Bridging the Emissions Gap: The Role of Non-state and Subnational actors-Pre-release version of a chapter of the forthcoming UN Environment Emissions Gap Report 2018

The Emissions Gap Report 2018. A UN Environment Synthesis Report

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Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

UN environment

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Acknowledgements

UN Environment would like to thank the Ministry for the Environment, Nature Conservation and Nuclear Safety of Germany, the Ministry of Economic Affairs and Climate Policy of the Netherlands and the Climate Works Foundation for their support to the work of the Emissions Gap Report.

This publication is part of a collaborative series of reports by over 30 organizations released in concert with the 2018 Global Climate Action Summit, which showcase the extraordinary action of states, regions, cities, businesses and investors – and assess the opportunity for even greater impact.

In this specific publication we focus on the role of non-state and subnational actors in enhancing global climate ambition and bridging the emissions gap.

Suggested citation

Hsu, A.; Widerberg, O.; Weinfurter, A.; Chan, S.; Roelfsema, M.; Lütkehermöller, K. and Bakhtiari, F. (2018). Bridging the emissions gap - The role of non-state and subnational actors. In The Emissions Gap Report 2018. A UN Environment Synthesis Report. United Nations Environment Programme. Nairobi.

Bridging the emissions gap
- The role of non-state and subnational actors

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Executive Summary

This publication is a pre-release version of a chapter in the forthcoming UN Environment Emissions Gap Report 2018. It provides an assessment of the role and potential impact of mitigation actions by non-state and subnational actors such as cities, states, regions, companies, investors and foundations.

Many non-state actors are engaging in mitigation action, across sectors and regions

Non-state and subnational actors have the opportunity both to be part of implementing mitigation commitments made at national level and to go beyond current pledges and raise ambition. The number of actors participating is rising fast: more than 7,000 cities from 133 countries and 245 regions from 42 countries, along with more than 6,000 companies with at least US$36 trillion in revenue have pledged mitigation action. Commitments cover large parts of the economy and are gradually expanding in regional coverage. Many of the actors are cooperating in what are called 'international cooperative initiatives'.

Other actors need to join

The numbers seem impressive, but there is still huge potential for expansion. Not even 20 percent of the world population is represented in current international initiatives, and most companies around the world still can and need to act. On the finance side, a record of just over US$74 billion of Green Bonds were issued in the first half of this year, but still only represent a very small fraction of the capital markets around the world.

Emission reduction potential from non-state and subnational action could ultimately be vast, but the current impact is still low and hard to track

The emission reduction potential from non-state and subnational actors is large. If international cooperative initiatives are scaled up to their fullest potential, the impact could be considerable (up to 15-23 $GtCO_2e$ per year by 2030 compared to current policy). If realized this would be instrumental in bridging the emissions gap to "well below 2 degrees Celsius".

However, this pre-release Emissions Gap Report chapter shows that the additional emission reduction contribution made so far by non-state actors is still quite limited in relation to what countries have already pledged (up to 0.2-0.7 $GtCO_2e$ per year by 2030 compared to full Nationally Determined Contribution implementation, and 1.5-2.2 $GtCO_2e$ per year compared to current policy). A wider, more comprehensive overview of all non-state and subnational climate action occurring globally is limited by the current low level of available data and lack of consistent reporting on tracking the impact of non-state and subnational climate action.

Non-state and subnational actors are providing other crucial contributions that go well beyond quantified emission reductions

Non-state and subnational actors provide important contributions to climate action beyond their quantified emission reductions. They build confidence in governments concerning climate policy and push for more ambitious national goals. They provide space for experimentation or act as orchestrators in coordination with national governments for climate policy implementation. Initiatives and actors also incentivize, support and inspire additional climate action by exchanging knowledge and good practices, by engaging in advocacy and policy dialogue, by assisting in formulating action plans, and by rewarding and recognizing climate actions.

Improving performance and transparency

Non-state actors should ideally adopt more common principles when formulating their actions. Such principles should include clear and quantifiable targets based on relevant benchmarks, technical capacity of the actors, availability of financial incentives, and the presence of regulatory support. Monitoring and progress reporting, which are generally weak at the moment, are essential to document tangible results and gain credibility. Governments can play a vital role by stimulating this growing movement, and can for example support non-state actors by providing collaboration platforms, capacity building and technical and financial resources.

Bridging the emissions gap - The role of non-state and subnational actors

Pre-release version of a chapter of the forthcoming UN Environment Emissions Gap Report 2018

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1 Introduction to the publication and overview of its key findings

Global climate change governance is diversifying rapidly: in recent years, political attention has been acknowledging the increasingly important role of non-state and subnational actors such as cities, states, regions, companies, investors, foundations, civil society organizations, and cooperative initiatives.

This publication, provides an assessment of non-state and subnational actors' role in enhancing global climate ambition and bridging the emissions gap, based on the most recent literature.

Non-state and subnational actors (NSAs) can take individual action to address climate change, or they can cooperate with other actors and, frequently, with national governments. This report confirms that there is clear evidence that NSAs are increasingly committing to individual climate actions and coming together in international cooperative initiatives. In all sectors and regions, more commitments have been formulated and registered compared to the assessment in the 2016 UN Environment Emissions Gap Report (UNEP, 2016). Furthermore, it is worth noting that only a fraction of the NSA activity occurring globally is being consistently reported and quantified at the international level.

The emission reduction potential from NSAs is large and could, if fully implemented, contribute significantly to bridging the 2030 emissions gap. However, realizing this potential requires commitments and action that go far beyond current pledges made by individual actors or single initiatives, and implies the scaling up of multiple initiatives across sectors and regions. The few studies that estimate the 2030 global emission reductions from commitments currently pledged by individual actors compared to the Nationally Determined Contributions (NDCs) find that their additional contribution is modest.

Limited data transparency and a lack of consistent reporting that tracks implementation of NSA climate action prevent a full picture of the global impact, although reporting practices are improving and clearer results are emerging. Nonetheless, there is still limited knowledge on the extent to which NSAs are implementing their actions and realizing their commitments.

NSAs' contributions to climate change action go beyond direct emission reductions. For example, they can play a key role in building confidence in governments concerning the implementation of climate policies and inspire higher national and global ambition. In addition, NSAs can facilitate catalytic linkages, act as orchestrators, and provide a basis for experimentation. Quantitative analyses that emphasize NSAs' direct contributions to climate mitigation may overlook these aspects of the critical role that NSAs can play in global climate change governance.

In recent years, great progress has been made in terms of understanding what fosters and influences their performance. Solid design principles and context markers are emerging, including: effective leadership, permanent secretariat (for cooperative initiatives), clear and quantifiable targets, monitoring and progress reporting systems, technical capacity of actors, financial incentives, sustainable funding, and the presence of regulatory support. By following or establishing these principles and contexts, NSAs can help bridge the emissions gap and foster credibility, and governments can help establish the required support.

The publication begins with a brief overview of the increasing engagement of NSAs in the United Nations Framework Convention on Climate Change (UNFCCC) process (section 2), before examining the landscape and trends in terms of NSAs' individual commitments and international cooperative initiatives (ICIs) (section 3). Section 4 provides an assessment of the emission reduction potentials estimated by the latest studies and looks at, non-quantifiable, roles of NSAs that have important implications for global climate change governance. The final section summarizes some of the key ways forward for harnessing the potential of NSAs' climate action to bridge the emissions gap (section 5).

