Beyond states: Harnessing sub-national actors for the deep decarbonisation of cities, regions, and businesses

Abstract

Important phenomena are emerging that increasingly call for enhanced or more coordinated climate governance, but that seriously challenge the capacities of a traditional governance system centered on nation-states, their legal subdivisions, and intergovernmental organizations. Climate change represents one such governance challenge. In this Perspective, we ask: What role are sub-national actors poised to play in terms of accelerating a transition to deep decarbonisation. What sorts of mitigation contributions can such actors make, in lieu of or even in concert with national pledges under the Paris Accord? To answer these questions, this Perspective first defines and identifies a range of sub-national actions and efforts undergoing on climate change. It then reviews studies that quantify non-state emissions potentials, mentions limitations with the analysis, and concludes with implications for both policy and governance efforts. The potential of sub-national action for climate mitigation appears to be substantial—up to about 20 GtCO2e, far greater than existing NDC contributions— although prone to potential overlaps and uncertainties.

Keywords: polycentrism; climate governance; Paris Agreement; Nationally Determined Contributions (NDCs); Intergovernmental Panel on Climate Change

1. Introduction

Increasingly, a traditional governance system centered on nation-states and intergovernmental organizations is proving inadequate for addressing some of the most pressing and urgent phenomena, including climate change, that necessitate transboundary cooperation (Abbott, Green, & Keohane, 2016; Gilligan & Vandenbergh, 2020; Stern & Dietz, 2020). These phenomena also often require specialized knowledge and expertise that go beyond the resources of the entities seeking to address them. Because of these and other characteristics, existing national state-based governance institutions have fallen increasingly short of expectations in several domains, and non-state governance institutions have emerged, apparently at an increasing rate as the governance challenges have expanded.

Concerted effort across different stakeholders and non-state actors—-involving sub-national entities and their institutional kin—are likely to become increasingly important as political, economic, and environmental threats and harms increasingly globalize. They are therefore key study objectives for testing ideas of "regime complexes" (Keohane & Victor, 2011), "global legal pluralism" (Berman, 2007), "experimentalist governance" (Brassett, Richardson, & Smith, 2010; Sabel & Zeitlin, 2012), "polycentric networks" (Cole, 2015; Ostrom, 2010a, 2010b; Sovacool, 2011), "multi-level governance" (Hooghe & Marks, 2001), "networked governance" (Bäckstrand, 2008), "transnational climate governance" (Andonova, Betsill, & Bulkeley, 2009), and "private governance" (Vandenbergh, 2013) that blur commonly held understandings of governance, international relations, sustainability, business practices, and democracy.

Reflecting the climate governance challenge is the widening emissions gap between projected emissions based on nationally determined contributions (NDCs) and temperature goals set in

the Paris Agreement (Höhne et al., 2020; UNEP, 2019). The sum of NDCs is by far not sufficient to keep global warming well below 2°C or to pursue 1.5°C. In addition, there is an implementation gap between projected emissions of current policies and unconditional and conditional NDCs estimated to be around 29 to 32 $GtCO_2e$ for 1.5°C, and 12 to 15 $GtCO_2e$ for 2°C, in 2030. Current policies are not sufficient to achieve the already insufficient mitigation targets in NDCs.

These gaps provide compelling evidence that continuing along the same development pathways that led to high emissions will not address the problem. With that in mind, we ask: what might narrow the emissions gap? What role are sub-national and non-state actors poised to play in terms of addressing global climate change? What sorts of emissions reductions can such actors make, in concert with national pledges under the Paris Agreement? To answer these questions, this Perspective first defines and identifies a range of sub-national and non-state actions and efforts, including businesses and subnational governments, undergoing on climate change. It then reviews studies that quantify the emissions potentials of these actors' climate mitigation initiatives, identifies limitations with the analysis, and concludes with implications for both policy and governance efforts.

