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Are major economies on track to achieve their pledges for 2020? An assessment of domestic climate and energy policies

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HIGHLIGHTS

- Many countries have pledged to reduce their greenhouse gas emissions by 2020.
- There are upward revisions of greenhouse gas emission projections in many developing countries.
- Higher emissions expected from pledged mitigation action plans of developing countries.
- Achieving the 2 °C climate goal becomes more difficult.
- The expected emission levels resulting from the pledges are surrounded with large uncertainties.

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ABSTRACT

Many of the major greenhouse gas emitting countries have planned and/or implemented domestic mitigation policies, such as carbon taxes, feed-in tariffs, or standards. This study analyses whether the most effective national climate and energy policies are sufficient to stay on track for meeting the emission reduction proposals (pledges) that countries made for 2020. The analysis shows that domestic policies of India, China and Russia are projected to lead to lower emission levels than the pledged levels. Australia's and the EU's nationally legally binding policy framework is likely to deliver their unconditional pledges, but not the conditional ones. The situation is rather unclear for Japan, South Korea, Brazil and Indonesia. We project that policies of Canada and the USA will reduce 2020 emission levels, but additional policies are probably needed to deliver their pledges in full. The analysis also shows that countries are implementing policies or targets in various areas to a varying degree: all major countries have set renewable energy targets; many have recently implemented efficiency standards for cars, and new emission trading systems are emerging.

1. Introduction

Since the climate negotiations in Copenhagen in 2009, many countries have submitted quantitative economy-wide greenhouse gas (GHG) emission reduction targets, or pledges, for 2020, as anchored in the 2010 Cancún Agreements (UNFCCC, 2010). To achieve these targets, most of these countries have planned or implemented climate and energy policies (REN21, 2011; Townshend et al., 2013)). Although many studies have analysed whether these pledges are sufficient for limiting global temperature increase to 2 °C (for an overview, see Höhne et al., 2012; UNEP, 2012a) or analysed the ambition level of individual pledges (www.climateactiontracker.org/), no study to date has analysed whether the pledges are likely to be achieved. This study fills this gap by assessing how much the most effective domestic climate policies in major emitting countries would contribute to reducing GHG emissions, and by comparing the resulting emission levels with the pledges. As future emission levels without specific climate policies are uncertain, depending largely on economic growth and factors such as technological innovations (to exploit shale gas, for instance), we take into account uncertainty in business-as-usual (BAU) emissions, by using a range in BAU projection, and determining the emission levels resulting from implementing climate policies starting at BAU levels.

This paper is organised as follows. Section 2 provides the methodology of calculating the effect of domestic policies. Section 3

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presents the expected emission levels from the policies and Section 4 discusses the caveats of this analysis and concludes.

2. Methodology and data

2.1. General methodologies and data sources

The quantification of the pledges was based on den Elzen et al. (2013) and Hof et al. (2013). The selection of the most effective policies was done based on expert judgment (interviews of national experts) and literature review. For the calculation of the impact of domestic policies, three methods were used: (i) the policy evaluation module of the PBL FAIR policy model, (ii) bottom-up calculations by Ecofys (energy sector) and IIASA (agriculture and forestry sector), and (iii) literature research.

The policy evaluation module of the PBL FAIR policy model (www.pbl.nl/fair) consists of a spreadsheet with specific bottom-up calculations for each policy type, as described in Section 2.2. The spreadsheet is based on PBL/IIASA BAU projections including all Kyoto GHGs, except CO_2 emissions from land-use change. These projections were developed for the OECD Environmental Outlook (OECD, 2012), and were calculated using the PBL energy model TIMER (van Vuuren et al., 2011) and the PBL land-use model IMAGE (Bouwman et al., 2006), based on GDP projections of the OECD (2012). For the Annex I countries, land-use credits are based on the agreed accounting rules for emissions from land use, land-use change and forestry (LULUCF) (Grassi et al., 2012; UNFCCC, 2012). Data on CO_2 emissions from LULUCF (e.g. deforestation) of non-Annex I countries were based on the IIASA forestry model G4M (Kindermann et al., 2008). The projections are harmonised to historical 1990–2010 emissions, which are based on the UNFCCC National Inventory Submissions, Common Reporting Format Tables for Annex I countries. The EDGAR database (JRC/PBL, 2012) and/or the national communications are used for the non-Annex I countries. Energy statistics data until 2010 is based on IEA (2012).