2 Non-state and subnational actors and climate change negotiations: from Paris to Katowice

The 2015 Conference of the Parties to the UNFCCC held in Paris showed an increased institutionalization of processes and engagement of NSAs (UNEP, 2016). Specifically, the Paris Agreement:

- Encourages Parties to work closely with non-Party stakeholders to catalyse efforts to strengthen mitigation and adaptation action (paragraph 118)
- Encourages non-Party stakeholders to register their climate actions in the Non-State Actor Zone for Climate Action platform (paragraph 117)
- Strengthens the technical examination process on mitigation for the period 2016–2020 in various ways (paragraphs 109 and 110)
- Convenes a high-level event building on the Lima–Paris Action Agenda during the period 2016–2020 in conjunction with each session of the Conference of the Parties (paragraph 120)
- Appoints two high-level champions on behalf of the President of the Conference of the Parties to catalyse NSAs (paragraph 121).

The Decision also mandated a summary for policymakers based on more information gathering and an analysis of the potential of, and results from, NSAs (paragraph 111(c)). In sum, the process leading up to the Paris Agreement and the outcomes of Decision 1/CP.21 have paved the way for an increasingly prominent role for NSAs under the climate regime to support Parties in reaching the mitigation and adaptation goals.

The Marrakech Partnership for Global Climate Action was launched by the first two high-level champions[1] during the 2016 Conference of the Parties to continue mobilizing NSAs, support the implementation of the targets set out by the Parties, and align NSAs' actions with the Sustainable Development Goals (MP Work Programme 2017–2018). To this end, round tables were organized on how climate action and various Sustainable Development Goals could be mutually supportive.

During the Conference of the Parties in 2017, the champions were asked to align the Marrakech Partnership with the 2018 Talanoa Dialogue that takes stock of the efforts of Parties towards goals set out in the Paris Agreement and aims to inform the preparation of new or updated NDCs by 2020 (Decision 1/CP.23, Annex II). They also presented the first ever yearbook on climate action that reports on actions by non-Party stakeholders (which is the term the UNFCCC uses for NSAs) throughout the year. The yearbook, including the forthcoming 2018 edition, is expected to inform the Talanoa Dialogue. By April 2018, 109 inputs from NSAs had been registered on the Talanoa Dialogue online platform, and more are expected in time to inform the political phase of the Talanoa Dialogue, which will take place at the Conference of the Parties in Katowice in December 2018.

In parallel with the UNFCCC process, national and regional initiatives have emerged to stimulate and support NSAs in the European Union, Latin America and Asia, among others (Chan *et al*., 2018). Fossil Free Sweden (Fossilfritt Sverige), for instance, is an initiative launched by the Swedish government in which a national coordinator engages companies, municipalities and other non-Party stakeholders in showcasing climate action, sharing experiences, and encouraging new actors to take on commitments. The Argentinian government has launched the National Climate Change Cabinet (NCCC) initiative, with a view to increasing the participation of businesses and civil society in tackling climate change nationally through technical round tables and coordination. In India, the Energy and Resources Institute's Council for Business Sustainability has been engaging corporate leaders in climate action since 2001 (Chan *et al*., 2018).

3 Overview of non-state and subnational actor initiatives and individual commitments

Cities, states, regions, businesses, civil society and a range of other actors can take individual and cooperative actions to address climate change. Acknowledging that action by NSAs comes in many forms, this section focuses on two categories: actions by individual NSAs (section 3.1) and cooperative actions through international cooperative initiatives (ICIs) (section 3.2), both of which are on the rise. By 30 August 2018, just over 12,500 commitments to action had been recorded in the Non-State Actor Zone for Climate Action (NAZCA), the largest online platform showcasing climate efforts by subnational and non-state actors. Almost two thirds of these commitments are by individual actors, while just over one third are by cooperative initiatives (including international cooperative initiatives. See also Box 1).

1 Dr. Laurence Tubiana (France) and Dr. Hakima El Haite (Morocco).

Box 1 Defining international cooperative initiatives

Although there is no single definition of an international cooperative initiative (ICI), a number of terms and common characteristics help characterize them. When non-state or subnational actors from at least two different countries "adhere to rules and practices that seek to steer behaviour towards shared, public goals" across borders (Andonova *et al*., 2017), they engage in "transnational climate governance" (Andonova et al., 2009). Broader coalitions made up of countries, companies, non-governmental organizations (NGOs), academia, international organizations or subnational public actors, such as cities and regions, form cooperative initiatives (Blok *et al*., 2012). When these coalitions cross national borders they become "international cooperative initiatives" (Widerberg and Pattberg, 2015).

3.1 Individual commitments by non-state and subnational actors

Individual NSA climate actions take a variety of forms, referred to in the literature as 'commitment', 'action', 'initiative', and 'target'. These generally refer to a "diverse set of governance activities taking place beyond strictly government and intergovernmental (or multilateral) settings" (Chan and Pauw, 2014). When individual actors participate in ICIs or transnational climate governance initiatives, they may define an individual commitment or climate action according to the specific set of rules that an initiative or programme identifies. When an NSA abides by that particular initiative, it constitutes an instance of "participation" (Andonova *et al*., 2017).

The landscape of NSA actors and the commitments they pledge on climate change are varied, ranging from city, state and regional governments to companies, investors, higher education institutions and civil society organizations. These actors often pledge climate action through a range of networks that collate individual climate pledges and inventories (for example, C40 Cities for Climate Leadership) or reporting platforms such as the CDP (formerly known as the Carbon Disclosure Project). The criteria for participation within these networks and platforms vary: some networks require members to pledge specific commitments, such as greenhouse gas emission reduction targets, or to submit regular emissions inventories. Others emphasize peer-to-peer knowledge sharing and capacity-building, while some are membership-based networks that do not require actors to commit to specific goals.

While these networks capture many NSA climate actions, they do not comprehensively cover all NSA climate actions occurring globally.

Table 1: Examples of the growth in individual NSA actor participation from 2015 to 2017

Actor group	2015	2017
Cities	7,025 from 99 countries, representing 11 percent of the global population	7,378 from 133 countries, representing 16.9 percent of the global population
States and regions	116 regions from 20 countries, representing 11 percent of the global population	245 regions from 42 countries, representing 17.5 percent of the global population
Companies and investors	4,431 companies from 88 countries and over 400 investors, with more than US$25 trillion in assets under management	6,225 companies and investors from 120 countries, representing at least US$36.5 trillion in revenue
Banks	15 of the 20 largest banks	34 of the 57 largest banks, representing US$3.1 trillion in market capitalization
Higher education institutes	Not assessed	700 colleges and universities in the United States, with a total student population nearing 1 million and a collective endowment of over US$250 billion

Data source: Hsu *et al*., 2015b; Hsu *et al*., 2016, Hsu *et al*., 2017

Box 2 Framing climate action in developing countries

Linkages between sustainable development and climate change provide a powerful rationale for climate action. Evidence suggests that citizens are more likely to take climate action, or to support government action on climate change, if the sustainable development benefits of these efforts are emphasized (Floater *et al.*, 2016). Communicating the sustainable development gains that are often co-generated alongside climate mitigation or adaptation may be particularly important among NSAs in developing countries and the Global South.

One example is the Indian city of Rajkot, which "has emerged as a climate innovator" by focusing on projects that deliver urban development benefits, and support climate action as a supplementary goal or co-benefit. The political feasibility of climate action increases when connected to "more familiar, and often more immediate, urban priorities" (Bhardwaj and Khosla, 2017). A survey of various climate action experiments also found that climate actions were aligned with development priorities.

