

Annex B

Additional INDC assessment information: global modelling studies methodologies and mitigation components in the INDCs

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B.1 Methodologies of the global modelling studies included in the INDC assessment

The methodologies of the global modelling studies are described below:

- **Climate Action Tracker**, www.climateactiontracker.org. The Climate Action Tracker has evaluated climate action proposals by countries since 2009. Emission estimates are gathered from a variety of sources, following a hierarchy of reliability. Independent estimates of current trajectories are prepared, sometimes based on national estimates or from global models, for example, the IEA World Energy Outlook.
- **PBL Netherlands Environmental Assessment Agency**, www.pbl.nl/indc (Admiraal *et al.*, 2015). The calculations of the emission projections of the current policies scenario are based on the FAIR policy model and the TIMER energy model, as described for thirteen major emitting countries in detail in den Elzen *et al.* (2015). The calculations are supplemented with land use, land-use change and forestry (LULUCF) CO₂ emission projections based on land-use and agricultural policies using IIASA's global land-use model GLOBIOM (Havlík *et al.*, 2014) and global forest model G4M (Gusti, 2010). National afforestation and deforestation rates are calibrated in the models to historical data (FAOSTAT, 2015) using a calibration procedure. The quantification of the pledges and INDCs were performed with the FAIR model (Hof *et al.*, 2013), with updates described at: www.pbl.nl/indc.
- **IEA World Energy Outlook:** For the calculations, trends from the current policies scenario of the International Energy Agency (IEA) World Energy Outlook (IEA, 2014) are used. Since the World Energy Outlook (WEO) scenario only includes carbon dioxide emissions from energy use, we take the emission projections for non-carbon dioxide gases from the EPA reference scenario. The historical emissions of carbon dioxide from the industry sector are based on the historical emission database EDGAR 4.2 (JRC/PBL, 2012), and the growth rates from the IEA current policies scenario. The trend of the LULUCF carbon dioxide emissions are based on the IIASA global land-use model calculations, as described in den Elzen *et al.* (2015).
- **London School of Economics and Political Science, Grantham Research Institute:** A Reference scenario was used to estimate emissions from countries that have not submitted an INDC. For energy and industrial CO₂ emissions, the projection was provided by Enerdata, using the POLES model calibrated to the IEA's WEO 2014 Current Policies Scenario. Data on CO₂ emissions from

LULUCF was provided by the International Institute for Applied Systems Analysis (IIASA) and projections for other GHG emissions was provided by the Netherlands Environmental Assessment Agency (PBL).

- **The Climate and Energy College / University of Melbourne dataset** (Meinshausen (2015), available at <http://climate-energy-college.net/indc-factsheets>): The scenarios included here quantify the INDCs on the basis of UNFCCC reported inventory data for Annex I countries and a set of other authoritative data sources for Non-Annex I countries, such as IEA, EDGAR, CDIAC and others, as aggregated in a composite data source. For any sectors or gases that are not covered by INDCs, this quantification uses a range of 10 reference scenarios from the IPCC AR5 Scenario database with 2 from each of the GCAM, MESSAGE, IMAGE, REMIND, and WITCH modelling groups that projected Cancun pledges until 2020 and no further climate policies until 2030. Regional specific growth rates relative to 2010 are used, sourced from the AMPERE database that includes higher regional detail of those scenarios than contained in the 5 regional IPCC AR5 scenario database. Shown are here the averages across those 10 different INDC quantifications with different background reference scenarios. The INDC quantification distinguishes between the lower and upper ends of any INDC target ranges that countries provided, and between conditional and unconditional targets.
- **Danish Energy Agency** (DEA, 2015) (available at www.ens.dk/gap): The calculations by DEA are made using the COMPARE model. Projected current policy carbon dioxide emissions are based on input data from the POLES energy model for 57 individual countries/regions (Kitous *et al.*, 2010; Enerdata, 2014). The PBL TIMER and IMAGE models are used to project non-carbon emissions such as CH₄, N₂O and F-gases (Van Vuuren *et al.*, 2014; Stehfest *et al.*, 2014). LULUCF emissions are projected using IIASAs global land-use model GLOBIOM (Havlík *et al.*, 2014) and global forest model G4M (Gusti, 2010) and harmonized by DEA to historical values (nationally reported estimates under the Convention or WRI CAIT 2.0 data). Emissions from peatland drainage are averaged from the IPCC AR5 WGIII (Smith *et al.*, 2014). Quantification of pledges and INDCs were performed using the COMPARE model. Where available, national communicated LULUCF projections have also been included, adding to the uncertainty of the final estimate.
- **National Institute for Environmental Studies** (Masui, 2015) (<http://www-iam.nies.go.jp/aim>): Asia-Pacific Integrated Model (AIM) is an integrated assessment model to assess mitigation options to reduce GHG emissions and impact/adaptation to avoid severe climate change damages. The model is extended to assess sustainable development policies together with Asian researchers.
- **Climate Interactive** (2015): The Climate Scoreboard uses the C-ROADS climate policy simulation model to analyze the impact of the INDCs to the UN climate negotiations. The Scoreboard analysis above shows the expected impact of the INDCs nations have made to date, assuming (1) the INDCs are fully implemented, and (2) assuming no further reductions beyond those that have been formally pledged, specifically, actions after the end of the country's pledge period (2025 or 2030).

