Global climate action from cities, regions, and businesses

Taking stock of the impact of individual actors and cooperative initiatives on global greenhouse gas emissions. 2021 edition

Technical annex I: Methodology for quantifying the potential impact of individual actors' commitments

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1 Datasets used in the analysis

The analysis covers commitments from individual actors that have set quantitative greenhouse gas (GHG) emissions reduction targets, and for which historical emissions data is available. The emissions trajectories for non-state and subnational actors with commitments are developed based on the data provided by CDP for companies and by Data-Driven Lab, with data from the Alliance of Peak Pioneering Cities, Global Covenant of Mayors for Climate & Energy, Global Covenant of Mayors for Climate & Energy (EU Secretariat), CDP Cities, CDP States and Regions, ICLEI carbon*n*® Climate Registry, C40 Cities Climate Leadership Group, Under2 Coalition, We Are Still In, United States Climate Mayors, and United States Climate Alliance, for sub-national actors. For sub-national actors, these datasets were further supplemented by additional data collection from websites of individual subnational governments (see Section 1.2). Our analysis covers quantifiable emissions reduction commitments from over 1,929 cities, more than 125 regions, and approximately 800 companies operating in the ten major emitting economies.

Direct emissions (Scope 1) and indirect emissions from electricity generation (Scope 2) are included in the analysis for individual actors. Commitments' impact on supply chain emissions (Scope 3) are excluded from the analysis if they make up the entirety of the commitment. While Scope 3 emissions are significant for most companies, it was not possible to quantify the overlaps between Scope 1 and 2 emissions and Scope 3 emissions across actors, nor to localize these emissions to specific geographies given current data availability. We include commitments with a combination of Scope 1 and 2 emissions and Scope 3 emissions, although the impact of this assumption on the obtained results are likely limited since there are only 98 companies with this type of commitment in our dataset. For cities and regions, only 105 cities and 4 regions reported Scope 3 emissions in their inventories, so we did not assess them in this study.

1.1 Overview of data

Our analysis considered approximately quantifiable emissions reduction commitments from 1,929 cities, 125 regions, and approximately 800 companies. The emissions inventory totals used for the calculations were mostly self-reported by entities through one of the above-mentioned reporting platforms. Data for quantifiable climate commitments came from the sources presented in Table 1.

Table 1: Data sources for individual subnational and non-state actor commitments

Climate Action Platform	Data source
Alliance of Peaking Pioneer Cities of China	Alliance of Peaking Pioneer Cities of China (2016). Accessed from: http://www.huanjing100.com/p-1307.html. Peak emissions years were used in the calculation of the cities' projected carbon emissions. Emissions data were further supplemented through data collection through Internet research.
C40 Cities for Climate Leadership Group	C40 Cities for Climate Leadership. Accessed February 2021 from: https://www.c40.org/cities.
ICLEI Local Governments for Sustainability carbon*n*® Climate Registry	ICLEI Local Governments for Sustainability carbon*n*® Climate Registry (www.carbonn.org). (Data provided directly by ICLEI in June 2019). Individual targets and action plans for carbonn participants based on 2018 GPC Inventory responses. Although many ICLEI members report to CDP through the ICLEI-CDP unified reporting system, we supplemented our database with previously-collected data from the ICLEI carbon*n* Climate Registry if used in previous report editions.
CDP Cities	CDP. (2021). 2020 Full Cities Disclosure. Individual target and emissions data. Accessed February 2021 from: www.data.cdp.net.
CDP 2020 Disclosure Survey	CDP. (Provided directly from CDP in March 2021). *GHG emissions and action data for companies based on the 2020 responses*.
CDP States and Regions	CDP. (2021). 2020 States and Regions Annual Disclosure. Individual target and emissions data. Accessed February 2021 from: www.data.cdp.net.
EU Covenant of Mayors for Climate & Energy	EU Covenant of Mayors for Climate & Energy. Individual targets and emissions data for reporting members. Accessed February 2021 from: https://www.covenantofmayors.eu/. Additional data on EU Covenant of Mayors members (e.g., scope 1 and 2 disaggregated emissions data) were obtained from: Kona, A., Bertoldi, P., Monforti-Ferrario, F., Baldi, M. G., Lo Vullo, E., Kakoulaki, G., Vetters, N., Thiel, C., Melica, G., Sgobbi, A., Ahlgren, C., and Posnic, B.: Global Covenant of Mayors, a dataset of GHG emissions for 6,200 cities in Europe and the Southern Mediterranean, Earth Syst. Sci. Data Discuss. [preprint], https://doi.org/10.5194/essd-2021-67, in review, 2021.
Under2 Coalition	Under2 Coalition (Secretariat: The Climate Group). Membership data. Accessed March 2021 from: https://www.under2coalition.org/members.
Global Covenant of Mayors for Climate & Energy	Global Covenant of Mayors for Climate & Energy. Membership data. Accessed February 2021 from www.globalcovenantofmayors.org.
US Climate Alliance	U.S. Climate Alliance. Accessed February 2021 from: https://www.usclimatealliance.org/state-climate-energy-policies. Information from this source was supplemented through desk research of participants' climate action targets or plans.
US Climate Mayors	US Climate Mayors. Accessed February 2021 from: www.climatemayors.org and http://climatemayors.org/actions/climate-action-compendium/. Information from this source was supplemented through desk research of participants' climate action targets or plans.
We Are Still In	We Are Still In. Participation data. Accessed July 2019 from: https://www.wearestillin.org

The emission pathway in the "Current national policies plus individual actors' commitments" (CPS+NSA) scenario for each actor is derived from emission levels in target year. We assume a linear interpolation of emission levels between the modelling starting year and the short- to mid-term target year (between 2020 and 2030). After the last target year, we have assumed that the emission levels follow CPS scenario emission projections until 2030. We also assume linear interpolation towards the target year if the actor only has a long-term target (e.g., 2050) and take the obtained emissions level for 2030. The methodology note of the Climate Action Aggregation Tool (CAAT) provide more detailed explanations on how the CAAT conducts linear interpolations between the target's base year, the most recent inventory year (if available), and target year(s) (ICAT, 2021).

1.2 Subnational actions

Data collection and harmonisation approach

Subnational climate action data was collected from a variety of climate action registries and platforms, including the Global Covenant of Mayors for Climate and Energy, Global Covenant of Mayors for Climate and Energy (EU Secretariat), CDP Cities, CDP States and Regions, ICLEI carbon*n*® Climate Registry, C40 Cities Climate Leadership Network, Under2 Coalition, United States Climate Mayors, United States Climate Alliance and We Are Still In.[1]

Different platforms report participants' climate actions in different formats and to different levels of detail: CDP Cities report the breakdown of Scope 1 and Scope 2 emissions of subnational actors, whereas others do not include information on emissions scopes if inventory information is reported by an actor. Climate action platforms also capture different types of targets that span absolute greenhouse gas (GHG) emissions reduction, energy efficiency, renewable energy, and intensity-based targets, among others.

To overcome the inconsistencies in each platform's method of categorizing targets and to include as many subnational actors' targets as possible, we chose the most common targets across platforms. We included city- or region-wide absolute GHG emission reduction targets and quantified each target's emissions reduction using the following variables: actor's base year Scope 1 and Scope 2 emissions, the target percent reduction, the target base year, the target year, and the actor's most recent GHG inventory data.