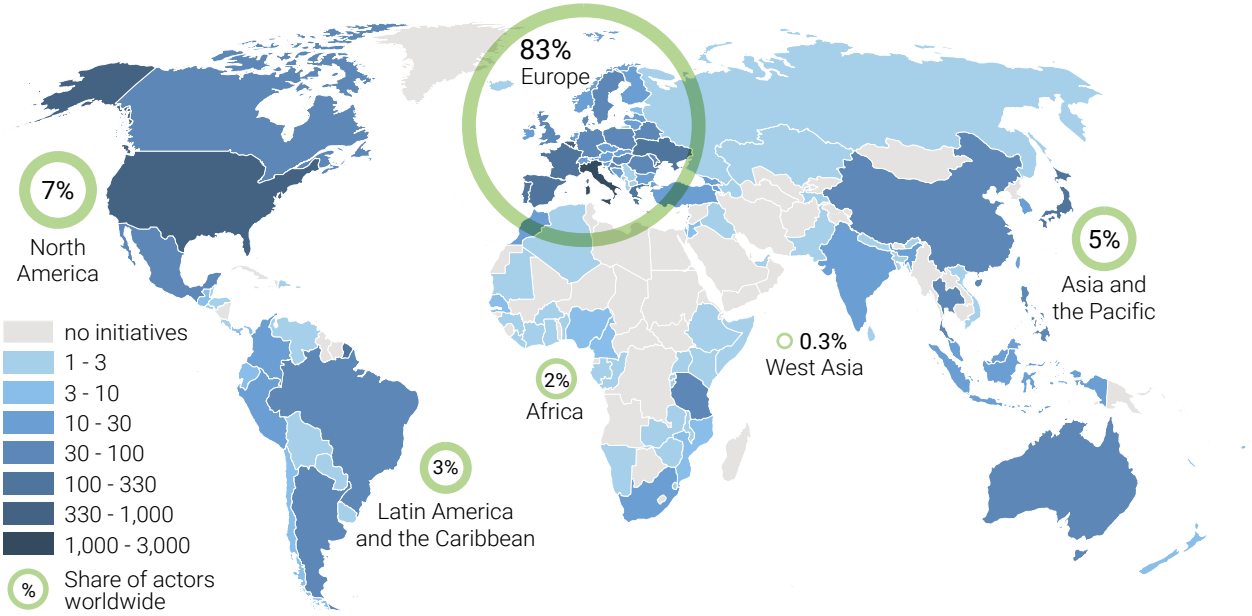
However, if actions and policies that generate substantial mitigation or adaptation benefits are framed and registered according to their ability to reduce poverty, create jobs, foster economic growth, or protect public health, they may fall under the radar of climate accounting efforts. This might be one of the reasons for the lower representation of NSA climate action in developing countries and the Global South.

For instance, national networks of NSAs and individual actions that are not reported in global climate action databases are not included in the analysis here (see also Box 2). Analysis suggests, however, that individual NSA participation through these networks has increased since the 2015 Paris climate negotiations (Table 1 - possible overlaps are not taken into account). These positive trends indicate the continued and growing role of NSAs in global climate governance. The following section captures an overview of some of these NSA constellations and their membership.

Subnational governments – cities, states and regions

There are several networks connecting city, state and regional action on climate change. Figure 1 provides an overview of some of these, illustrating the number of NSA city participants and their geographical distribution. Networks include the Global Covenant of Mayors for Climate & Energy (GCoM), signed by 9,130 cities representing 775.5 million people worldwide or just over 10 percent of the global population (Global Covenant of Mayors for Climate & Energy, 2018). The GCoM includes the EU Covenant

Figure 1: Regional distribution of NSA city participants in carbon*n*, C40 Cities, CDP Cities, Global Covenant of Mayors for Climate & Energy, and Climate Mayors



Source: Yale, NewClimate Institute and PBL (2018)

of Mayors for Climate & Energy that reports 7,755 signatories with 252.6 million inhabitants within the EU (EU Covenant, 2018). All of these members commit to either submitting individual Sustainable Energy and Climate Action Plans or pledging a 40 percent reduction in carbon dioxide emissions by 2030. ICLEI, a global network of subnational governments, has developed the carbon*n* Climate Registry that includes more than 1,000 cities, towns and regions, drawn from 89 countries and accounting for 9 percent of the world's total population (ICLEI, 2018).

In terms of state and regional governments taking action, the Compact of States and Regions (2017) includes 110 regional governments from 36 countries, representing 658 million people and 18 percent of the world economy and baseline emissions of 3.9 $GtCO_2e$. These governments have committed to 290 climate actions focused on emissions reductions, renewable energy and energy efficiency that are estimated to result in total (cumulative) emissions reductions of 21.9 $GtCO_2e$ between 2010 and 2050, if climate targets are reached on time (The Climate Group, 2017).

Companies and investors

CDP reports that over 6,300 companies representing a combined purchasing power of over US$3 trillion responded to their climate change questionnaire, and that over 650 investors with assets of US$87 trillion participate (CDP, 2018). In 2017, CDP recorded primary data from over 4,800 companies, of which 47 percent noted an emissions reduction or renewable energy target (CDP, 2018).

A few reports detail financial investors' actions on climate change. The Climate Bonds Initiative's 2018 Green Bonds Summary found that US$74.6 billion in green bonds were issued during the first half of 2018, by 156 issuers from 31 countries (Climate Bonds Initiative, 2018). The United States and China topped the list of countries where the most bonds were issued, and most proceeds support projects in the energy, buildings, and land-use sectors (Climate Bonds Initiative, 2018). The Low Carbon Investment (LCI) Registry currently includes 53 investors from 21 countries, with US$50 billion in low-carbon assets (Global Investor Coalition on Climate Change, 2018) – a slight increase on the 2014 assessment, which found 45 investors reporting investments valued at US$24 billion, most of which (44 percent) focused on renewable energy (Global Investor Coalition on Climate Change, 2014).

3.2 International cooperative initiatives

By engaging large and growing numbers of NSAs, international cooperative initiatives (ICIs) can lead to considerable emission reductions, provided that their stated goals are realized and emissions reductions do not displace action elsewhere (Graichen *et al*., 2017; Blok *et al*., 2012; Hsu *et al*., 2015; UNEP, 2015; Widerberg and Pattberg, 2015; see also section 4).

In addition to direct emission reductions, ICIs can play a number of other important roles, including providing proofs of concept for low-emissions development strategies, spurring technology development and diffusion, and helping generate momentum for additional initiatives and activities (Weischer *et al*., 2012).

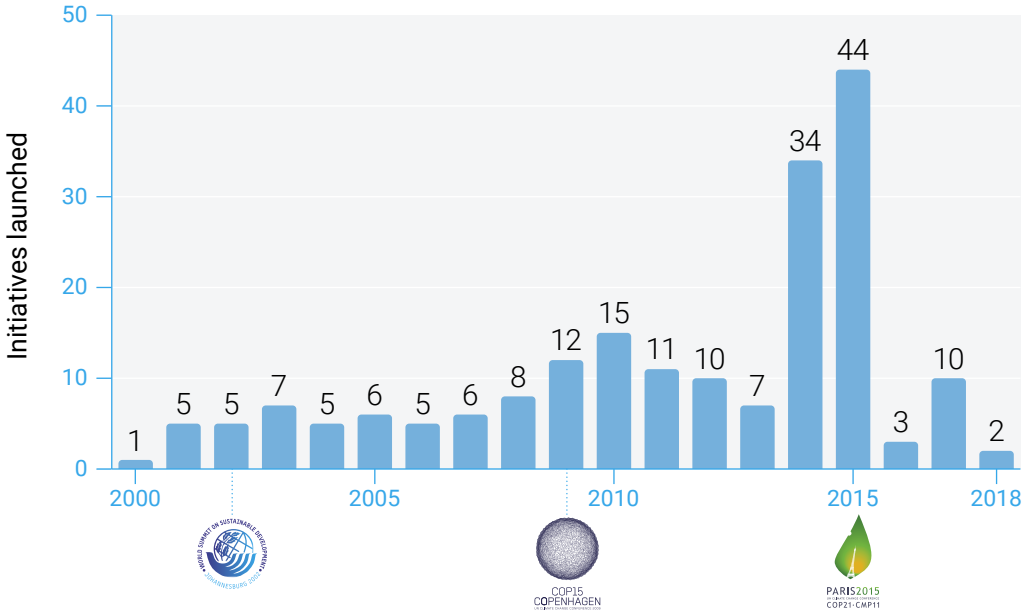
Several databases collect information on ICIs. They vary in number of initiatives, often due to different definitions of ICIs, purposes, focus areas, data collection methods and sources (UNEP, 2016; Widerberg and Stripple, 2016). The summary of trends in this section focuses on mitigation-related ICIs and is based on data from the Climate Initiatives Platform, which is regularly updated, includes clear criteria for inclusion, and is publicly accessible.[2]

2 The Climate Initiatives Platform is hosted by UN Environment and the UNEP DTU Partnership. It includes ICIs that fulfil the following criteria:

- Includes several non-state actors taking voluntary action, and may also include states;
- Have an objective to reduce greenhouse gas emissions or to increase resilience, or could bring about greenhouse gas emission reductions or increased resilience;
- Have an international scope or the potential for significant impact on a global scale; and
- Have a focal point.