2. Defining, typifying and quantifying non-state actors and actions

In the Paris Agreement, the importance of the role of non-government and subnational stakeholders is stressed. Non-state actors, e.g. companies, associations, international organizations, civil society, cities and regions, have emerged to undertake a range of climate mitigation actions (Hsu et al., 2019). It is important to distinguish between individual actions, e.g. taken by individual regions, cities or businesses, and international cooperative initiatives spanning national borders that incentivize action by many actors (Hsu et al., 2018). The international cooperative initiatives take a variety of forms, ranging from those that focus solely on non-state actors to those that engage national governments. They can also range in commitment level, from primarily membership-based that do not necessarily require specific actions (e.g. America's Pledge, 2019) to those that require members to tackle emissions reductions in specific sectors or aim for transformational change (Kuramochi et al., 2020).

Transnational cooperative initiatives vary in terms of their potential impact, membership, scope and scale. We provide a selection of 20 of these initiatives that promise climate mitigation impacts beyond current national policies reported in the last several years (see Table 1). For example, business activities have the potential to significantly contribute to global mitigation efforts. The SBT (Science-Based Targets Initiative) provides companies with several methods to align emission reduction targets with the 2°C or 1.5°C target by specifying how much and how quickly they need to reduce their greenhouse gas emissions. As of November 2019, 689 companies have pledged science-based climate action and 285 companies have approved SBT. Another example is the RE100 initiative, which is comprised of more than 200 multinational companies committed to 100% renewable electricity; these members collectively account for electricity consumption equivalent to Indonesia and South Africa today (RE100, 2019).

Table 1: Emissions reduction potential for subnational government and business initiatives in 2030 ($GtCO_2e$/year). Source: adapted from Lui et al. (2020)

Sector	**Leading Actor**	**Name**	**Scale**	**Target(s)**	**2030 emissions reduction potential compared to no policy, current policies or NDC baseline ($GtCO_2e$/year)**		**Membership assumptions**	**Source**
					Min	***Max***		
Energy efficiency	Intergovernmental (UNEP)	United for Efficiency (U4E)	Global (focus on developing countries)	Members to adopt policies for energy-efficient appliances and equipment	0.6	1.25	Current membership	Lui et al. (2020), CIP (Climate Initiatives Platform, 2019)
Energy efficiency	Intergovernmental	Super-efficient Equipment and Appliance Deployment (SEAD) Initiative	Global	Members to adopt current policy best practices for energy efficiency product standards	0.5	1.7 (excl. China)	Current membership	Lui et al. (2020), Letschert et al. (2012)
Buildings	Business	Architecture 2030	Global (focus on North America)	New buildings and major renovations shall be designed to meet an energy consumption performance standard of 70% below the regional (or country) average/median for that building type and to go carbon- neutral in 2030	0.2	0.2	Current membership	Lui et al. (2020)
Transport	Business (aviation sector)	Collaborative Climate Action Across the Air Transport World (CAATW)	Global	Two key objectives: 1) 2% annual fuel efficiency improvement through 2050, 2) Stabilise net carbon emissions from 2020	0.3	0.6	Current membership	Lui et al. (2020), Roelfsema et al. (2018)
Transport	Business	Lean and Green	Europe	Member companies to reduce CO_2 emissions from logistics and freight activity by at least 25% over a five-year period	0.02	0.02	Current membership	Lui et al. (2020)