In the preliminary analysis presented in this paper, sector-level and government-operations targets for cities and regions were excluded if city- or region-wide emissions reduction targets existed.

In sum, the hierarchy was applied as follows:

1) City- or region-wide absolute GHG emissions reduction targets, in terms of:
    - Absolute emissions reduction
    - Reduction relative to base year emissions
    - Intensity-based targets
2) Government (e.g., direct and indirect GHG emissions from buildings and other government-owned sources) GHG emission reduction targets, in terms of:
    - Absolute emissions reduction
    - Reduction relative to base year emissions

We supplemented data on subnational actors from a range of external sources for key countries in our analysis. Chinese subnational commitments were derived from the C40 Cities for Climate Leadership Group, the iGDP China Policy Mapping Tool (IGDP, 2019), and the Chinese cities and provinces participating in the Alliance of Pioneer Peaking Cities (2016). China's 2012 emissions inventory data (including both Scopes 1 and 2) of these cities in 2012 were taken from Liu & Cai (2018) and also through Internet research. Population data and projections from the World Urbanization Prospects 2014 were also used in the calculation of these Chinese cities' emissions (UN DESA, 2014). GDP data were derived from the China Economic Database (CEIC, 2019). For US subnational actors, we gap-filled

[1] Several of these networks are included as data sources for both the analysis of individual commitments by cities, states, and regions and the analysis of ICIs. In this analysis, we assess the specific commitments already made by each city, state, and region, while the ICIs analysis assess the aspirational goals of included initiatives.

some missing information on baseline emissions and climate action commitments through internet desk research of city climate action plans and progress reports.

For Japanese subnational actors, we collected most up-to-date data on historical GHG emissions and post-2020 emissions reduction targets data for all 47 prefectures and government ordinance cities from their respective websites. GHG emission inventories by Japanese subnational governments include emissions related to electricity consumption, but the breakdown between direct and electricity-related emissions are not always available. Therefore, we uniformly applied the average share of power generation CO_2 emissions in national total GHG emissions (excluding land use, land-use change and forestry) for years FY2013-2018 (GIO, 2020).

In other cases, when city-level GHG emissions data was missing cities' emission values were calculated by multiplying per-capita provincial-level emissions by the cities' population. An example of such a case is Semarang in Indonesia. The city's emissions inventory value was calculated by multiplying per capita emissions of Central Java Province (where Semarang is located), as reported in the World Resources Institute (WRI)'s CAIT Indonesia Climate Data Explorer (PINDAI) (WRI, 2016), by Semarang's population.

We also made several corrections to the reported data based on additional desk research and expert judgment. When we could not verify questionable data, we removed these commitments from our analysis. In total we quantified commitments from 1,929 subnational actors from 35 countries in our key 10 high-emitting economies.

The emissions data for the subnational commitments was carefully examined; we corrected or excluded erroneous data points whenever identified. In the case of discrepancies between collected emissions and emissions values found in inventory reports, official municipal strategy documents, etc., the latter sources were prioritized. For data appearing to be resulting from incorrect unit conversion, etc. (values much higher or lower than the per capita emissions mean) we applied filters to exclude commitments with per capita GHG emissions lower than 0.2 tCO_2e/capita and higher than 40 tCO_2e/capita, with a few exceptions for which were able to verify the correctness of the data (e.g., many GHG commitments for local government operations, which often had very low per capita GHG emissions values, were still included in the analysis).

Population and other contextual data for cities and regions came from Hsu et al. (Hsu *et al.*, 2020) and the data sources listed above, supplemented, when possible, with desk research.

Calculation of share of Scope 1 and Scope 2 emissions for cities and regions

The shares of Scope 1 and Scope 2 emissions in cities and regions' total Scope 1 plus Scope 2 emissions were often not available. For regions, we use the share of electricity related GHG emissions in total emissions of a region is assumed to equal the national average. Country-level total GHG emissions from electricity generation in 2015 were estimated based on the IEA World Energy Outlook 2019 (China, Brazil, EU, India, Japan, Russia, South Africa) and APEC Energy Demand and Supply Outlook 2019 (Canada, Indonesia, Mexico) for energy-related CO_2 emissions (APERC, 2019; IEA, 2019). For cities, we use the median values for cities with the data available (Table 2).

Table 2: Share of Scope 2 emissions in total Scope 1 plus Scope 2 emissions from cities by country

Country	Value	Source
Brazil	12%	Average of 3 cities in dataset
Canada	10%	Average of 12 cities in dataset
China	45%	Authors' estimate from Liu (2016) on four major cities (Beijing, Shanghai, Tiangjin, Chongqing) in 2009
EU27+UK	33%	Average of 522 cities in dataset
India	44%	Average of 2 cities in dataset
Indonesia	30%	Average of 1 city in dataset
Japan	49%	Average of 4 cities in dataset
Mexico	19%	Average of 3 cities in dataset
South Africa	51%	Average of 3 cities in dataset
USA	34%	Average of 58 cities in dataset

1.3 Companies' actions

Data collection and harmonisation approach

The dataset of companies' actions was provided by CDP. It is based on the 2020 responses to CDP's investor climate and supply chain program (CDP, 2019, 2021). The CDP dataset on company-level action provides information necessary for the analysis, such as the amount of GHG emissions generated in each country's jurisdiction, by a company operating worldwide.

While CDP is not necessarily comprehensive of all corporate global climate action, they report that over 6,900 companies responded to their climate change questionnaire (CDP, 2019). We quantified the mitigation impact of approximately 800 companies that reported quantifiable absolute GHG emissions reduction targets with a target year beyond 2020 and operated within the 10 high-emitting economies this report focuses on. We could not quantify any intensity GHG emission reduction targets except for nine companies operating in India that have been manually collected from the CDP database. We have further added two Japanese companies' targets not included in the CDP dataset (Tokyo Electric Power Company and Chubu Electric Power Company).

The CDP questionnaire for companies encourages the use of GWPs from the IPCC's Fifth Assessment Report (AR5) (IPCC, 2014) for reporting emissions. We consider these data to be comparable with that reported in terms of AR4 GWPs as most companies are categorised to be emitting predominantly CO_2, with only a minimal amount of tracked emissions (<1%) coming from non-CO_2 emissions from the waste sector.

For the quantification of absolute emission levels under the commitments, we used values provided by CDP. CDP either received GHG emissions reduction levels directly, or calculated levels based on another indirect measure of climate mitigation (i.e., a commitment to increase renewable energy generation). CDP attributed GHG emissions to each country branch based on reported information.

We have removed all records with insufficient data to develop an emission pathway (at least base year and target year emissions within target scope are needed). The starting year (inventory) emission values were calculated as the sum of total Scope 1 and 2 emissions in the country of operation, while target year emission values were calculated using the company's target percentage in emissions reduction for absolute targets, anticipated emissions reduction for emission intensity targets.

Targets aiming at exclusively reducing Scope 3 emissions were removed from the dataset since we were unable to quantify probable overlaps, while targets that also include Scope 3 emissions alongside Scope 1 and/or Scope 2 emissions were included due to their low group size (~1% of the number of total company commitments).