Source: **http://climateinitiativesplatform.org/index.php/Climate_Database:About.**

Figure 2: Number of international cooperative initiatives launched each year, between 2000 and 2018



Source: Climate Initiatives Platform [accessed 1 July 2018].

The main features of these ICIs are captured in Figures 2 and 3.

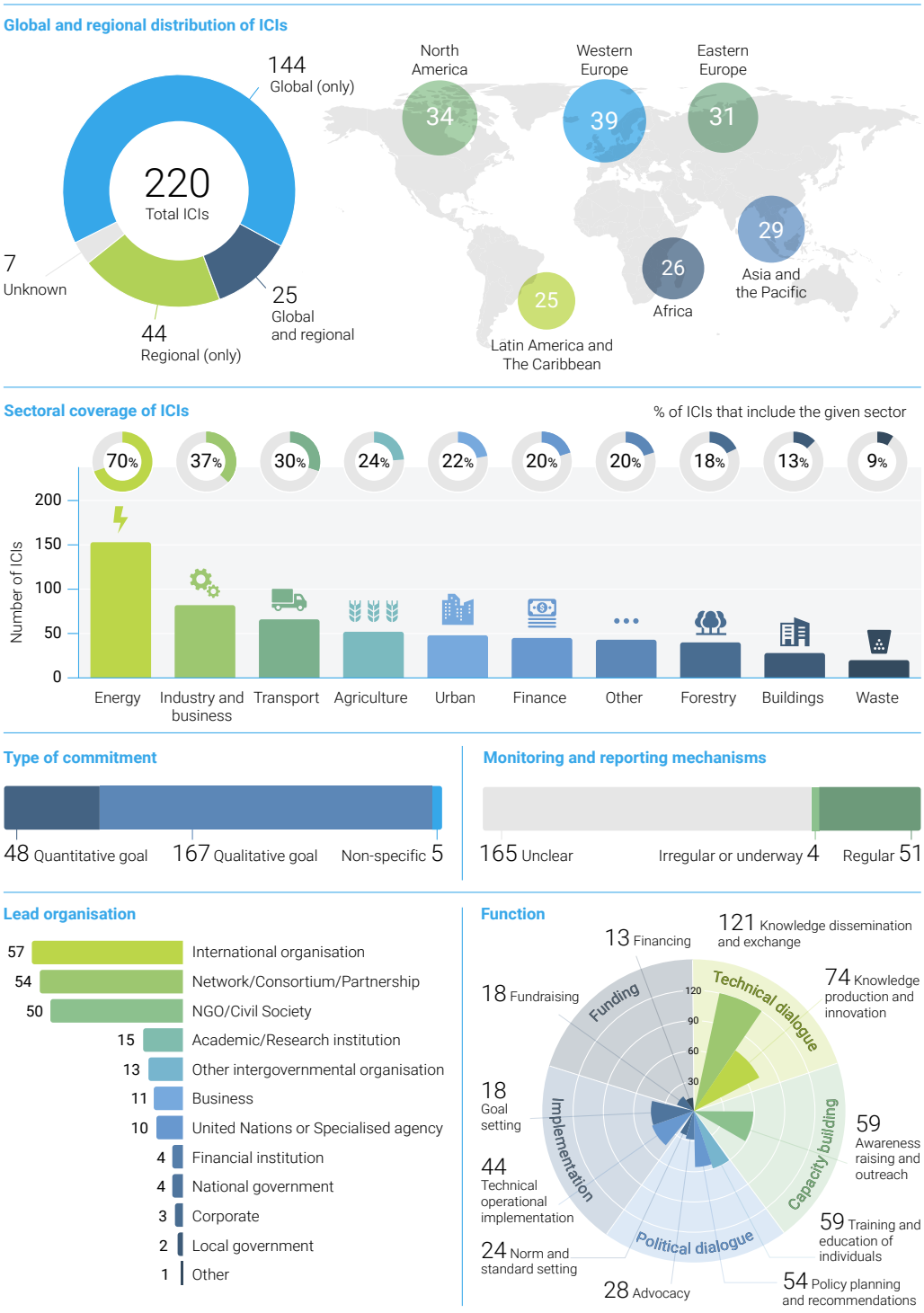
Trend in numbers of ICIs

The Climate Initiatives Platform currently records 244 initiatives, of which 220 are mitigation-focused and are implemented in more than one country.[3] Since the 2016 UN Environment Emissions Gap Report, 17 new initiatives have been added to the platform.

Over the past two decades, the number of ICIs has grown significantly, with peaks in launches of new initiatives around large climate events such as COP15 in 2009, the United Nations Climate Action Summit convened by United Nations Secretary-General Ban Ki-moon in 2014, and COP21 in 2015 (Figure 2). The slowdown in the number of new initiatives in 2016, 2017 and 2018 may reflect a shift in focus towards implementing the initiatives created in earlier years, as well as the importance of global political forums in catalysing the formation of ICIs.

3 As at 25 August 2018

Figure 3: Overview of features of 220 mitigation-focused ICIs



Note: Many initiatives are active in several regions and sectors, and include multiple lead organisations and functions. The numbers and percentages in this figure include all recordings by initiatives, explaining why totals for some elements are higher than 220 initiatives and 100 percent.

Source: Based on data from Climate Initiatives Platform [accessed 24 August 2018].[4]

4 Numbers for the lead organizations, type of action, region, and year of initiation are taken from analysis conducted by and published on the Climate Initiatives Platform website at: http://climateinitiativesplatform.org/index.php/ICI_Analysis [accessed on 24 August 2018].

Regional participation

As Figure 3 illustrates, many initiatives operate in several regions. Although the overall increase in recorded mitigation-focused ICIs since 2016 is relatively limited, regional participation in ICIs has increased in nearly every region of the world. The biggest increase is in Latin America and the Caribbean, where the number of ICIs has increased from 6 in 2016 to 25 in 2018. In Western Europe, Asia and the Pacific, regional participation has roughly doubled compared with 2016. It is worth noting that global ICIs may be active in regions with relatively low participation in regional ICIs, such as South-Eastern Asia and the Middle East. Furthermore, while ICI activities have been concentrated in high- and middle-income countries (Chan *et al*., 2015; Chan *et al*., 2018; Pattberg *et al*., 2012), the number of ICIs operating in lower-income countries grew dramatically between 2015 and 2017, rising by 56 percent in low-income countries, and 50 percent in lower-middle income countries (United Nations Climate Change Secretariat, 2017).[5]

Sectors

Most ICIs (149 out of 220) cover multiple sectors, generally focusing on key sectors where the mitigation potential is significantly higher than the emission reductions implied by current policies and NDCs: the energy, industry, forestry, transport, agriculture, and building sectors (UNEP, 2017). An ICI's sectoral emphasis often shifts according to the needs and capacities of the regions where it is implemented. Actions focused on resilience and agriculture, for example, are most commonly implemented in low-income and middle-income economies, while initiatives addressing the industrial sector are most prevalent in high-income or upper-middle income economies (Chan *et al*., 2018).