Transport	Hybrid	Global Fuel Economy Initiative (GFEI)	Global	Halve the fuel consumption of the LDV fleet in 2050 compared to 2005	0.5	1.0	Current membership	Lui et al. (2020), GFEI (2018), Roelfsema et al. (2018)
Transport	Business	Below50 LCTPi [1)]	Global	Replace 10% of global transportation fossil fuel use with low-carbon transport fuels by 2030	0.5	0.5	Scaled-up global potential	PwC (2015)
Renewable energy	Business	European Technology & Innovation Platform Photovoltaic (ETIP PV)	Europe	Supply 20% of electricity from solar PV technologies by 2030	0.2	0.5	Current membership	Lui et al. (2020)
Renewable energy	Intergovernmental (African Union)	Africa Renewable Energy Initiative (AREI)	Africa	Produce 300 GW of electricity for Africa by 2030 from clean, affordable and appropriate forms of energy	0.3	0.8	Current membership	Lui et al. (2020)
Renewable energy	Hybrid	Global Geothermal Alliance (GGA)	Global	Achieve a five-fold growth in the installed capacity for geothermal power generation and a more than two-fold growth in geothermal heating by 2030	0.2	0.5	Targeted capacity	Lui et al. (2020)
Renewable energy	Business	REscale LCTPi [1)]	Global	Support deployment of 1.5 TW of additional renewable energy capacity by 2025 in line with the IEA's 2°C scenario	5	5	Scaled-up global potential	PwC (2015)
Renewable energy	Business	RE100 initiative	Global	2,000 companies commit to source 100% of their electricity from renewable sources by 2030	1.9	4	Targeted membership	Lui et al. (2020)
Forestry	Hybrid	Bonn Challenge / Governors' Climate and Forests Task Force (GCFTF) / New York Declaration	Global	End forest loss by 2030 in member countries and restore 150 million hectares of deforested and degraded lands by 2020 and an additional 200 million hectares by 2030	3.8	8.8	Scaled-up global potential	Lui et al. (2020), Wolosin (2014), Roelfsema et al. (2018)

		on Forests (NYDF)						
Non-CO_2 emissions	Government	Climate & Clean Air Coalition (CCAC)	Global	Members to implement policies that will deliver substantial short-lived climate pollutant (SLCP) reductions in the near- to medium-term (i.e. by 2030) for HFCs and methane	1.4	3.8	Current membership	Lui et al. (2020), CIP (Climate Initiatives Platform, 2019)
Non-CO_2 emissions	Intergovernmental (World Bank)	Zero Routine Flaring	Global	Eliminate routine flaring no later than 2030	0.4	0.4	Current membership	Data-Driven Yale et al. (2018)
Multisectoral	Cities and regions	Under2 Coalition	Global	Local governments (220 members) aim to limit their GHG emissions by 80 to 95% below 1990 levels by 2050	4.6	5	Current membership	Lui et al. (2020)
Multisectoral	Cities and regions	Global Covenant of Mayors for Climate & Energy (GCoM)	Global	Member cities have a variety of targets (+9,000 members)	1.4	1.4	Current membership	Lui et al. (2020), GCoM (2018)
Multisectoral	Cities and regions	C40 Cities Climate Leadership Group (C40)	Global	94 member cities have a variety of targets, aiming for 1.5°C compatibility by 2050. The network carries two explicit goals: 1) to have every C40 city develop a climate action plan before the end of 2020 (Deadline 2020), which is "deliver action consistent with the objectives of the Paris Agreement" and 2) to have cities achieve emissions neutrality by 2050	1.5	3	Current membership	Lui et al. (2020), ARUP and C40 Cities (2016)
Agriculture	Business	Climate Smart Agriculture (CSA) LCTPi [1)]	Global	Reducing agricultural and land-use change emissions from agriculture by at least 50% by 2030 and 65% by 2050. 24 companies and 15 partners	3.7	3.7	Scaled-up global potential	PwC (2015)

Multisectoral	Business	Science Based Targets initiative (SBTi)	Global	By 2030, 2,000 companies have adopted a science- based target in line with a 2°C temperature goal	2.7	2.7	Targeted membership	Lui et al. (2020)

[1)] As of July 2020 most of the LCTPi initiatives are defunct, except the Climate Smart Agriculture programme (Climate Initiatives Platform, 2020).