From all companies in the dataset, for each country branch two GHG target were selected, based on the following priority order

- The target year closest to 2035, and the target closest to this target with a preference for an earlier target (if it exists).
- Only absolute emission reduction targets were included.
- Scopes preferred in order of "Scope 1", "Scope 1+3", "Scope 1+2", "Scope1+2+3", "Scope 2", "Scope 2+3".
- Targets closest just before and closest to 2030 are preferred.

The data was translated to the data format required by the Climate Action Aggregation tool (ICAT, 2021) that was used for the assessment of the impact of company targets on GHG emissions. For this we assumed that the same reduction targets applied to both Scope 1 and Scope 2 emissions. In addition, CDP sectors were translated to sectors used in the tool.

The starting point of the scenario analysis is 2018, and therefore the emission pathway of each company branch consists of interpolated emissions between base year, start year and the selected two target years. If the target years are before 2030, emission growth in line with the current policies scenario is assumed.

For the analysis described Section 2, we combined company revenue data from the 2020 Fortune Global 500, Forbes Global 2000, Orbis, and D&B Hoovers datasets, supplemented, when possible, with desk research.

Overview of selected industrial subs-sectors in the companies' dataset

The assessment of several selected industrial sub-sectors - *cement and concrete*, *chemicals*, *metal products manufacturing*, *metal smelting*, and *refining and forming* - reveals that these are generally underrepresented in our analysis. Table 3 provides a detailed overview of their Scope 1 and Scope 2 emissions coverage in the most recent inventory year for ten major emitting economies.

Companies in these industrial (sub-)sectors are less likely to set absolute emission targets to date, instead rather setting intensity targets for the short- to medium-term future. Existing data limitations explained above, the exclusion of intensity targets from our analysis (except for a nine Indian companies, three of which in these sub-sectors) prevents a more conclusive analysis for these sub-sectors.

Table 3: Overview of number of companies and their Scope 1 and Scope 2 emissions in the last available inventory year (MRY) in selected industrial sub-sectors (cement and concrete, chemicals, metal products manufacturing, metal smelting, and refining and forming) for all high-emitting economies.

	Cement & concrete	Chemicals	Metal products manufacturing	Metal smelting, refining & forming	Grand Total
BRA					
Number of actors in dataset (in #)		20	7	3	30
Sum of MRY Scope 1 emissions (in tCO2e)		9,036,046	48,756	3,327,741	12,412,542
Sum of MRY Scope 2 emissions (in tCO2e)		435,554	43,184	567,941	1,046,680
CAN					
Number of actors in dataset (in #)		12	3	3	18
Sum of MRY Scope 1 emissions (in tCO2e)		317,099	19,903	252,626	589,628
Sum of MRY Scope 2 emissions (in tCO2e)		28,036	6,118	246,487	280,642
CHN					
Number of actors in dataset (in #)		33	18	3	54
Sum of MRY Scope 1 emissions (in tCO2e)		838,998	117,016	8,075	964,088
Sum of MRY Scope 2 emissions (in tCO2e)		3,158,258	1,066,482	19,208	4,243,948
EU27+UK					
Number of actors in dataset (in #)		187	70	31	288
Sum of MRY Scope 1 emissions (in tCO2e)		13,643,158	412,575	14,354,048	28,409,782
Sum of MRY Scope 2 emissions (in tCO2e)		5,645,878	511,655	2,802,635	8,960,168
IDN					
Number of actors in dataset (in #)		13	2	2	17
Sum of MRY Scope 1 emissions (in tCO2e)		80,613	643	807	82,064
Sum of MRY Scope 2 emissions (in tCO2e)		183,945	42,561	131	226,637
IND					
Number of actors in dataset (in #)	3	21	8	3	35
Sum of MRY Scope 1 emissions (in tCO2e)	33,272,571	2,577,974	24,817	2,555,283	38,430,644
Sum of MRY Scope 2 emissions (in tCO2e)	84,999	264,521	44,527	7	394,053
JPN					
Number of actors in dataset (in #)		30	5	1	36
Sum of MRY Scope 1 emissions (in tCO2e)		13,394,591	1,267,095	56	14,661,741
Sum of MRY Scope 2 emissions (in tCO2e)		6,781,391	2,269,540	1,343	9,052,274
MEX					
Number of actors in dataset (in #)		17	7	2	26
Sum of MRY Scope 1 emissions (in tCO2e)		293,209	58,409	2,023	353,641
Sum of MRY Scope 2 emissions (in tCO2e)		123,628	134,264	253	258,144
USA					
Number of actors in dataset (in #)		36	8	5	49
Sum of MRY Scope 1 emissions (in tCO2e)		11,123,151	258,794	1,552,330	12,934,275
Sum of MRY Scope 2 emissions (in tCO2e)		6,368,051	643,778	1,315,602	8,327,431
ZAF					
Number of actors in dataset (in #)		13	2	4	19
Sum of MRY Scope 1 emissions (in tCO2e)		56,972,585	98	741,895	57,714,578
Sum of MRY Scope 2 emissions (in tCO2e)		7,385,760	100	7,396,096	14,781,956
Total Number of actors in dataset (in #)	**3**	**382**	**130**	**57**	**572**
Total Sum of MRY Scope 1 emissions (in tCO2e)	**33,272,571**	**108,277,424**	**2,208,106**	**22,794,883**	**166,552,984**
Total Sum of MRY Scope 2 emissions (in tCO2e)	**84,999**	**30,375,022**	**4,762,209**	**12,349,704**	**47,571,934**

2 Quantification of greenhouse gas (GHG) emissions reductions at national level

The quantification of greenhouse gas (GHG) emissions reductions at national level builds upon a stepwise approach similar to the 2019 assessment. The potential GHG emissions reduction of actors was aggregated using methods developed under previous phases of this project that were integrated into the Climate Action Aggregation Tool (CAAT) developed under the Initiative for Climate Action Transparency (ICAT, 2021).

The CAAT tool builds upon the aggregation methodology presented in Kuramochi et al. (Kuramochi *et al.*, 2020) used for the 2018 and 2019 global aggregation reports (Data-Driven Yale, NewClimate Institute and PBL, 2018; NewClimate Institute *et al.*, 2019) and the *Non-State and Subnational Action Guide* of the Initiative for Climate Action Transparency (2020).

The CAAT develops a reference scenario on the actor level, using the sector-specific growth rates from Current National Policies. This scenario is then compared to the scenario under target realisation, assuming linear emissions reductions, to find the actor-level emissions reduction potentials. The emissions reductions potentials are then aggregated, while accounting for overlaps between subnational and non-state actors. Table 4 presents a high-level comparison between the two aggregation methodologies.