Setting goals and tracking progress

The percentage of ICIs that have set quantitative goals remains low, at around 22 percent. Quantitative goals – defined as a specific, measurable goal made either by an initiative or an initiative's members – range from focusing on emissions reduction (for example, reduce emissions by a specific amount by a specific year), to fund-raising (for example, raise, distribute or invest a specific amount of funds), to capacity-building (for example, reach a specific number of people or communities). Similar low levels of quantitative goals are reported in other studies (Chan *et al*., 2018; Graichen *et al*., 2017; Hsu *et al*., 2015; Michaelowa and Michaelowa, 2017; Widerberg and Stripple, 2016; Pattberg *et al*., 2012).

Graichen *et al*. (2017) found that 75 percent of the 174 ICIs they surveyed either did not include sufficient information about their targets, had unclear goals, or did not propose concrete actions. Focusing on emissions reduction targets, Hsu *et al*. (2015) found that just 8 out of 29 initiatives contained explicit emissions mitigation targets tied to a particular year. A study conducted by UNEP (2015) used a similar approach to narrow a list of 184 initiatives down to 15. However, among initiatives with clear emissions reductions targets, many have made more ambitious emission reduction commitments than national governments (Graichen *et al*., 2017).

Monitoring, reporting, and verification practices also remain weak across ICIs: just under 23 percent of ICIs on the Climate Initiatives Platform noted regular monitoring or reporting mechanisms. Other studies also report relatively low percentages of initiatives with established monitoring and reporting mechanisms, ranging from 31 percent (Graichen *et al*. 2017), to 43 percent (Pattberg *et al*., 2012) or 44 percent (Chan *et al*. 2018). Hsu *et al*. (2015a) found that more than half (18) of 29 ICIs announced at the United Nations Climate Action Summit convened by United Nations Secretary-General Ban Ki-moon in 2014 included provisions for monitoring progress, but that very few of these identified specific indicators to track performance. Bansard *et al*. (2016) likewise noted that the type and stringency of monitoring requirements varied widely among city-focused initiatives. Furthermore, many initiatives do not conduct or share cost estimates or feasibility studies, adding an additional barrier to efforts to assess the feasibility and identify potential barriers to initiatives (Roelfsema *et al*., 2015). Striving for "more and better" data collection (Widerberg and Stripple, 2016) from initiatives is required to facilitate efforts to assess ICIs' progress and anticipate their contributions to climate action and sustainable development efforts (Roelfsema *et al*., 2015; Widerberg and Pattberg, 2015; Hsu *et al*., 2016). Some ICIs have developed approaches that demonstrate how this could be accomplished. The Bonn Challenge, for instance, maintains an interactive online dashboard tracking its signatories' commitments, and their potential collective progress towards the initiative's goal.[6]

Lead organization and secretariat

The existence of a secretariat and a lead organization is likely to influence ICI performance (Pattberg and Widerberg, 2016). Initiatives with a permanent secretariat report both higher-than-average potential emission reduction contributions in 2020 and 2030, and higher indirect impacts, complementary goals and co-benefits, such as diffusion of information, political effects, technology development, reduced air pollution, improved health, and strengthened energy security and economic development (Graichen *et al*., 2017). Similarly, the active involvement of NGOs, as either leaders or ICI members, has been shown to be associated with higher potential emission reductions and potentially larger co-benefits (Graichen *et al*., 2017).

5 Part of the increase may include adaptation-focused ICIs.

6 See http://www.bonnchallenge.org/

Almost all (217) of the ICIs included in this report state that they have a secretariat, in many cases hosted by one of the larger organizations participating in the ICI. Based on the information in the Climate Initiatives Platform, it is not possible to assess how many of these secretariats are permanent. In fact, some studies suggest that most ICIs lack a permanent secretariat (Graichen *et al*., 2017; Chan, 2018).

Functions

ICIs primarily provide information and knowledge-related services to their participants (Figure 3). Although the distribution of functions has remained relatively stable over time, a few new functions have recently emerged, including financing and fund-raising. In a recent survey of 75 ICIs, funding was found to be the most common challenge, reported by approximately 30 percent of respondents (UNFCCC, 2017). Meanwhile, financial and organizational capacity tends to be associated with high-performing ICIs (Chan *et al*., 2015; Chan and Pauw, 2014; Galvanizing the Groundswell of Climate Actions, 2015; Widerberg and Pattberg, 2015; Biermann *et al*., 2007). The recent growth in ICIs' fund-raising and financing activities is therefore promising and may suggest increased efforts to address the challenges reported.

4 The potential contribution of non-state and subnational actors to enhancing ambition and bridging the 2030 emissions gap

NSAs contribute to global climate change governance in numerous ways. At the international level, there is particular interest in how much NSAs could contribute to global greenhouse gas emission reductions by 2030 and the extent to which these potential contributions are already included in national current policy and NDC estimates. Section 4.1 assesses the most recent studies on these issues, while section 4.2 addresses the questions related to tracking the progress and results of NSA action. NSAs also play a number of critical roles that do not easily lend themselves to quantification, but may nevertheless be important to enhancing ambition and bridging the 2030 emissions gap. Section 4.3 provides a brief overview of such roles.

4.1 Estimates of potential emission reductions in 2030 of non-state and subnational actors

The 2016 Emissions Gap Report (UNEP, 2016) published an overview of quantitative analyses of the potential contribution of NSA actions to global emissions mitigation in 2030, illustrating a wide range of results. Since these estimates were published, the number of studies that quantify NSAs' potential contribution to global climate action has grown, with more networks and researchers conducting analysis of aggregate impact of member groups on global emissions. These studies can be divided into three categories:

1. **Individual commitments:** estimate the aggregate impact on emissions from pledges by individual cities, regions or business actors that commit to fully implement the targets they set themselves.

2. **Single initiatives:** estimate the potential impact on emissions from a single cooperative initiative goal, assuming this is implemented by all actors under the initiative. Often, individual actors subscribe to a collective cooperative initiative (which can be an ICI) that together sets a goal for the initiative. The single initiative studies assess the emission reductions of the initiative's goals, rather than pledges that individual actors take themselves. The estimated emission reductions subsequently involve some scaling up of the potential.

3. **Scaled-up potential of multiple initiatives:** estimate the potential emission reductions from several initiatives that would occur if the initiatives reached a transformative impact at the sector- or economy-wide level. These studies apply a range of significant assumptions on how actions are expanded; from assuming that all members within a network will adopt an ICI's ambitious emission reduction goal, to that membership will grow to a certain number of actors and cover a certain number of additional sectors. These studies therefore estimate greater reduction potential at the sector- or economy-wide level.

Table 2: Potential greenhouse gas emission reductions of selected individual commitments and initiatives (in $MtCO_2e$ per year in 2025/2030, by study).