The collective ambition of initiatives is significant. Lui et al. (2020) estimated that the aggregate potential impact of 17 selected initiatives could total up to emissions reductions in 2030 consistent with a 2°C pathway, or a range of reductions from 18 to 21 $GtCO_2e$/year below a current policy baseline (Figure 2). This assumes that these initiatives achieve their ambitious goals and do not displace action elsewhere. It accountd for the overlaps between the initiatives.

Although not necessarily a congruent comparison, this level of reductions from sub-national actors would be significantly higher than the reductions expected to come from the NDCs. For example, Rogelj et al. (2016) calculate that the NDCs are projected to lead to a reduction of around 4 (2–8) $GtCO_2eq$/year relative to the median current-policy scenario estimate.

Within this collection of reductions, the three most significant potentials in terms of emissions reductions or scope relate to forestry (Bonn Challenge / Governors' Climate and Forests Task Force (GCFTF) / New York Declaration on Forests (NYDF)), cities and regions (Under2 Coalition) and the business coalition committed to 100% renewable energy (RE100). The most significant collection of actor or actor type was found to be cities and regions, followed by businesses and the private sector. City and region initiatives are spread widely -- these actors have huge potential to add additional reductions, due to their large geographical scope. Lui et al. (2020) find largest potential in that area. Several regions like California and Scotland have set zero emission targets (Höhne et al., 2019). Initiatives not quantified in Lui et al. (2020) e.g. Zero Routine Flaring and Climate Smart Agriculture initiatives, may add another few $GtCO_2e$/year of emissions reductions compared to a current policy baseline by 2030.

Initiatives focused on forestry have very high emissions reduction potential due to the current high deforestation rates and the ambitious targets of many of these forestry initiatives, such as the New York Declaration on Forest's goal to end deforestation by 2030. On the other hand, uncertainties in global forest carbon emissions (and therefore potential reductions) are high and despite a multitude of initiatives in the sector, actually measured deforestation rates have not declined since the initiative was announced in 2014.

Initiatives focused on non-CO_2 emissions, and particularly on methane, can achieve sizable reductions, in the order of multiple $GtCO_2e$/year. Renewable energy initiatives are not only initiated by groups of countries, but also business entities and private sector consortiums.

Granted, these figures are prone to significant uncertainties, including uncertain implementation, and represent more an aggregation of various aspirational goals rather than actual commitments, which is a bold extrapolation beyond current levels of both performance and membership. When calculating these substantial contributions, Lui et al. (2020) take into consideration overlap between sectors, programs, and national policies, although future iterations of higher ambition NDCs could incorporate these efforts.

It is also important to note the role of international initiatives other than direct GHG emissions reductions. For example, the Global Cement and Concrete Association (formerly the Cement Sustainability Initiative), which includes 30 percent of the world's cement production, has contributed to the development of consistent energy and emissions reporting from member companies in its nearly 20-year history. The CSI also suggested possible approaches to balance GHG mitigation and the issues of competitiveness and leakage (Cook & Ponssard, 2011). The member companies of the GCCA (CSI) have become better prepared for future legislation on managing GHG emissions and developed management competence to respond to climate

change compared to non-member companies in the cement sector (Busch, Klee, & Hoffmann, 2017).