Bottom-up calculations by Ecofys were used for different subsectors, making use of emission projections by the countries themselves, as reported in the national communications, if available. Furthermore, data on energy-related CO_2 emissions were taken from projections of the World Energy Outlook of IEA (2011) (hereafter WEO 2011) and data for non-CO_2 GHG emissions from US EPA projections (EPA, 2006). The calculations of Ecofys were supplemented with calculations for land-use policies using the IIASA forestry model.

The most important literature sources include the Climate Action Tracker (CAT) of Ecofys, PIK, and Climate Analytics (Ecofys and Climate Analytics, 2011, 2012), Globe Climate Legislation Study (Townshend et al., 2011), REN21 report (REN21, 2011) and various national studies as explained in Section 3.

The first two methods for calculating the impact of different policy instruments and targets on reducing emissions are similar, with only few differences. Implementation barriers, domestic legislation and underlying policy instruments are taken into account in projecting the effect of specific targets, for instance by assuming that only a fraction of the target is achieved.

2.2. Methodology for specific policy instruments and targets

For all the policies and targets analysed in this paper (Table 1), the methodology for calculating the effect on emissions is described briefly below (for more details, see Roelfsema et al., 2013).

The effect of *renewable mix targets* is calculated based on the difference in the share of primary energy consumption coming from renewable resources between the BAU projection and a projection of a scenario in which the renewable target is achieved, using emission factors per unit of primary energy consumption. If the target applies to electricity generation, a similar method is used, in which the primary energy consumption is calculated using the efficiency of power plants.

The effect of *renewable capacity targets* is calculated by estimating the primary energy consumption coming from fossil fuel resources that is avoided compared to BAU by replacing the fossil fuel resources by renewables resources, using emissions factors per unit of energy consumption.

The effect of *energy intensity targets* is calculated based on GDP projections (assuming GDP growth is not affected), and on BAU trends in the energy mix and emission factors per unit of primary energy consumption.

The effect of *power plant standards* (i.e. the CO_2 emissions per unit generated electricity) is estimated by calculating the difference in emissions per unit generated electricity of the new installed power plants between BAU projection and a projection in which all new fossil fuel plants are gas-fired to meet the standards or exceed them. It further accounts for the possible differences in energy efficiencies for the new power plants in both projections.

Table 1
Overview of major domestic policies per country analysed in this study.

Australia	Emission trading system	Indonesia	Forestry policy
	Renewable mix target (electricity)		Renewable mix target (primary energy) Renewable energy target
	Renewable Portfolio Standard		Biofuel target
	Power plant standard	Japan	(unknown)
Brazil	Forestry policy	Mexico	Renewable mix target (electricity)
	Grazing land management		Forestry policy
	Renewable capacity target	Russia	Gas-flaring target
	Renewable mix target (electricity)		Renewable mix target (primary energy)
Canada	Car standard		Energy intensity target
	Power plant standard	South Africa	Renewable capacity target
China	Emission intensity target		Feed-in-tariff
	Energy intensity target	South Korea	Emission trading system
	Renewable mix target (primary energy)		Renewable mix target (primary energy)
	Renewable capacity target	Ukraine	Feed-in-tariff
EU	Emission trading system		Energy-intensity target
	Renewable mix target (primary energy)	USA	Renewable mix target (electricity) (regional)
	Energy efficiency target		Car standard
India	Renewable mix target (electricity)		Power plant standard
	Renewable capacity target		Emission trading system (regional)
	Renewable Portfolio Standard (PAT Scheme)		Biofuel quota

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