Actors and sectors	1) Individual commitments					2) Single initiatives					3) Scaled-up potential of multiple initiatives				
	CDP (2016)	ICLEI (2015)	Kura-mochi et al. (2017)	Roelf-sema (2017)	Yale, New-Climate Institute, and PBL (2018)	Ameri-ca's Pledge (2018)	Arup and C40 Cities for Climate Leader-ship Network (2014)	The Climate Group and CDP, Compact of States and Regions (2017)	Compact of Mayors (2015)	Global Covenant of Mayors (2017)	CDP and We Mean Business (2016)	Roelfsema et al. (2018)	Graichen et al., (2017)	Erickson and Tempest (2014)	Yale, New-Climate Institute, and PBL (2018)
Cities and municipa-lities		179 by 2035	360–560 by 2025	3–30	1,550–2,200 (current policy scena-rio 1a); 200–700 (NDC scenario 1b)	500 in 2025	402		740	1,290				3,700	
Regions								550							
Business	1,000					.026 in 2025					3,200–4,200				
ICIs												5,500	5,000–11,000		15,000–23,000
Number of actors or initiatives quantified	1,089 compa-nies	116 cities	54 cities, 22 regions, 250 compa-nies	25 cities	2,175 compa-nies, 76 regions, 5,910 cities	155 busines-ses, 115 cities, 20 states	228 cities	110 regional govern-ments	360 cities	7,494 cities	5 ICIs including ~ 300 compa-nies	11 ICIs	19 ICIs	600+ cities	21 ICIs
Baseline scenario of the study	Not specified - variable according to individual company actor	Not specified - variable according to individual city actor	Current national policies scenario	Current national policies + NDCs	Current policy scenario and NDCs scenario	Business as usual	Business as usual (no policy baseline)	Compared to 'reference technology scenario' that includes current policies and the NDCs	Business as usual (no policy baseline)	Business as usual (no policy baseline)	Current national policies scenario	Counter-factual (no policy baseline)	Current national policies scenario plus NDCs	Current policy scenario	Current policy scenario and NDCs Scenario
Overlaps quantified?			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓

Note: This table only evaluates reports that include estimated impact in 2025/2030 and excludes those with pre-2025 or post-2030 assessment timeframes. Source: Adapted from Hsu et al. (in review).

Table 2 provides an overview of available studies, organized according to these three categories. The table shows the wide range of potential emission reductions estimated in various studies – from companies based in the United States of America contributing 0.026 $GtCO_2e$ in 2025 (America's Pledge, 2018) to as much as 15 to 23 $GtCO_2e$ in 2030 based on an evaluation of the scaled-up potential of 21 cross-sector, multi-actor ICIs (Yale, NewClimate Institute and PBL, 2018).

Due to the variable baseline methodologies and assumptions adopted by each study, as well as different scopes in terms of actors and emissions covered, the wide range of overall impact assessment is unsurprising. Some studies focus on NSA impact in a single country, such as the United States of America (for example, Roelfsema, 2017), while other single initiative studies evaluate emissions savings relative to business-as-usual scenarios for the actor group, rather than comparing to a global scenario.

Only some studies report a range of results that take into consideration assumptions such as a lower and upper range of results (Kuramochi *et al*., 2017; Roelfsema, 2017; CDP and We Mean Business, 2016; Graichen *et al*. 2017; Yale, NewClimate Institute, and PBL, 2018), and even fewer conduct sensitivity analyses. Not all studies include estimates of overlap between actor groups to adjust the resulting emissions reductions accordingly. In some cases, studies do not take into consideration overlap between actor groups' impact, while others may select for analysis only the most ambitious actor pledges from the same geography or sector (Yale, NewClimate Institute, and PBL, 2018; America's Pledge, 2018). Other reports, such as the U.S. Climate Alliance (2017) report analysing 15 regions' contributions to greenhouse gas reductions or the Nordic Council of Ministers' report on NSAs in Nordic countries (Nordic Council of Ministers, 2017), do not provide an aggregate quantified assessment of impact. They are therefore not included in Table 2.

The studies included in Table 2 all assume various baseline scenarios against which they assess additional impact of NSAs. These baseline scenarios range from study-specific "business as usual" or no-action scenarios, to "current policy scenarios" that take into account a range of existing government policies and pledges, to an "NDC scenario" that assumes that countries implement their NDCs under the Paris Agreement (Table 2; Hsu *et al*., in review). Consequently, it is challenging to compare the estimated impact across studies, although meta-analyses of methodologies applied in each study demonstrate similar approaches, including the use of the Greenhouse Gas Protocol standard for distinguishing between direct and indirect emissions (Hsu *et al*., in review). Specifications of baseline scenarios by which to compare additional NSA contributions are also increasingly converging to common terminology and methods.

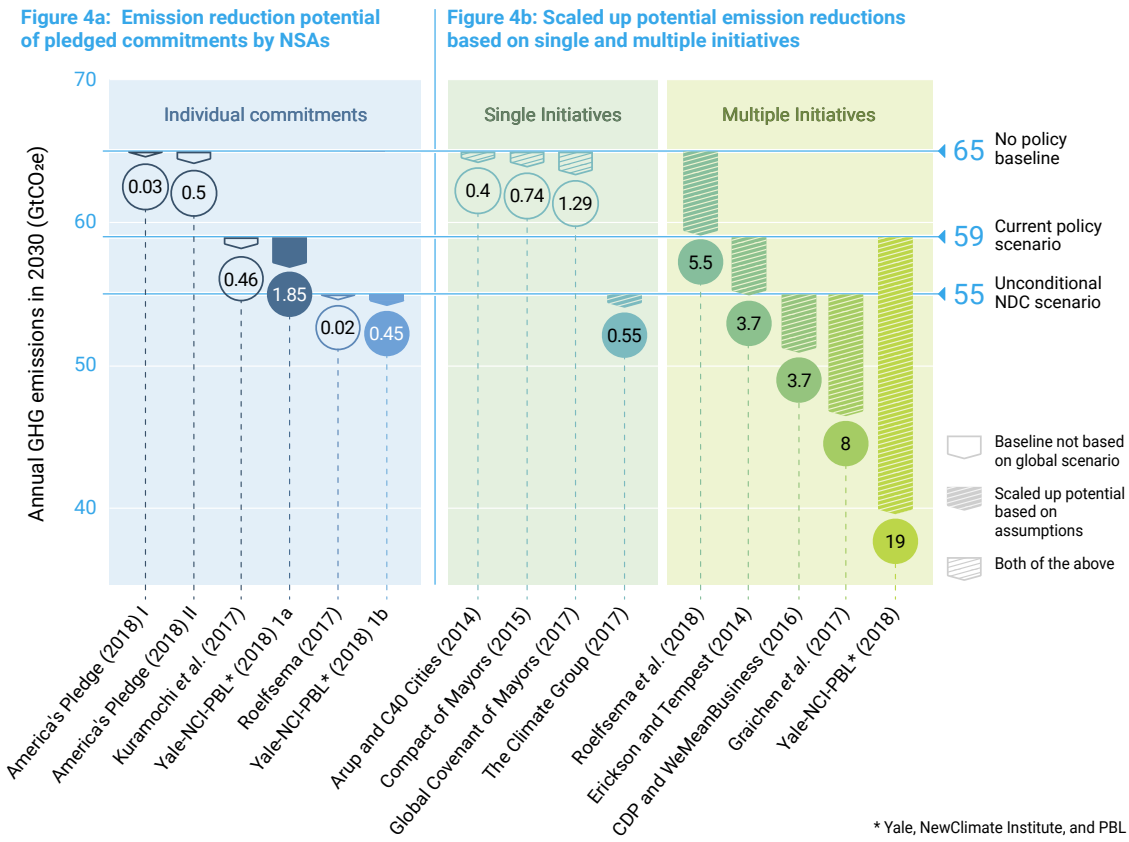
A major question with respect to NSA climate mitigation contribution is the extent to which this leads to emission reductions that are not accounted for in current national policies or in the NDCs. A limited number of the available studies assess NSA mitigation impact relative to global current policy and NDCs based on an assessment of overlap scenarios (see Table 2). These quantitative assessments of overlap determine the ambition level of NSA commitments *vis-à-vis* current policy scenarios and NDC scenarios by comparing the rate of emissions decline in actors' targets (Kuramochi *et al*., 2017). For instance, if a city's emission reduction target results in a steeper rate of decline in overall emissions compared to a national government's NDC, a common assumption is to consider the emissions reductions that are beyond what a national actor has pledged as "additional" reductions.

One analysis focused on the United States of America (Kuramochi *et al*., 2017), found that 17 states and 54 cities with recorded greenhouse gas mitigation commitments comprise 40 percent of national United States of America emissions after accounting for overlaps. These commitments, which do not represent pledges made after the national administration announced its intent to withdraw from the Paris Agreement in June 2017, were found to have the potential to meet almost half of the United States of America's NDC by 2025. Another study that quantified nearly 6,000 subnational and over 2,000 business commitments determined that emissions would be 0.2 to 0.7 $GtCO_2e$/year lower in 2030 than with NDCs alone (Yale, NewClimate Institute, and PBL, 2018, Figure 4).