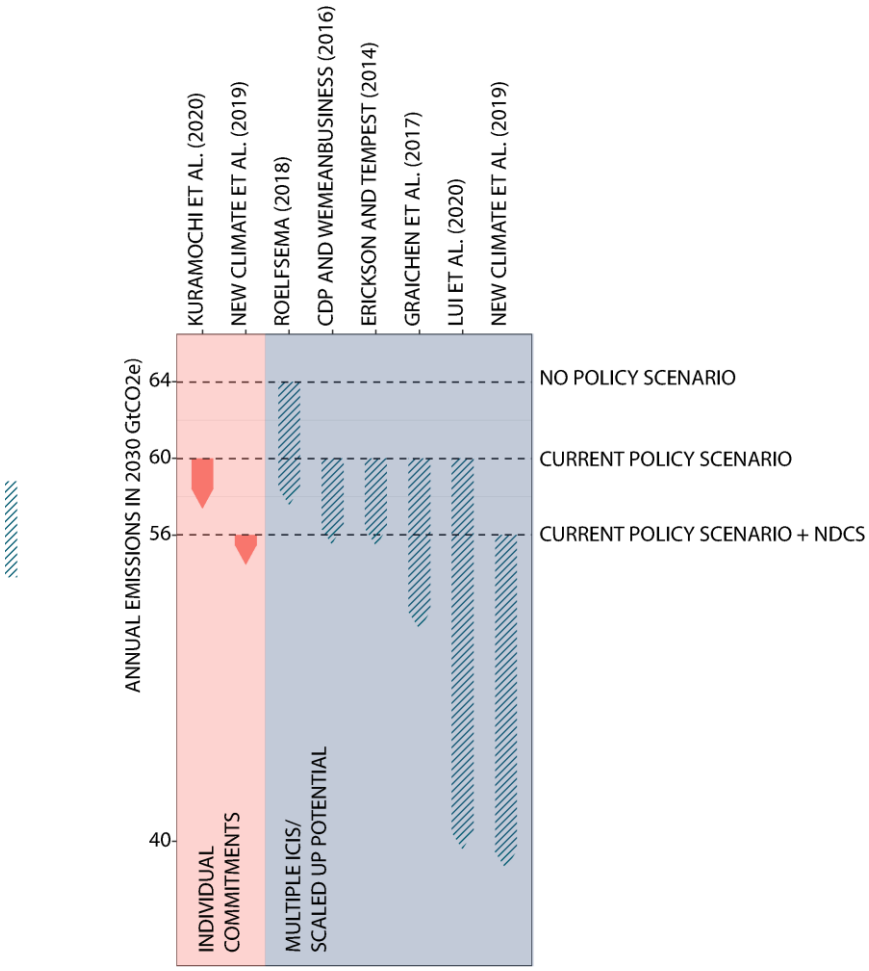
It is also important to note that individual actors' commitments and international initiatives that commit to GHG mitigation activities are only nascent in many of sectors where reaching zero emissions is generally more difficult, e.g. aviation, iron and steel and freight transport (Höhne et al., 2020).

Quantification of the potential impact of these actions is still limited and prone to uncertainty. Almost all studies estimate the potential impact of the full implementation of the individual actions and initiatives, but do not factor in that they may not reach their targets. The main reason for this challenge is that there is very limited data currently available from individual actors (e.g., annual GHG inventory reports) and initiatives to assess progress towards their targets. There are a few studies that attempt to assess initiatives' progress by looking into their production of relevant outputs compared to stated goals (Chan, Falkner, Goldberg, & van Asselt, 2018). Existing quantification studies do not yet cover all commitments and only a selected number of initiatives are analysed. Most of these studies exclude commitments that are not (self-)identified as climate change mitigation-related, those that are not connected to international networks, those that have non-mitigation-related goals such as adaptation or resilience, or those that are communicating in languages other than English.

Analyses that aggregate the potential impact of sub-national and non-state climate actions have evaluated two levels of commitments: those at the individual actor level, which include a city or company that has pledged a specific emissions reduction target; and transnational initiatives that necessarily include multiple actors cooperating across borders towards a common mitigation goal (Data-Driven Yale et al., 2018). These individual actors' targets and actions can help implementation of policies and plans within their own national contexts, but on their own at a global scale are only to a limited extent more ambitious than national polices when accounting for overlaps between actors covering the same emissions or operating within the same jurisdictions (Figure 1, "individual commitments"). For example Kuramochi et al. (2020) calculate that within the umbrella of such overarching initiatives, more than 6,000 cities and regions have made quantifiable commitments to reduce GHG emissions; participating cities represent a collective population of 579 million (more than Brazil and the United States combined), whereas participating regions are home to approximately 514 million people (four times the total population of Japan). They find that particularly in the USA, where national government action is non-existent, the potential impact of sub-national and non-state actors is most significant and could make up more than half of the U.S.'s original NDC.