Table 4: Comparison of aggregation methodologies of potential GHG emissions reductions by individual non-state and subnational actors between Kuramochi et al. (2020) and the Climate Action Aggregation Tool (CAAT) developed under the Initiative for Climate Action Transparency (ICAT, 2021)

	Kuramochi et al. (2020)	**Climate Action Aggregation Tool** (ICAT, 2021)
Resolution of current national policies (baseline) scenario emissions projections	Economy-wide level	Sector level
General order of overlap calculation among non-state and subnational actors	**Largest emissions scope to smallest** 1) Regions 2) Cities 3) Corporates 4) Energy utilities	**Smallest emissions scope to largest** 1) Corporates 2) Energy utilities 3) Investors, civil society organisations, and others 4) Cities 5) Regions
General approach to calculate overlap among non-state and subnational actors	**Chapter 2.3.2.** of Kuramochi et al. (2020) introduces the general approach: • Geographical identifiers used for overlap calculations between regions and cities • Assumption that end-use companies with commitments are geographically evenly spread over subnational actors with and without commitments to calculate overlaps between energy end-use companies and subnational actor commitments • Assumption that electricity-generating companies with commitments are geographically evenly spread over regions/cities calculate overlaps between electricity-generating	**Chapter 2.6.3** of Climate Action Aggregation Tool (ICAT, 2021) introduces the general approach: • Emissions coverage for the collective set of NSAs of each actor type within a given sector is calculated, • Resulting emissions coverage values for each actor type and sector are used as proxies for overlap within each sector, • Emissions coverage is used to calculate “quantified overlap” by multiplying the actors’ emissions coverages with impacts at all lower levels, • Quantified overlaps for each actor level are summed, resulting in the total overlap among the actions within the assessment boundary.

	companies and all other NSA commitments	
Use of specific geographical identifier	**Yes**, for calculation of cities' overlap with regions in each country	**No**, underlying assumption that aggregated actions have a geographically unbiased dispersion across a country, region or sector
Considerations of overlap in targets' ambition	**Yes**, consideration for overlap between (1) regions and cities and (2) subnational actors and corporates	**No**

We added the impact of the analysed countries to derive the global total. We did not quantify the mitigation potential outside the ten high-emitting economies, due to the relatively small scale of commitments outside of these countries.

3 Individual actors aggregation: country results

We present all country-level results for the high-emitting economies in the following Section 3.1.1 to Section 3.1.10. The following disclaimers should be taken into consideration when interpreting the country-level results.

- All energy utilities (n=68) for EU27+UK have been excluded from analysis given their coverage under the EU Emissions Trading System (EU ETS).
- The 2021 analysis filtered out 122 outliers for energy end use companies and energy utilities due to incomplete or not verifiable data, incl. some larger emitters (e.g., *Petróleo Brasileiro SA – Petrobras* due to a reported target of 0% in 2025 compared to baseline emissions in CDP dataset).
- The 2021 analysis does not include intensity targets by energy end use companies and energy utilities given limited data availability except for a several companies located in India that were collected manually and included in India's assessment (n=9).
- The 2021 analysis excludes all pre-2020 targets by regions, cities, and companies except for peak year targets of Chinese cities and regions (n=11).

3.1.1 Brazil

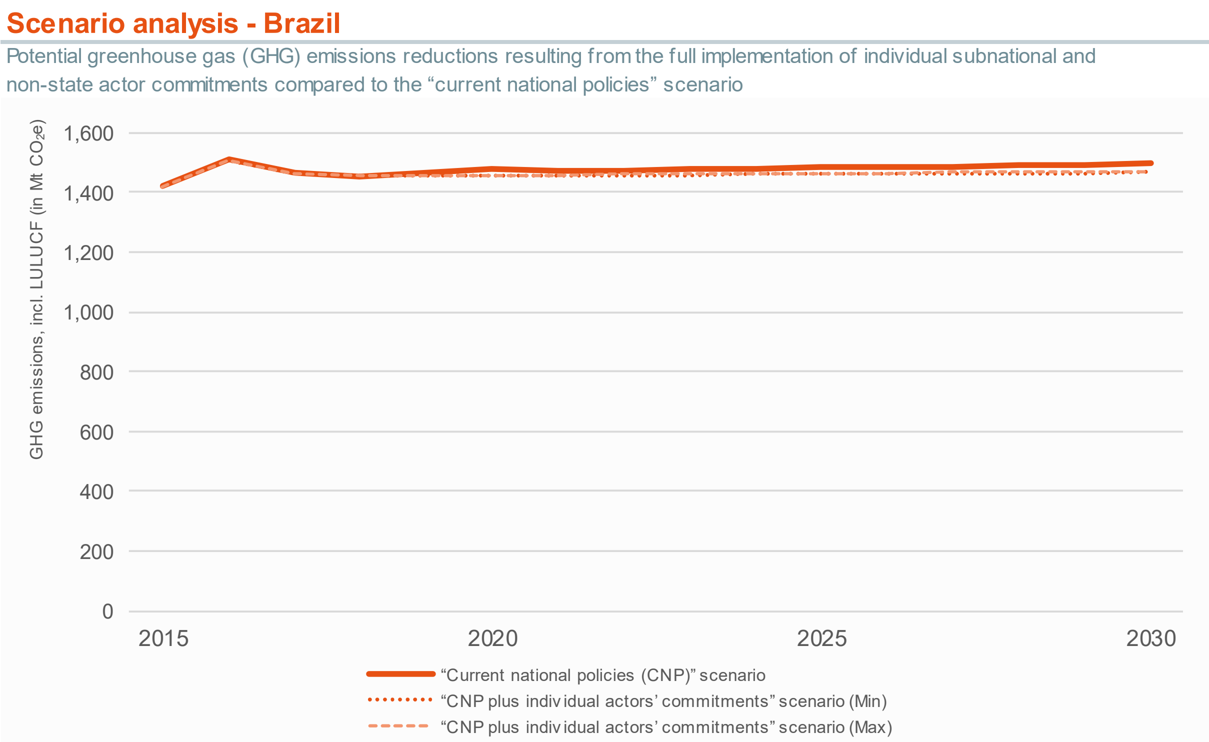

Figure 1: Potential greenhouse gas (GHG) emissions reductions for Brazil resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" (CNP) scenario. Source: This study.

Summary results - Brazil

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	165	
Energy utilities	#	13	
Cities	#	8	
Regions	#	2	
Total	#	188	
		Max	Min
Current national policies (CNP) scenario in 2018	Mt CO_2e	1,454	1,454
Current national policies (CNP) scenario in 2030	Mt CO_2e	1,494	1,494
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	1,465	1,471
	%-reduction below CNP	-1.9%	-1.6%
	$MtCO_2e$ reduction below CNP	29	23

Figure 2: Summary results for 2021 Individual Actor Aggregation analysis for Brazil.

3.1.2 Canada

Scenario analysis - Canada

Potential greenhouse gas (GHG) emissions reductions resulting from the full implementation of individual subnational and non-state actor commitments compared to the “current national policies” scenario

