outcome.¹¹⁸ Such transferrable elements can include institutions and methodological issues and tools, such as setting baselines, assessing the contribution of the city climate action to the implementation of the NDC,

117 World Bank. Forthcoming. *Morocco Energy Policy MRV: Emission Reductions from Energy Subsidies Reform and Renewable Energy Policy*. World Bank, Washington D.C.

118 Source: Partnership for Market Readiness (PMR). 2015.

refining emission reductions calculation methods, and implementing MRV systems in line with national tracking tools. Piloting should have a clear evaluation mechanism so that it can be used to test the viability of certain approaches and capture learnings that can be used to scale up the crediting approaches.

Piloting could also provide useful insights to the priority areas for further work identified above regarding the economics of urban mitigation. This could focus on the costs and revenues of different types of urban mitigation activities and relevant financing models, and will help build capacity at different levels of government and individual system operators.

Figure 23 gives an example of elements that could be investigated and piloted in the context of scaled-up crediting used in market mechanisms under Article 6 of the Paris Agreement. Even if the immediate opportunities for scaled-up crediting in cities under Article 6—and especially 6.4—might be limited due to the uncertainty around demand and the absence of clear rules, there are opportunities to explore the use of crediting approaches under the financing pillar of the Paris Agreement, in particular RBCF. Besides demand, the piloting of crediting approaches under Article 6 requires specific attention to the question of environmental integrity and avoidance of double counting.¹¹⁹

Figure 23: Example of potential piloting activities for a scaled-up crediting approach under Article 6 of the Paris Agreement



119 Source: Partnership for Market Readiness (PMR). 2017.

7. CONCLUSIONS

The Paris Agreement and its adoption decision calls for scaling up mitigation globally, and in cities specifically. It also opens the door for a new generation of crediting approaches in both market mechanisms under Article 6 of the Agreement and in RBCF instruments. Crediting approaches could be an appropriate mechanism to support climate action in cities at scale if designed with urban characteristics in mind. Given the intrinsic features of crediting approaches, their use could be more effective when supporting urban climate actions that prioritize and focus on the replication of discrete measures at the (sub-) sectoral level (e.g., end-of-pipe mitigation options such as building retrofits or street lighting) and on interventions with a broader scope of action, including in the interconnected sectors (e.g., low-carbon communities and distributed renewables in the building sector). Wider transformational interventions, such as CUD and TOD, call for a substantial revisit to the way crediting approaches can be combined with other sources of financing for cities. Without such an integrated, strategic approach to financing, covering the entire lifecycle of structural change and policy process to support the long-term delivery of results, transformational interventions are likely to be more effectively supported by another type of mechanism.

The need and potential for urban mitigation has been well-documented. However, the complex modes of governance, service delivery, infrastructure investment, and asset ownership reflecting a diversity of city types and development

phases mean that there is no simple approach to identify mitigation policies and actions and assess their costs, prioritize, finance and implement them, and quantify their mitigation impacts. Local governments need to work with public and private partners, including individual system operators, to create holistic approaches aligned with and enabled by national frameworks and policies. In such approaches, cities will play various roles, from policy maker, to regulator, service provider, and partner. New crediting approaches need to be developed in a way that reflects the complexity and variability of the city context and allows for a better fit with integrated approaches.

The role that a new generation of crediting approaches could play in supporting urban mitigation needs to evolve from a narrow, marginal, carbon-centric incentive toward a more integrated form of financial support, cognizant of a broader policy environment and policy objectives at the urban and national levels. The scale-up from technology-based interventions to sectoral and policy-driven actions is crucial in the urban context. The level of scaling-up will affect the risks both the finance recipient and provider bear and their ability to deliver the planned emission reductions (i.e., inter alia quality, quantity, schedule, costs). These risks include crediting risks (institutional capacity, aggregation, regulatory risks, and monitoring) and urban risks (planning uncertainty, extended delivery periods, vertical/horizontal coordination, and financial and investment barriers).

Cities should ensure that the modality they select to implement a crediting approach allocates risks related to the use of crediting in an appropriate manner, and facilitates policies and actions at a level of governance where they would be most efficient, from both an economic and institutional perspective, at avoiding complex coordination issues when possible. Recognizing the diversity of cities and their risk profiles, crediting approaches can be deployed through different implementation modalities, from a centralized modality led by the national government and implemented by the city, to a decentralized modality led and implemented by the city, or more explicitly focused on policy levers. New crediting approaches will need to recognize that most of the growth in urban emissions will happen in emerging economies, where cities will need to expand, increase, and improve the quality of services and where a lot of infrastructure has yet to be built. This will mean, in many cases, increases in energy consumption, which need to be reflected in the design of crediting approaches (e.g., baselines that will capture this growth but ensure environmental integrity). This growth pattern also emphasizes the need to find ways to use climate finance to incentivize cities to incorporate climate change considerations into urban planning and land-use regulations.