Figures 4a and 4b illustrates the wide range of potential emission reductions estimated in various studies. The figure includes the studies from Table 2 that have clear and comparable baseline scenario definitions by which to assess the magnitude of additional impact. Figure 4a includes estimates from studies that aggregate from a bottom-up method of *pledged 2030 commitments* made by individual actors. As this figure illustrates, the pledged 2030 contribution by NSAs, if fully realized, is estimated to lead to limited additional emission reductions (ranging from 3 to 700 $MtCO_2e$, as indicated in Table 2) compared to the full implementation of the unconditional NDCs.

Figure 4b includes estimates of *scaled-up potential emission reductions* based on an assessment of single initiative goals and multiple initiatives' goals. These studies assume that all actors participating within their initiative fully implement and achieve the larger goal of an initiative and therefore represent "scaled-up" potential that is larger than the estimates in Figure 4a. The studies behind the estimates in Figure 4b apply a range of assumptions on how actions are expanded, from assuming that all members within a network will adopt an ICI's ambitious emission reduction goal, to that membership will grow to a certain number of actors and cover a certain number of additional sectors.

Figure 4: The range of estimated potential emission reductions in various NSA studies



Source: Based on data in Table 2.
Note: a) For studies that include ranges, median estimates are provided in Figures 4a and 4b.
b) Studies for which baseline scenarios are based on trajectories for the actor group as a whole, rather than compared to a global scenario, are shown with no fill to indicate that the extent to which these projections are comparable to the Emissions Gap Report scenario values for 2030 is less certain.
c) Studies that are cross-hatched indicate these studies evaluate single and multiple ICI goals rather than individual actors' recorded and quantified pledges. They rely on assumptions of future scaled-up impact and therefore represent potential rather than a quantified analysis of individual actors' NSA pledges.
d) Studies that are outline cross-hatched indicate that both b) and c) applies.
e) No extrapolation of 2025 estimates has been made.

The figure indicates that NSAs have the potential to contribute significantly to bridging the 2030 emissions gap, but that realizing this potential requires commitments and action that go far beyond current recorded and quantified individual actor pledges as well as single initiatives.

4.2 Tracking progress and results of non-state and subnational actors

Data limitations and gaps

As the previous sections illustrate, limited availability, consistency and comparability of data pose significant challenges to evaluating the potential NSA impact on climate mitigation and their other benefits. For instance, Bansard *et al*. (2016) found in their evaluation of cities participating in the C40 Cities for Climate Leadership Network that out of around 40 members evaluated, nine different base years with seven different target years were found, making an evaluation and comparison of targets and level of ambition difficult.

Although the Non-State Actor Zone for Climate Action acts as an umbrella for various NSA climate action repositories, no comprehensive database of NSA actions exists, with each NSA adopting various criteria for inclusion that are often unclear or opaque (Widerberg and Stripple, 2016). The reported data are often not suited to calculating emissions impact, estimating overlap, or comparing NSA mitigation potential to the emissions scenarios of other actors, such as national governments.

Key information, such as actors' target and baseline emissions, emissions scopes (that is, direct or indirect), and inventory emissions with historic time-series available, are often inconsistently reported (if at all), with subnational actors from the European Union reporting the largest amount of data required for mitigation impact assessments and the greatest gaps found in emerging and developing countries (Hsu *et al*. 2018, in review).

Box 3 Monitoring, reporting and verification success stories

Monitoring, reporting and verifying the emissions inventories and commitments of both national actors and NSAs is key to global climate change assessment and governance, as there is a risk that actors participate in transnational climate governance initiatives to "greenwash" or boost their reputations, without setting or implementing meaningful climate action targets (Hsu *et al*., 2016; Okereke, 2007; Mayer and Gereffi, 2010). Some NSAs, however, are making their emissions inventories more transparent and making progress on implementing climate actions. For example, Scotland, Wales, and the Australian Capital Territory all compile particularly comprehensive greenhouse gas emissions inventories, which account for the emissions of one or more greenhouse gases from sources within a defined space and time. Each government also goes one step further, by having these inventories externally verified.

Scotland's inventory (Scottish Government, 2017) covers a wide range of emissions sources, and researchers draw on a variety of data sources – including government statistics, regulatory agencies, trade associations, individual companies, and surveys and censuses – to develop approaches that measure their contributions. Even as the inventory tailors and adjusts the approach it uses to calculate emissions from a diverse range of sources, it remains consistent with the Intergovernmental Panel on Climate Change's international guidance on national inventory reporting.

Similarly, Wales aligns its inventory with international guidelines and provides extensive information on its emissions, recording how much heat seven greenhouse gases[7] could trap in the atmosphere over a 100-year period (Aether and Ricardo Energy & Environment, 2016).[8]

While the Australian Capital Territory receives annual emissions data from a national database, these data are often too coarse for the Territory's monitoring goals. The district therefore collects its own electricity, gas, transport and waste data, to supplement the information it receives from the national government (Australian Capital Territory Government, 2017).

Note: This box draws heavily on insights shared by The Climate Group's Compact of States and Regions initiative.[9]

Finally, as the figures in this report exclude national cooperative initiatives and networks, they underestimate the scale and spread of NSA climate actions, particularly in regions where actors have less access or capability to engage with transnational initiatives.

Some efforts under way to address data reporting and methodological consistency should help improve the future data landscape for analysing NSAs' contributions. For example, the World Resources Institute's Greenhouse Gas Protocol Initiative released in 2015 (the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (Fong *et al*., 2015)) and a consortium of non-government institutes, through the Initiative for Climate Action Transparency (ICAT), are currently developing guidance for NSAs, national governments and other audiences to account for and measure NSA climate mitigation contributions (see also Box 3). These and other efforts should help improve consistency among NSA-reported data.

Tracking progress on NSA implementation achievement of targets

Although efforts to improve the monitoring, reporting and evaluation of NSA actions are increasing (see previous section and Box 4), studies and information regarding NSA implementation – progress towards achieving targets and whether actors are meeting their goals – are still scarce (Chan *et al*. 2015; 2018). Part of the difficulty of tracking implementation is that ex-post measurement of results is largely lacking, given the nascent nature of many NSA climate actions. Therefore, most available studies quantifying the mitigation impact of NSAs assess their potential emission reductions, rather than ex-post or achieved results.

To bolster confidence in NSA contributions to bridging the 2030 emissions gap, data on implementation are critical to understanding whether current targets and goals are being reached and 2030 potentials are likely to be achieved.

7 Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride and sulfur hexafluoride.

8 In more technical terms, the inventory shares the global warming potential of these gases over a 100-year time horizon.

9 In particular, we thank Milimer Morgado and Jean Charles Seghers for their help in compiling these examples.

Box 4 Improving monitoring, reporting and verification in international cooperative initiatives

Many initiatives are improving their commitment pledging and evaluation process. For example, CDP is starting to collect this information through its Assessing Low-Carbon Transition (ACT) initiative that provides data, indicators and feedback for companies to align their targets with 2°C scenarios. Some city networks, including ICLEI and the EU Covenant of Mayors, are reporting on their members' progress, although currently only a fraction (1,743 out of more than 6,000 members with action plans) list progress reports on their website. The Science-Based Targets initiative helps companies to set internal climate targets that are aligned with the long-term mitigation goals of the Paris Agreement. The initiative currently includes over 100 companies with science-based targets and over 300 companies wanting to develop such targets.