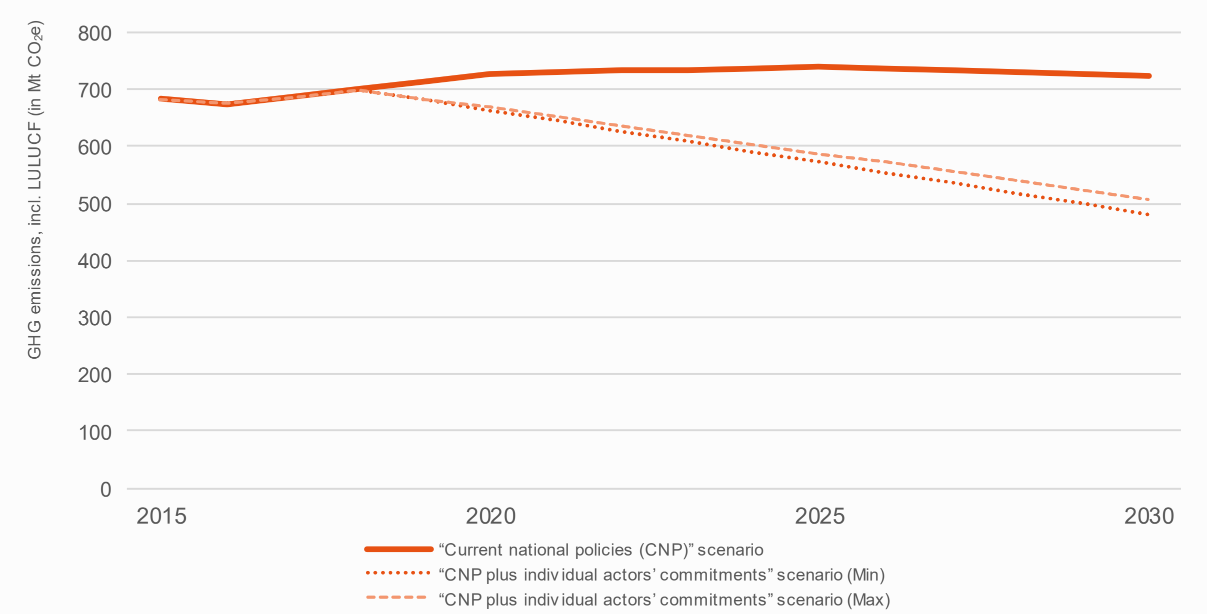

Figure 3: Potential greenhouse gas (GHG) emissions reductions for Canada resulting from the full implementation of individual subnational and non-state actor commitments compared to the “current national policies” (CNP) scenario. Source: This study.

Summary results - Canada

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	167	
Energy utilities	#	9	
Cities	#	28	
Regions	#	6	
Total	#	210	
		Max	**Min**
Current national policies (CNP) scenario in 2018	Mt CO_2e	699	699
Current national policies (CNP) scenario in 2030	Mt CO_2e	724	724
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	482	508
	%-reduction below CNP	-33.4%	-29.8%
	MtCO_2e reduction below CNP	242	216

Figure 4: Summary results for 2021 Individual Actor Aggregation analysis for Canada.

3.1.3 China

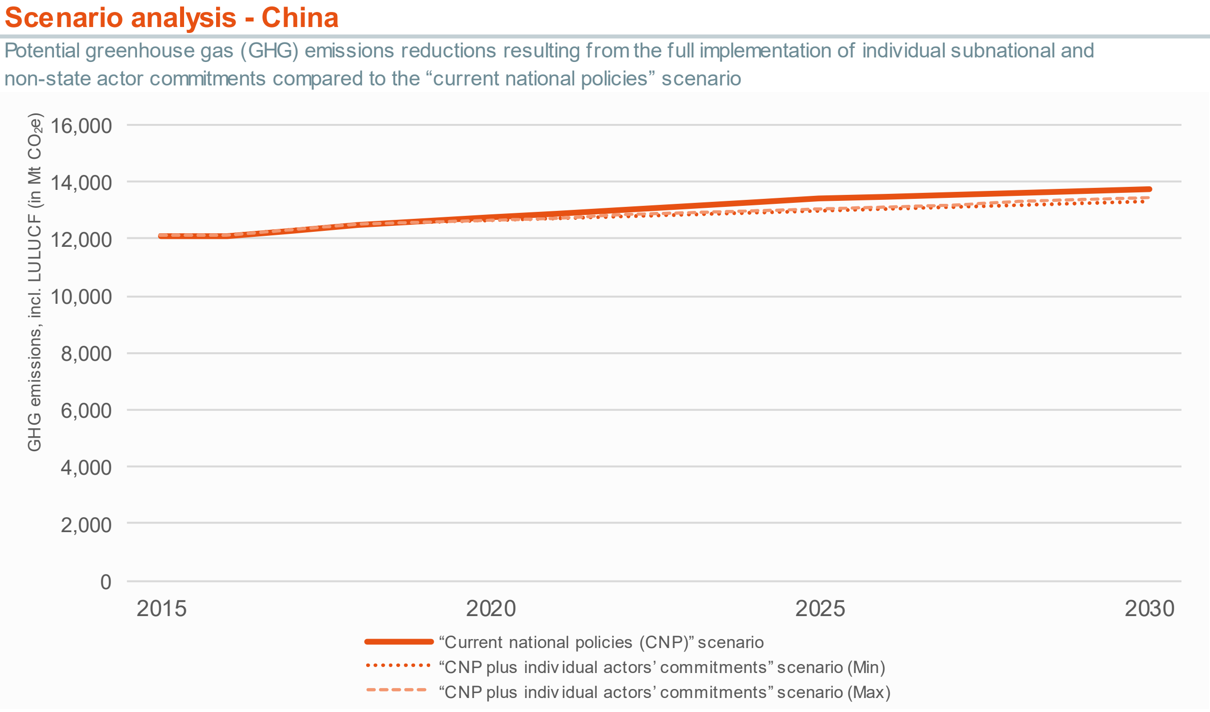

Figure 5: Potential greenhouse gas (GHG) emissions reductions for China resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" (CNP) scenario. Source: This study.

Summary results - China

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	303	
Energy utilities	#	1	
Cities	#	30	
Regions	#	2	
Total	#	336	
		Max	Min
Current national policies (CNP) scenario in 2018	Mt CO_2e	12,506	12,506
Current national policies (CNP) scenario in 2030	Mt CO_2e	13,740	13,740
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	13,312	13,433
	%-reduction below CNP	-3.1%	-2.2%
	MtCO_2e reduction below CNP	428	307

Figure 6: Summary results for 2021 Individual Actor Aggregation analysis for China.

3.1.4 European Union (EU27) + United Kingdom

Scenario analysis - EU27+UK

Potential greenhouse gas (GHG) emissions reductions resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" scenario