The emission projection resulting from the INDC calculation is based on the median estimate of research groups of these eight studies, and the median estimate of the national studies, and of the official studies, as described in UNEP (2015). Since the IEA World Energy Outlook includes several regions and countries, which do not necessarily match the countries with an INDC, the calculation of replacing the current trajectory by the INDC is not straightforward. Countries' current emission trajectories are calculated based on the trajectory of the region, to which the country belongs, scaled towards the 2010 emission of the country.

B.2 Overview of all countries included

Table B.1: Mitigation objectives included in INDCs submitted, in alphabetical order (UNFCCC, 2015)

Country	GHG Emission Reduction Target			Adaptation
Albania	-11.5% CO ₂	by 2030	below BAU	
Andorra	-37%	by 2030	below BAU	
Argentina	-15% (conditional: -30%)	by 2030	below BAU	INDC
Algeria	-7% (conditional: -22%)	by 2030	below BAU	INDC
Armenia	Conditional: aggregate emissions 633 MtCO ₂ e	2015-2030	Fixed Level Target	INDC
Australia	-26% to -28%	by 2030	below 2005	Strategy to be developed
Azerbaijan	-35%	by 2030	below 1990	INDC
Bangladesh	3 sectors -5% (conditional: -15%)	by 2030	below BAU	INDC
Barbados	-23% (-21% by 2025)	by 2030	below 2008	INDC
Belarus	-28%	by 2030	below 1990	
Belize	Conditional: -24 MtCO ₂ e	2014-2033	below BAU	INDC
Benin	Conditional: -21.4%	by 2030	below BAU	INDC
Bhutan	Carbon neutral; gross CO ₂ emissions 6.3 MtCO ₂ e or lower	by 2030	Fixed Level Target	INDC
Brazil	-37% (-43% indicative by 2030)	by 2025	below 2005	INDC
Botswana	-15%	by 2030	below 2010	INDC
Burkina Faso	-6.6% (conditional: -18.2%)	by 2030	below BAU	INDC
Burundi	-3% (conditional: -20%)	by 2030	below BAU	INDC
Cabo Verde	30% electricity from RE (conditional: 100%)	by 2025	Non-GHG	INDC
Cambodia	Conditional: -27%	by 2030	below BAU	INDC
Cameroon	Conditional: -32%	by 2035	below BAU	INDC
Canada	-30%	by 2030	below 2005	
Central African Republic	Conditional: -5%	by 2030	below BAU	INDC
Chad	-18.2% (conditional: -71%)	by 2030	below BAU	INDC
Chile	30% CO ₂ intensity reduction (conditional: 35-45%)	by 2030	below 2007	INDC
China	Peaking CO ₂ around 2030; 60-65% CO ₂ emission intensity reduction; 20% non-fossil fuels in primary energy consumption and increase the forest stock volume.	by 2030	below 2005	INDC
Colombia	-20% (conditional: -30%)	by 2030	below BAU	INDC
Comoros	Conditional: -84%	by 2030	below BAU	INDC
Costa Rica	Net emissions 9.374 MtCO ₂ e	by 2030	Fixed Level Target	INDC
Cote D'Ivoire	-28%	by 2030	below BAU	INDC
Democratic Republic of the Congo	Conditional: -17%	by 2030	below BAU	INDC
Djibouti	-40% (conditional: -60%)	by 2030	below BAU	INDC
Dominica	Conditional: -17.9% by 2020; -39.2% by 2025 and -44.7% by 2030	by 2030	below 2014	INDC
Dominican Republic	Conditional: -25%	by 2030	below 2010	INDC