Some studies question the extent to which NSA implementation and achievements to date have delivered real emission reductions (Chan *et al*., 2015; 2018; Michaelowa and Michaelowa, 2017). One analysis found that out of more than 300 collaborative non-state partnerships announced at the 2002 World Sustainable Development Summit, nearly 65 percent were yet to be operationalized 10 years later (Pattberg *et al*., 2012).

Nevertheless, from the studies available, a number of aspects that are likely to influence the implementation and performance of NSA actions are emerging (see also section 3.2). Graichen et al., (2017); ICAT, (2018); Michaelowa and Michaelowa, (2017); Pattberg and Widerberg, (2016) show that these aspects include:

- leadership and permanent secretariat (for cooperative initiatives),
- target clarity and ownership,
- the presence of monitoring and progress reporting mechanisms,
- past achievement of results, actors' technical capacity,
- financial incentives and the availability of funding,
- a commitment's vulnerability to political considerations,
- and the presence of regulatory support.

It should be noted that while monitoring, reporting and verification procedures are important in terms of enabling learning and boosting credibility among individual actors and initiatives, they may dissuade new NSAs from taking climate action. In ICIs in particular, if the goals and monitoring, reporting and verification procedures are considered too much of an administrative burden, it could discourage their further expansion.

4.3 Contributions by non-state and subnational actors beyond direct emission reductions

NSAs' contributions to climate change action go beyond their quantifiable potential emission reductions: they can play a key role in building government confidence in implementing climate policies and they can signal and push for greater ambition. Quantitative analyses that emphasize NSAs' direct contributions to climate mitigation may overlook the critical other roles that they play in global climate change governance, such as capacity-building, knowledge transfer and coalition building, as these important NSA actions are difficult to quantify. Other examples include facilitative or catalytic actions, such as low or zero-carbon norm creation, or policy foundations, such as voluntary emissions registries, which may produce longer-term societal transitions towards decarbonization (van der Ven *et al*., 2017).

Nevertheless, studies that analyse the roles and functions of NSAs in national and global climate change governance that are difficult to quantify are emerging. These studies highlight three roles and functions as particularly important:

- Facilitating *catalytic linkages* (for example, Betsill *et al*., 2015) with national actors that are often informal in nature, but allow for actors such as national governments to address underlying drivers of emissions, build capacity, or shape low-carbon development contexts;
- Acting as potential *orchestrators* (for example, Chan *et al*., 2018; Abbott *et al*., 2012) in climate policy implementation and coordination with national and intergovernmental actors;
- Providing *experimentation* (for example, Bernstein and Hoffmann, 2018; Hoffmann, 2011) for policy instruments or implementation deemed too risky or costly at the national level.

Box 5 provides examples of the orchestration role of NSAs.

Box 5 Orchestration of non-state and subnational action around the world

Actors and networks in developed and developing countries are incentivizing NSAs to act, identifying and addressing possible barriers to them doing so, and supporting NSA capacity-building to enable them to take effective action on climate change. Such orchestration efforts are resulting in a growing number of NSAs taking climate action.

Example 1: ActionLAC
ActionLAC, a partnership set up by the Latin American *Fundación Avina*, aims to accelerate climate action and strengthen ambition in Latin America. Targeting actors such as community-based organizations, small enterprises, and local governments, this partnership fosters inclusive climate governance in Latin America. ActionLAC provides support throughout the "life-cycle of climate actions", which includes (1) mobilization of action; (2) elaboration of action plans; (3) mobilization of finance; (4) support for implementation; (5) monitoring and measuring through self-reporting; and (6) communication of results to help improve policies. Moreover, it aims to raise awareness and stimulate learning between local and regional actors by connecting local actors with global processes and national policymaking.

Example 2: Cities and Regions Talanoa Dialogues
ICLEI – Local Governments for Sustainability, together with the Global Covenant of Mayors for Climate & Energy and UN-Habitat, are facilitating Cities and Regions Talanoa Dialogues around the world, in response to similar dialogues in the context of the UNFCCC. These dialogues – 50 of which have been scheduled throughout 2018 – engage actors that have often not been adequately involved in national climate efforts to date. The dialogues aim to advance the New Urban Agenda adopted in 2016, and to strengthen multilevel governance and national climate plans. For instance, they explore pathways for actively engaging subnational governments in formulating national climate investment plans. So far, about half of the scheduled dialogues are in developing countries.

Example 3: European Dialogue on Non-State Climate Action
The European Economic and Social Committee (EESC), the EU advisory body comprising representatives from workers' and employers' organizations, established the European Dialogue on Non-State Climate Action (ED-NSCA). This dialogue aims to strengthen and increase the scope and scale of European-based non-state climate action among constituencies that are often not traditionally known as main actors in environment and climate change, including workers' and employers' organizations in the industrial, agricultural and transport sectors. The European Dialogue envisages supporting non-state climate action by: (1) assessing actions; (2) recognizing actions; (3) improving governance; (4) accelerating actions; and (5) supporting actions. So far the EESC has, for instance, organized "participatory circles" with multiple stakeholders to explore means of tracking non-state climate action in Europe; to identify options for recognizing non-state action; to shape an enabling networking and learning environment; and to facilitate finance through and for non-state action.

5 Opportunities for harnessing the potential of NSA climate action to enhance ambition and bridge the emissions gap

The previous sections illustrate the magnitude, diversity and potential contributions of NSAs to climate change action, forming the basis for a number of recommendations on how to further strengthen NSAs' action to realize their emission reduction potential. These recommendations are briefly summarized below.

First, more actors must engage in climate action. Scaling up individual and collaborative climate action to more geographic areas, sectors and types of actors could significantly contribute to realizing the large mitigation potential of NSAs. NSAs from previously under-represented regions of the world are starting to take action. However, many regions, particularly in the Global South, are still under-represented in terms of participants, lead organizations, and the location of secretariats. Encouraging NSAs in developing countries to engage in initiatives would facilitate climate action in growing economies with potentially large and low-cost mitigation potentials. Scaling up also entails ensuring a broad range of sectors, including currently under-represented ones such as oil and gas.

Second, Governments can play a vital role by stimulating this growing movement, and can for example support non-state actors by providing collaboration platforms, capacity building and technical and financial resources. Furthermore, national political institutions are crucial to transnational climate action. For instance, stronger national policies tend to be positively correlated with greater participation in transnational governance (Andonova *et al*., 2017). Governments can also support the implementation of individual commitments. In order to support urban climate action, for example, governments could develop policies and approaches for enhancing the capacity of local governments, including providing financial investments and enabling private investments to lower greenhouse gases (Broekhoff *et al*., 2018).

Third, transparency is critical to assessing NSA actions and tracking their implementation. This report clearly shows that although progress is being made, transparency and related monitoring, reporting and verification standards require improvement at all levels: individual, cooperative initiative, and global. Commitments are often vague in terms of goals, language and enforcement mechanisms, while different baselines, timelines and assessment frameworks are used to report on progress (Bansard *et al.*, (2016). Implementing monitoring, reporting and verification mechanisms for cooperative initiatives is particularly important, in order to document tangible results, NSA climate actions could gain credibility among the broader public and decision makers. These mechanisms would also facilitate learning, allowing the organization to assess performance on an ongoing basis and to experiment with new approaches.

Data collection and reporting efforts are starting to enable more sophisticated analysis on the potential for NSA climate action to contribute additional greenhouse gas reductions beyond national governments commitments. However, data gaps (particularly in high-emitting sectors and developing countries) limit these analyses, meaning they do not necessarily capture the diversity of the NSA climate action taking place. Particularly where sustainable economic development is a pressing concern, NSA climate action takes on different forms besides participation in transnational climate action networks, focusing also on adaptation, capacity-building and resilience functions that are more difficult to quantify and aggregate on a global scale.

Finally, NSAs play different important roles and functions and their contribution to global climate change governance goes beyond what can be measured in terms of direct emission reductions. These aspects – including orchestration, catalytic effects, and experimentation –should therefore be kept in mind.

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