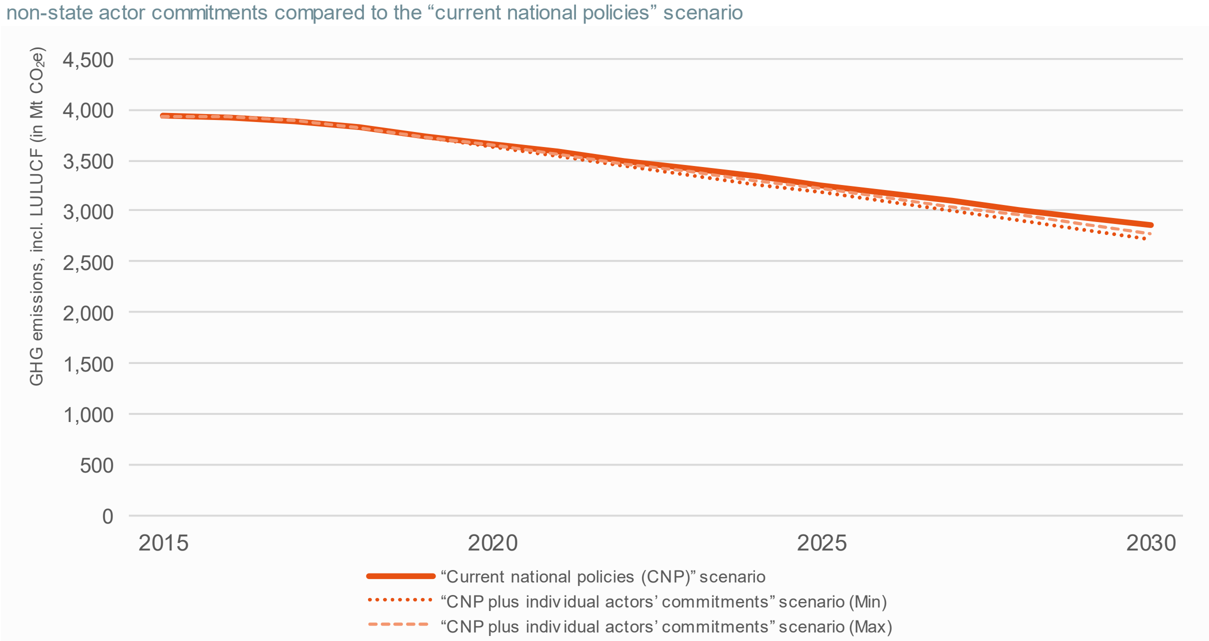

Figure 7: Potential greenhouse gas (GHG) emissions reductions for European Union (EU27) and the United Kingdom resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" (CNP) scenario. Source: This study.

Summary results - EU27+UK

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	2155	
Energy utilities	#	68	
Cities	#	1669	
Regions	#	35	
Total	#	3927	
		Max	**Min**
Current national policies (CNP) scenario in 2018	Mt CO_2e	3,820	3,820
Current national policies (CNP) scenario in 2030	Mt CO_2e	2,855	2,855
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	2,718	2,781
	%-reduction below CNP	-4.8%	-2.6%
	MtCO_2e reduction below CNP	137	74

Figure 8: Summary results for 2021 Individual Actor Aggregation analysis for the European Union (EU27) and the United Kingdom.

3.1.5 India

Scenario analysis - India

Potential greenhouse gas (GHG) emissions reductions resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" scenario

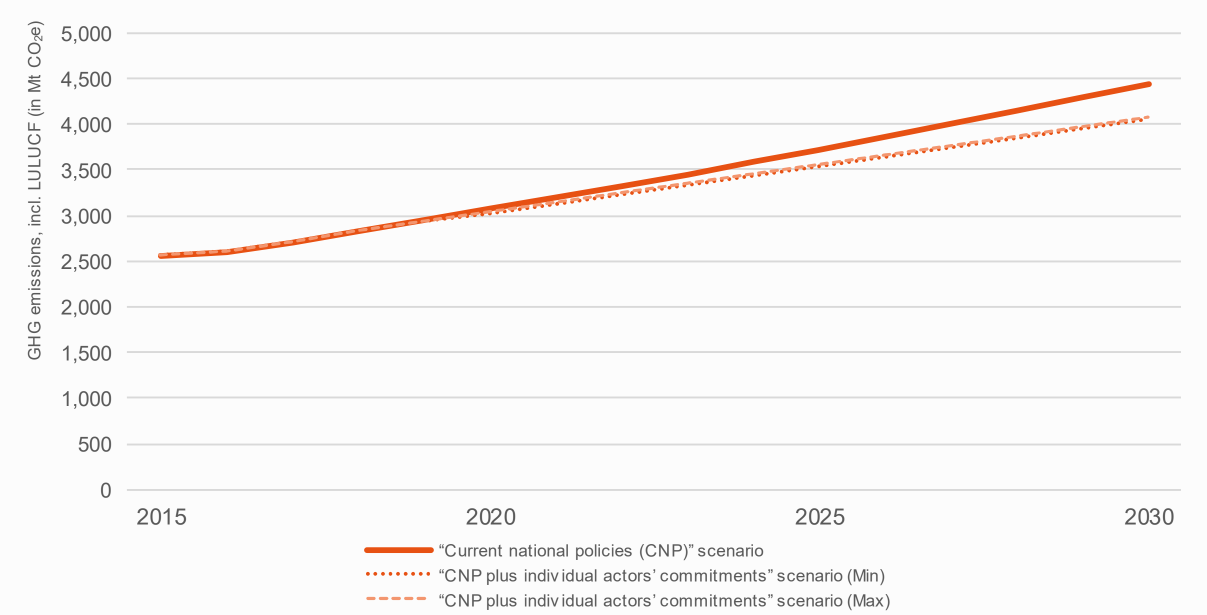

Figure 9: Potential greenhouse gas (GHG) emissions reductions for India resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" (CNP) scenario. Source: This study.

Summary results - India

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	184	
Energy utilities	#	2	
Cities	#	3	
Regions	#	1	
Total	#	190	
		Max	Min
Current national policies (CNP) scenario in 2018	Mt CO_2e	2,829	2,829
Current national policies (CNP) scenario in 2030	Mt CO_2e	4,433	4,433
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	4,048	4,085
	%-reduction below CNP	-8.7%	-7.9%
	MtCO_2e reduction below CNP	385	348

Figure 10: Summary results for 2021 Individual Actor Aggregation analysis for India.

3.1.6 Indonesia

Scenario analysis - Indonesia

Potential greenhouse gas (GHG) emissions reductions resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" scenario

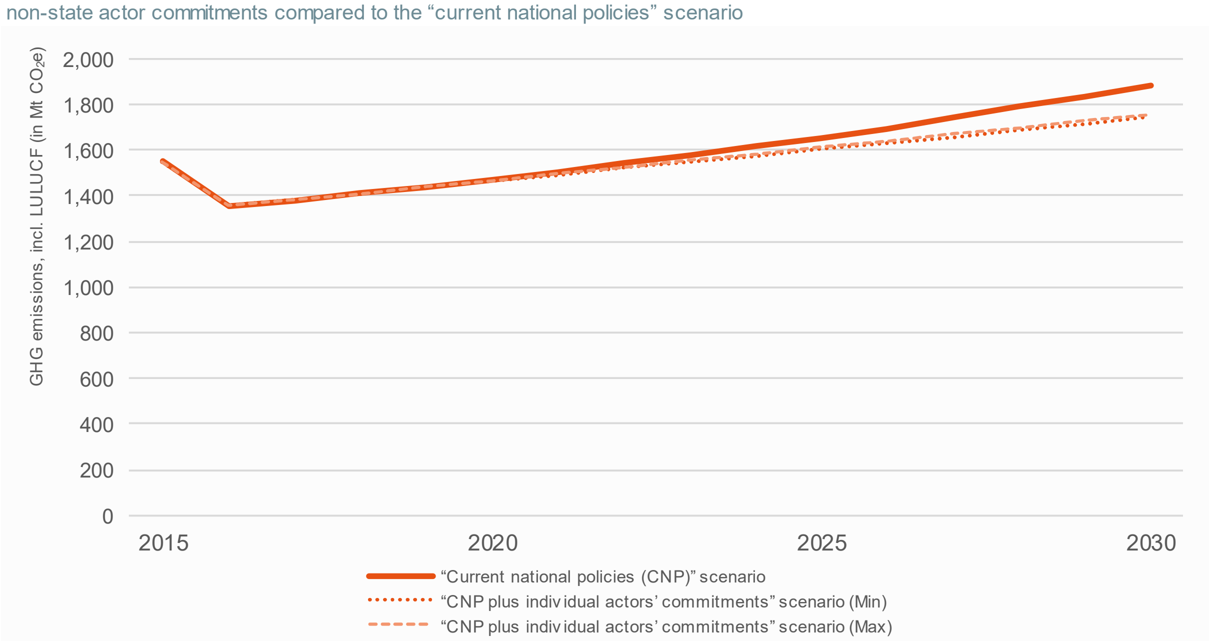

Figure 11: Potential greenhouse gas (GHG) emissions reductions for Indonesia resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" (CNP) scenario. Source: This study.