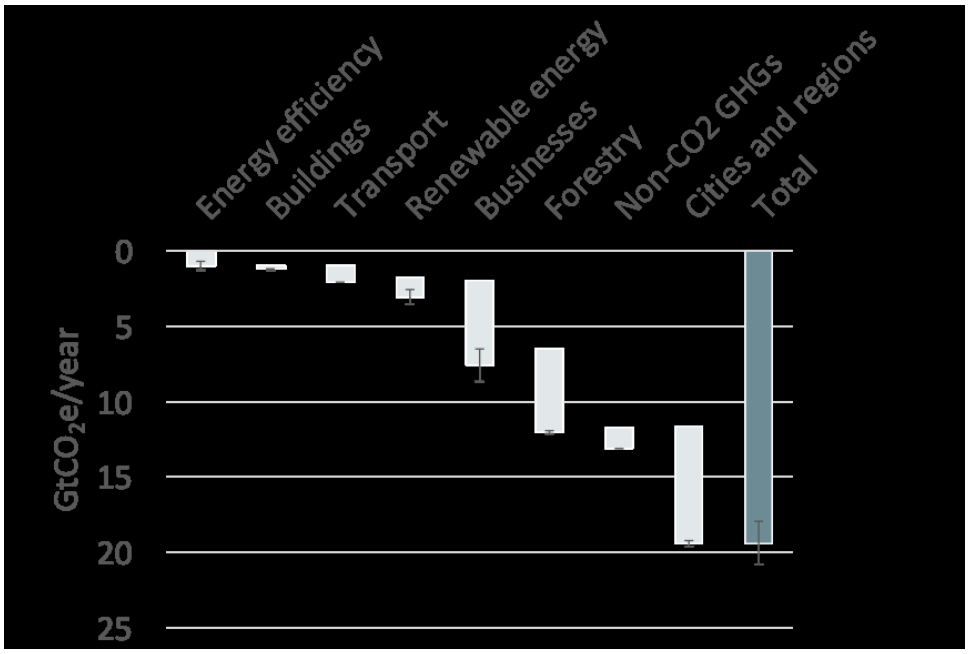
Climate mitigation potential of the ambitious targets of transnational climate initiatives is significantly higher and in aggregate significantly more ambitious than national actions (Figure 1, "multiple initiatives"). Roelfsema et al. (2018) project that a subset of sub-national and non-state transnational climate initiatives outside of the scope of the Paris Agreement's national commitments could deliver 5 Gt of CO_2e emissions reductions by 2030 below a no action scenario. Roelfsema et al. (2018) suggest that these reductions are projected to be of similar magnitude as the NDCs.

Figure 1: Emissions reduction potential for sub-national and non-state actors by 2030 (in Gigatons of Carbon Dioxide Equivalent)



Source: Compilation by the authors. Note that many of our examples do not include initiatives that target the emissions from religious organizations, colleges and universities, civic and cultural groups, and, to some extent, households. This means we may underestimate sub-national potential for mitigating emissions, rather than overestimate it.

Figure 2. Potential greenhouse gas emissions reductions up to 2030 resulting from full implementation of 17 analysed international cooperative initiatives per sector



Source: Lui et al. (2020)

3. Discussion and limitations

A major question with respect to subnational and non-state climate commitments is their performance and whether actors are making progress towards stated goals. The estimates in Table 1 and Figures 1 and 2 are contingent on assumptions that subnational and non-state actors fulfill their pledges and that these actions and do not result in rollbacks in climate action (i.e., weakening of national climate legislation) from other actors, but data tracking or quantifying implementation remains rare (Chan et al., 2018; Hale et al., n.d.; Hsu et al., 2019; Kuramochi et al., 2020).