Country	GHG Emission Reduction Target			Adaptation
Ecuador	-20.4% to -25% (conditional: -37.5% to -45.8%)	by 2025	below BAU	INDC
Eritrea	-39.2% (conditional: -80.6%)	by 2030	below BAU	INDC
Equatorial Guinea	Conditional: -20%	by 2030	below 2010	INDC
European Union	At least -40% domestic	by 2030	below 1990	Undertaking
Ethiopia	Net emissions 145 MtCO ₂ e or lower	by 2030	Fixed Level Target	INDC
Former Yugoslav Republic of Macedonia	-30% CO ₂ (conditional: -36%)	by 2030	below BAU	Analysis to come
Gabon	-50%	by 2025	below BAU	INDC
Gambia	Conditional actions only	2021-2025		INDC
Georgia	-15% (conditional: -25%)	by 2030	below BAU	INDC
Ghana	-15% (conditional: -45%)	by 2030	below BAU	INDC
Grenada	-30% (-40% indicative by 2030)	by 2025	below 2010	INDC
Guatemala	-11.2% (conditional: -22.6%)	by 2030	below BAU	INDC
Guinea	Conditional: -57 MtCO ₂ e	2016-2030	below BAU	INDC
Guinea Bissau	Conditional actions only	2020-2030		INDC
Guyana	Conditional: -52 MtCO ₂ e	by 2025	below BAU	INDC
Haiti	-5% (conditional: -26%)	by 2030	below BAU	INDC
Honduras	Conditional: -15%	by 2030	below BAU	INDC
Iceland	-40%	by 2030	below 1990	
India	Conditional: 33% to 35% emissions intensity reduction; 40% non-fossil fuel electricity; Increase carbon sink volume	by 2030	below 2005	INDC
Indonesia	-29% (conditional: -41%)	by 2030	below BAU	INDC
Israel	Per capita emissions 7.7 tCO ₂ e (8.8 tCO ₂ e per capita by 2025)	by 2030	Fixed Level Target	Strategy to be developed
Japan	-26%	by 2030	below 2013	
Jordan	-1.5% (conditional: -14%)	by 2030	below BAU	INDC
Kazakhstan	-15% (conditional: -25%)	by 2030	below 1990	
Kenya	Conditional: -30%	by 2030	below BAU	INDC
Kiribati	-12.8% (conditional: -61.8%)	by 2030	below BAU	INDC
Kyrgyzstan	-11.49% to -13.75% (conditional: -29.00% to -30.89%)	by 2030	below BAU	INDC
Lao PDR	Conditional forestry and RE actions, quantified emission reductions	2015-2030	below BAU	INDC
Lebanon	-15% (conditional: -30%)	by 2030	below BAU	INDC
Lesotho	-10% (conditional: -35%)	by 2030	below BAU	INDC
Liberia	Conditional: -10%	by 2030	below BAU	INDC
Liechtenstein	-40%	by 2030	below 1990	
Madagascar	Conditional: -14%	by 2030	below BAU	INDC
Malawi	Conditional and unconditional actions	by 2030		INDC
Maldives	-10% (conditional: -24%)	by 2030	below BAU	INDC
Mali	Conditional: agriculture -29%; energy -31% and LUCF -21%	by 2030	below BAU	INDC
Marshall Islands	-32% (indicative -45% by 2030)	by 2025	below 2010	INDC
Mauritania	Conditional: -22.3%	by 2030	below BAU	INDC
Mauritius	Conditional: -30%	by 2030	below BAU	INDC
Mexico	-22% (conditional: -36%)	by 2030	below BAU	INDC
Monaco	-50%	by 2030	below 1990	Strategy to be developed