Crediting approaches need to be embedded in the design of climate-related actions from the start and combined with other climate-related and broader policy and financing instruments through their lifecycle, starting with planning to monitoring of the performance of climate-related actions. Crediting approaches need to be part of the urban policy processes to have transformational impacts, including city planning. This can help plan and develop implementation strategies and bring projects/interventions to investment readiness. To achieve this, international support is needed to help improve urban-scale GHG metrics, data collection, and analysis methods, and to develop appropriate financial instruments and strengthen capacities at the urban level to plan for action and to bring implementation programs close to the investable grade.

Taking action now to integrate crediting approaches as a source of financing for urban mitigation could help cities as follows:

- ▶ Building readiness for crediting facilitates cities' contributions to national mitigation action by mobilizing their mitigation potential and triggering transformation impacts at the local level. It integrates cities in national NDC implementation efforts and helps increase the ambition of mitigation action at both the city and national levels. It also helps cities avoid locking into carbon-intensive infrastructure and helps cities move toward a low-carbon and resilient urban development pathway.
- ▶ The result-focused actions can help reveal abatement costs of a variety of measures in different urban sectors, in particular, those that are the main contributors to urban GHG emissions (transport, buildings, waste, and water). This focus can also incentivize the better quantification of impacts of more complex levers of urban emissions such as CUD and TOD.
- ▶ The carbon price signal set through crediting approaches helps leverage private finance and allocate efficiently the financial resources—both public and private—at the urban level. Crediting approaches need to blend with other instruments of (climate) finance and effectively complement other climate-related and broader policy instruments. Support to policies that create an enabling environment and target behavioral change should also be covered by blended instruments to allow for effective implementation.
- ▶ The establishment and use of MRV for GHG emissions and mitigation outcomes can improve capacity to track achieved levels of enforcement of policies and actions, and provide feedback for future planning and additional policy reforms. MRV can also serve broader policy objectives of cities and bring multiple benefits by creating readiness to access other types of climate finance.

- ▶ By exploring new market mechanisms now, urban actors have an early opportunity to help design and pilot future market mechanisms, including those under Article 6 of the Paris Agreement. Importantly, the experience learned from the implementation of Kyoto flexibility mechanisms can inform future design. This maintains momentum between the key actors and informs broader discussions about the limitations of current approaches and potential solutions. More widely, cities' experiences with crediting approaches can pave the way for using other market mechanisms and other forms of carbon pricing in the future.
- ▶ Map the existing urban mitigation tools and investigate whether and how they could be used or amended to better respond to the needs of crediting approaches.

To realize these benefits and progress, further research is needed to fill some remaining methodological gaps, and piloting is required to test options on the ground. Further research could be carried out under a global work program that would bring together leading urban initiatives, such as C40, ICLEI, GPSC, and CCFLA, and urban actors including cities, academia, think tanks, and financial institutions. Collaboration will help ensure that the proposed solutions are simple, practicable, and build on the existing practices.

The proposed new global work program could cover issues such as:

- ▶ Refine the guidance on assessing preconditions for effective and efficient use of crediting for achieving urban mitigation at scale.
- ▶ Demonstrate detailed concepts (blueprints) and the feasibility of various potential implementation modalities and what they would look like in practice, covering issues such as baseline setting, alignment with NDCs, different strategic allocation/prioritization of crediting aligned with resilient urban development and other urban social and environmental priorities, risk mitigation approaches, types of urban mitigation actions for which crediting approaches would be best-suited, most effective climate action planning, implications of blending, and so forth.

Such a work program would also help build capacities on the use of crediting approaches in cities. This is important as most of the growth in urban emissions will happen in emerging economies where capacity is, in some cases, limited. The work program would also strengthen the dialogue between cities and national governments to align efforts, policies, and instruments, and communicate on their contribution to NDC implementation. While crediting approaches focus on emission reductions as the outcome, the use of other metrics (i.e., other than tons of GHG emissions) should be investigated as this can provide flexibility for cities and influence a broader range of policy levers and actions, including adaptation, thereby helping countries meet their NDCs.

While crediting approaches bring benefits that go beyond pure mitigation, the success of crediting instruments in cities will ultimately rely on the demand for mitigation outcomes (demand for credits for carbon finance, and the willingness to pay for results in the form of emission reductions for climate finance). At the international level, this will depend on countries' willingness to engage in international cooperative actions where a crediting approach is used as a modality of climate finance and international transfers of mitigation outcomes in the case of market mechanisms. In the context of uncertain international demand for credits under market mechanisms, crediting approaches can be explored under the financing pillar of the Paris Agreement, in particular RBCF, and at the domestic level to complement other climate policy instruments to help compliance under a carbon tax, an ETS, or other forms of carbon pricing.

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