Summary results - Indonesia

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	93	
Energy utilities	#	0	
Cities	#	5	
Regions	#	3	
Total	#	101	
		Max	**Min**
Current national policies (CNP) scenario in 2018	Mt CO_2e	1,409	1,409
Current national policies (CNP) scenario in 2030	Mt CO_2e	1,885	1,885
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	1,743	1,756
	%-reduction below CNP	-7.5%	-6.8%
	MtCO_2e reduction below CNP	142	128

Figure 12: Summary results for 2021 Individual Actor Aggregation analysis for Indonesia.

3.1.7 Japan

Scenario analysis - Japan

Potential greenhouse gas (GHG) emissions reductions resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" scenario

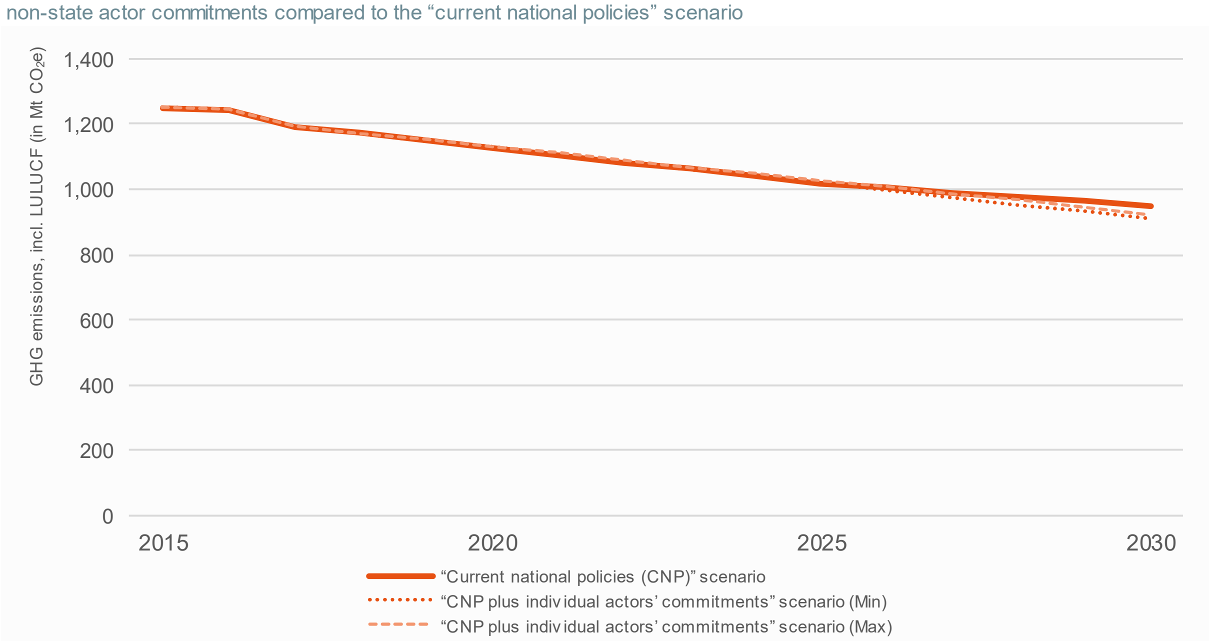

Figure 13: Potential greenhouse gas (GHG) emissions reductions for Japan resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" (CNP) scenario. Source: This study.

Summary results - Japan

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	227	
Energy utilities	#	4	
Cities	#	37	
Regions	#	45	
Total	#	313	
		Max	Min
Current national policies (CNP) scenario in 2018	Mt CO_2e	1,172	1,172
Current national policies (CNP) scenario in 2030	Mt CO_2e	950	950
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	910	924
	%-reduction below CNP	-4.2%	-2.7%
	MtCO_2e reduction below CNP	40	26

Figure 14: Summary results for 2021 Individual Actor Aggregation analysis for Japan.

3.1.8 Mexico

Scenario analysis - Mexico

Potential greenhouse gas (GHG) emissions reductions resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" scenario

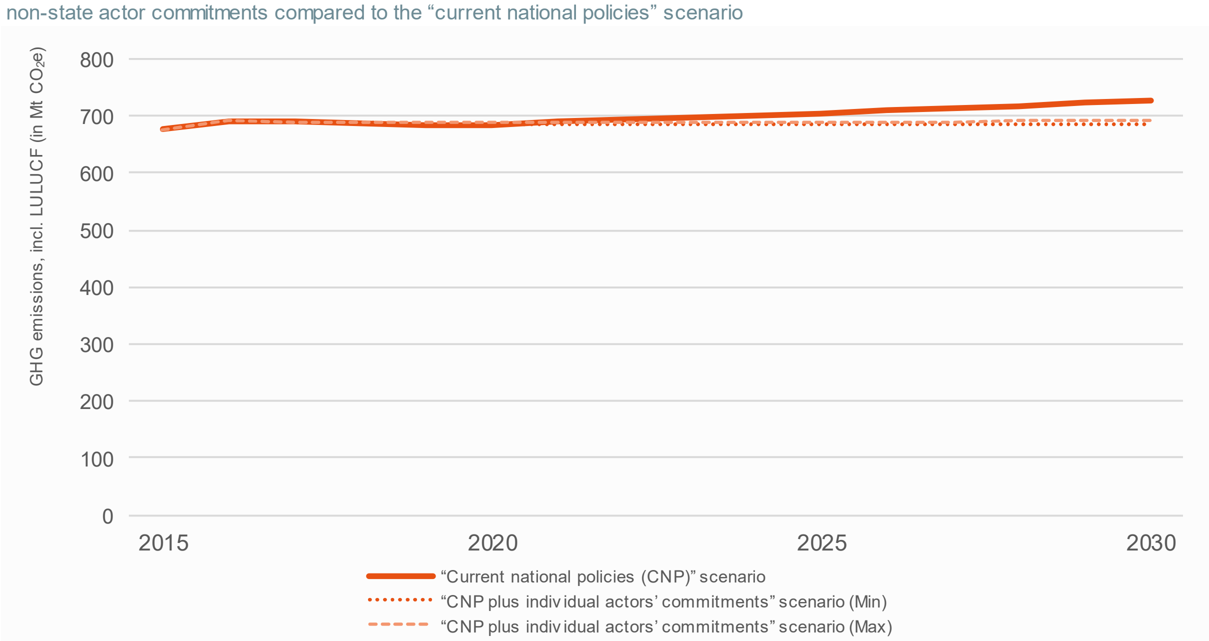

Figure 15: Potential greenhouse gas (GHG) emissions reductions for Mexico resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" (CNP) scenario. Source: This study.