On the one hand, reporting networks may attract high-performing cities, suggesting an artificially high level of cities interested in taking climate action or piloting solutions that may not be effective elsewhere (van der Heijden, 2018). In simpler terms: they could supplement national efforts that may be insufficient without them. But they could also exceed the efforts of countries within which they're located, so a basic question remains whether non-state action been taken into account. Kuramochi et al. (2020) has shown that the assumptions on the baseline emissions for non-state actors with targets have significant impact on the GHG impact estimates.

On the other hand, these studies could also present a conservative view of potential mitigation impact because they draw upon publicly reported mitigation actions and inventory data, excluding subnational actors that may be taking actions but not reporting them (Kuramochi et al., 2020). The nuances of likelihood, and the drivers and obstacles of climate action across different contexts is a key source of uncertainty around subnational actors' impacts. Furthermore, although non-state climate initiatives may have positive spillover effects such as stimulating government action, Leonard (2020) cautions that they can also have negative spillover effects and risk creating races to the bottom.

None of the studies reviewed in Table 1 quantified the potential impact of financial sector actions, e.g. divestment from emission-intensive activities, or supply chain targets, e.g. in the food chain or for cars, due to data limitations. Depending on the impact of these targets (which are reported to some extent), the mitigation potential could be higher.

Other uncertainties lie in the accounting methodologies analysts adopt to aggregate the mitigation impact of sub-national and non-state climate actions. Definitions of baseline or counterfactual scenarios have major impact on how much sub-national and non-state climate actions are considered "additional" or in addition to national government climate actions, which could assume these actions overlap or are included within existing policies or a country's NDC. How these overlaps are accounted for within aggregation impact analyses can also be assessed through a range of approaches, from broad interpretations that assume little to no overlap (UNEP, 2015) to those that estimate some range of overlap where emission reductions are discounted because actors cover similar baseline emissions, jurisdictions, or activities (Hsu et al., 2019). A major criticism of these aggregation studies' quantification of mitigation potential is that they risk double-counting of emissions reductions claimed by different actors operating in the same sector or jurisdiction, which some counter by applying a conservative approach of rather overestimating than underestimating the overlaps. How analysts approach these key methodological challenges can result in a wide range of results and uncertainties.

Beyond their potential impact in terms of emissions reduction, sub-national and non-state actors can contribute to climate governance by building confidence in governments concerning climate policy, pushing for more ambitious national goals and developing new business models and financial innovations to achieve their commitments.

A better alignment across governance scales and better coordination of international organizations and networks with national stakeholders can help reaching national goals in a strengthened and timely manner. Innovative governance approaches are needed to strengthen the role of sub-national and non-state actors, and reduce implementation challenges based on country-specific context and priorities.

4. Conclusions

Collectively, subnational and non-state climate plans and actions can add up to significant emissions reductions. If fully implemented, they have the potential, under varying conditions and assumptions as well as degrees of confidence, to bring the world back on track with a 2°C pathway. They could support the national efforts that may insufficient without them.

Global energy and climate governance, like governance of other emerging transnational phenomena, clearly generates novel actors and patterns that warrant further research. Climate change presents and will continue to present major new governance challenges requiring an ecosystem of governance entities and relationships, along with adequate procedural mechanisms to address them, extending far beyond and below the state.

The effectiveness of climate governance raises pressing research questions that include: developing a useful taxonomy of governance entities; exploring the emergence, roles and impact of various sub-national and non-state actors in this governance space; assessing the

effectiveness of particular institutions and the overall governance ecosystem in meeting the governance challenges; and identifying ways of increasing effectiveness.

Sub-national and non-state climate action raises new research questions for political science, international relations, public policy, and governance. Such questions are as exciting for researchers as they are challenging for governance institutions, which is precisely why we hope future analysts will begin to better recognize and address them.

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