Country	GHG Emission Reduction Target			Adaptation
Mongolia	Conditional: -14%	by 2030	below BAU	INDC
Montenegro	-30%	by 2030	below 1990	
Morocco	-13% (conditional: -32%)	by 2030	below BAU	INDC
Mozambique	Conditional actions: -76.5 MtCO ₂ e	2020 - 2030		Analysis to come
Myanmar	Conditional actions only	by 2030		INDC
Namibia	Conditional: -89%	by 2030	below BAU	INDC
New Zealand	-30%	by 2030	below 2005	INDC
Niger	-3.5% (conditional: -34.6%)	by 2030	below BAU	INDC
Norway	At least -40%	by 2030	below 1990	INDC
Papua New Guinea	Non-GHG Actions and Targets	by 2030	Non-GHG	INDC
Paraguay	-10% (conditional: -20%)	by 2030	below BAU	INDC
Peru	-20% (conditional: -30%)	by 2030	below BAU	INDC
Philippines	Conditional: -70%	by 2030	below BAU	INDC
Republic of Congo	Conditional: -48%	by 2025	below BAU	INDC
Republic of Korea	-37%	by 2030	below BAU	INDC
Republic of Moldova	-64% to -67% (conditional: -78%)	by 2030	below 1990	INDC
Republic of Serbia	-9.8%	by 2030	below 1990	
Russia	-25% to -30%	by 2030	below 1990	
Rwanda	Conditional actions only	by 2030		INDC
Samoa	Renewable (non-GHG) target	by 2025	Non-GHG	
San Marino	-20%	by 2030	below 2005	
Sao Tome and Principe	Conditional: -24%	by 2030	below 2005	INDC
Senegal	-4% by 2020; -7% by 2025 and -6% by 2030 (conditional: 10%, 23% and 31%)	by 2030	below BAU	INDC
Seychelles	Conditional: -21.4% (-29.0% by 2030)	by 2025	below BAU	INDC
Sierra Leone	7.58 MtCO ₂ e maintained	by 2035	Fixed Level Target	INDC
Singapore	-36% emission intensity; Peaking emissions by around 2030	by 2030	below 2005	INDC
Solomon Islands	-12% by 2025 and -30% by 2030 (conditional: -27% and -45%)	by 2030	below 2015	INDC
South Africa	398-614 MtCO ₂ e	2025-2030	Trajectory Target	INDC
Swaziland	Conditional actions only	2020-2030		INDC
Switzerland	-50%	by 2030	below 1990	
Tajikistan	-10% to -20% (conditional: -25% to -35%)	by 2030	below 1990	INDC
Tanzania	-10% to -20%	by 2030	below BAU	INDC
Thailand	-20% (conditional: -25%)	by 2030	below BAU	INDC
Trinidad and Tobago	Public transport emissions -30%; (conditional: 3 sectors -15%)	by 2030	below BAU	INDC
Togo	-11.14% (conditional: -31.14%)	by 2030	below BAU	INDC
Tunisia	-13% emission intensity (conditional: -41%)	by 2030	below 2010	INDC
Turkey	Up to -21%	by 2030	below BAU	
Turkmenistan	Conditional: peaking emissions	by 2030	Trajectory	INDC

Country	GHG Emission Reduction Target			Adaptation
			Target	
Ukraine	-40%	by 2030	below 1990	INDC
United States	-26% to -28%	by 2025	below 2005	Undertaking
Uruguay	Nine sector-specific emissions intensity reduction targets (conditional and unconditional)	by 2030	below 2010	INDC
Vanuatu	Renewable (non-GHG) target	by 2030	Non-GHG	INDC
Viet Nam	-8% (conditional: -25%); -20% emissions intensity (conditional: 30%)	by 2030	below BAU below 2010	INDC
Zimbabwe	Conditional: -33%	by 2030	below BAU	INDC
Zambia	-25% (conditional: -47%)	by 2030	below 2010	INDC

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