Summary results - Mexico

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	157	
Energy utilities	#	5	
Cities	#	8	
Regions	#	4	
Total	#	174	
		Max	**Min**
Current national policies (CNP) scenario in 2018	Mt CO_2e	687	687
Current national policies (CNP) scenario in 2030	Mt CO_2e	726	726
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	685	691
	%-reduction below CNP	-5.7%	-4.8%
	MtCO_2e reduction below CNP	41	35

Figure 16: Summary results for 2021 Individual Actor Aggregation analysis for Mexico.

3.1.9 South Africa

Scenario analysis - South Africa

Potential greenhouse gas (GHG) emissions reductions resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" scenario

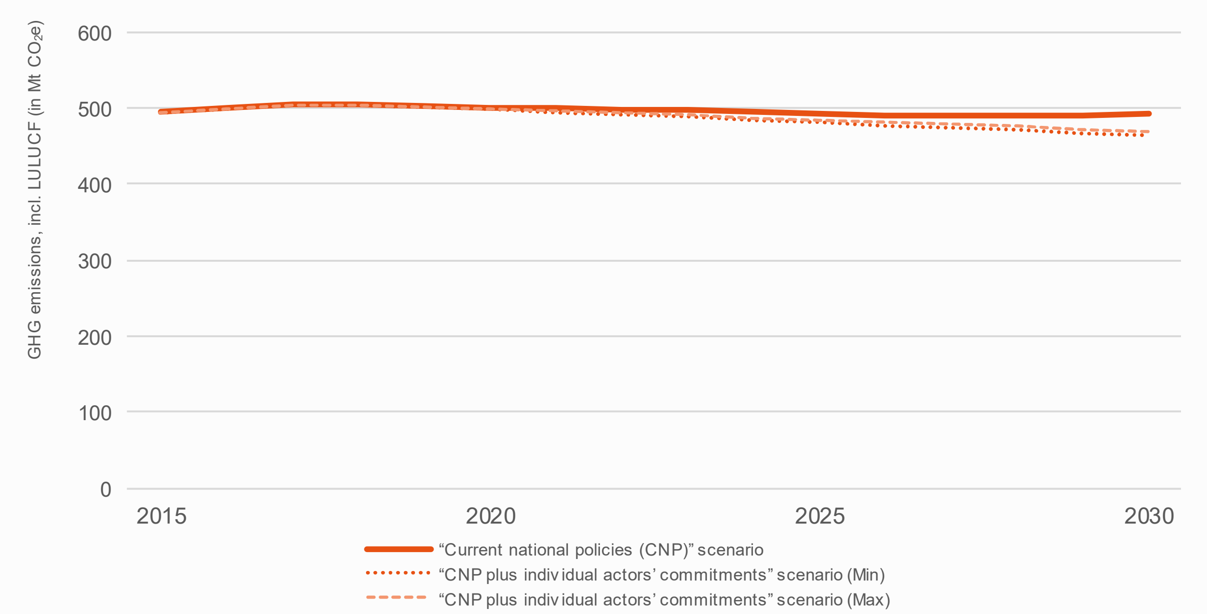

Figure 17: Potential greenhouse gas (GHG) emissions reductions for South Africa resulting from the full implementation of individual subnational and non-state actor commitments compared to the "current national policies" (CNP) scenario. Source: This study.

Summary results - South Africa

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	80	
Energy utilities	#	2	
Cities	#	3	
Regions	#	0	
Total	#	85	
		Max	**Min**
Current national policies (CNP) scenario in 2018	Mt CO_2e	505	505
Current national policies (CNP) scenario in 2030	Mt CO_2e	492	492
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	464	470
	%-reduction below CNP	-5.6%	-4.4%
	MtCO_2e reduction below CNP	28	22

Figure 18: Summary results for 2021 Individual Actor Aggregation analysis for South Africa.

3.1.10 United States

Scenario analysis - United States

Potential greenhouse gas (GHG) emissions reductions resulting from the full implementation of individual subnational and non-state actor commitments compared to the “current national policies” scenario

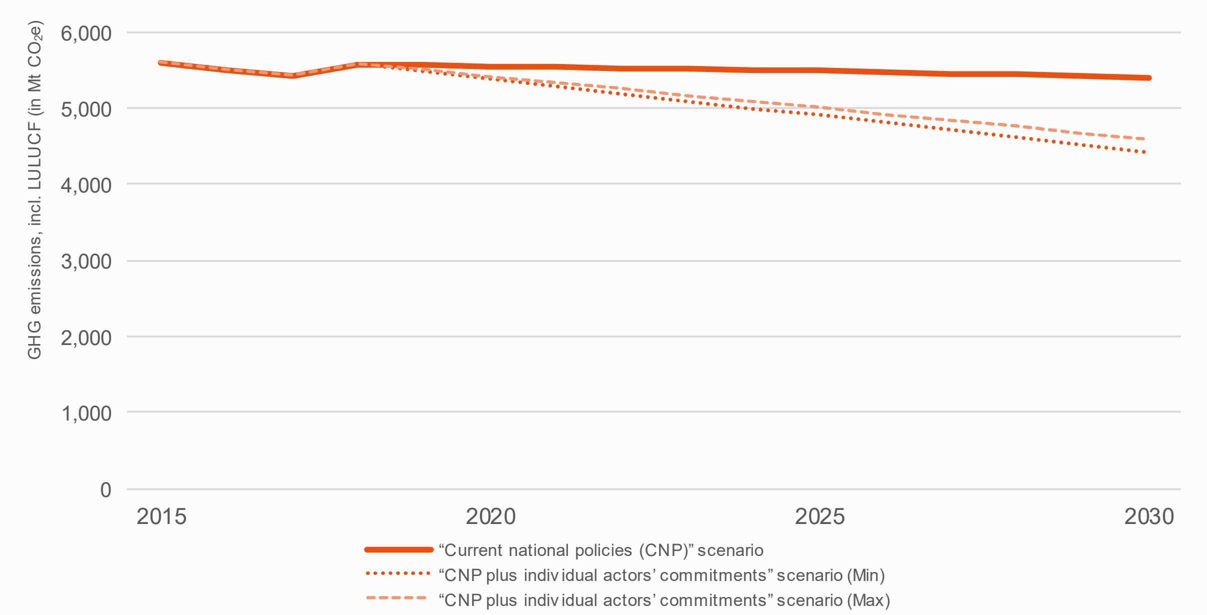

Figure 19: Potential greenhouse gas (GHG) emissions reductions for the United States resulting from the full implementation of individual subnational and non-state actor commitments compared to the “current national policies” (CNP) scenario. Source: This study.

Summary results - United States

Summary results for 2021 Individual Actor Aggregation analysis
All emission estimates numbers include LULUCF.

	Unit	2021 Individual Actor Aggregation	
End-use companies	#	364	
Energy utilities	#	30	
Cities	#	138	
Regions	#	27	
Total	#	559	
		Max	**Min**
Current national policies (CNP) scenario in 2018	Mt CO_2e	5,587	5,587
Current national policies (CNP) scenario in 2030	Mt CO_2e	5,402	5,402
"CNP plus individual actions' commitments" scenario in 2030	Mt CO_2e	4,421	4,596
	%-reduction below CNP	-18.2%	-14.9%
	MtCO_2e reduction below CNP	981	806

Figure 20: Summary results for 2021 Individual Actor Aggregation analysis for the United States.

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