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# Global emission reduction potential of additional mitigation measures

*Final report*

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# Foreword

According to The Emissions Gap Report 2012 by UNEP, global GHG emissions are on a pathway to grow from the 2010 level of approximately 49-50 to 58 GtCO<sub>2</sub>-eq by 2020 without decisive action. Simultaneously, there is a wealth of studies indicating the existence of global emission reduction potentials in excess of the 8 to 13 GtCO<sub>2</sub>-eq emissions gap for a “likely” chance of being on track to stay below the 2°C.

In order to bridge the gap, to avoid investments that further “lock in” our societies to carbon intensive production and consumption patterns, and to accelerate the pace of action in line with the latest climate science findings, several options have been identified. Among the most important ones are i) stronger country commitments, ii) stricter emission accounting rules, and iii) up-scaled action through so called International Cooperative Initiatives (ICIs).

This study reviews latest research and assessments, taking note of new developments and concrete climate action since the publication of the 2012 UNEP gap report. The study hereby provides an assessment of what kinds of emission reduction measures could be harnessed and potentials actually realized through these various options by 2020.

The work has been carried out in April-September 2013, commissioned by the Finnish Ministry of Environment. The authors assume full responsibility for the analysis and views expressed. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of the Finnish Ministry of the Environment.

We would like to warmly thank people consulted (see Annex 3) for their time and views expressed during interviews. In addition, we would like to extend our particular thanks to Jessica Boyle (Internationals Institute for Sustainable Development) for sharing valuable insights.



# List of abbreviations

AAU	Assigned Amount Units
ADP	Durban Platform for Enhanced Action
AR&D	Afforestation, reforestation and deforestation
BAU	Business as usual
CB	Carbon budget
CCAC	Clean Air and Climate Coalition
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CO <sub>2</sub> --eq	Carbon dioxide equivalent
COP	Conferences of Parties
CP	Commitment period
EDGAR	Emission Database for Global Atmospheric Research
EEDP	Energy Efficiency Development Plan
EIA	Energy Information Agency
ETS	Emission Trading System
ENCC	Mexico's National Climate Change Strategy
EPA	Environmental Protection Agency
EU27	27 European Union member states
FIT	Feed-in tariff
FM	Forest management
FVA	Framework for Various Approaches
GDP	Gross Domestic Product
GHG	Greenhouse gas
Gt	Gigaton
GW	Gigawatt
HFCs	Hydrofluorocarbons
ICI	International Cooperative Initiative
INC	Initial National Communication
IPCC	Intergovernmental Panel on Climate Change



JRC	Joint Research Centre of the European Commission
LULUCF	Land-use Change and Forestry
MRV	Measuring, reporting, and verifying
Mt	Megaton
NAPCC	National Action Plan for Climate Change
NAMA	National Appropriate Mitigation Action
NCCAP	National Climate Change Action Plan
NCCS	National Climate Change Strategy
NCCRWP	National Climate Change Response White Paper
NGETR	National GHG Emission Trajectory Range
NGHGI	National Greenhouse Gases Inventory
NEEP	National Energy Efficiency Program
NMM	New Market Mechanisms
NOAK	Nordic Working Group for Global Climate Negotiations
PECC	Special Program on Climate Change
PMR	Partnership for Market Readiness
PPSR	Previous Periods Surplus Reserve
QELRO	Quantified emissions limitation and reduction objective
R&D	Research and development
RE	Renewable energy
REDD	Reducing emissions from deforestation and forest degradation
RGGI	Regional Greenhouse Gas Initiative
RPS	Renewable Portfolio System
SBSTA	Subsidiary Body for Scientific and Technological Advice
TMS	Target Management System
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
VCM	Voluntary Carbon Market
WRI	World Resources Institute



# 1 Introduction

## Background

While the international climate negotiations under United Nations Framework Convention on Climate Change (UNFCCC) provide some hope of progress on global emission reductions, as noted in the commitment to reach an “agreement” in 2015<sup>1</sup>, the gap between required emission reductions and the actual global emissions continues actually to widen. According to the most recent emission gap report<sup>2</sup> by the United Nations Environment Programme (UNEP), the estimated emissions gap in 2020 for a “likely” chance of being on track to stay below the 2C target is 8 to 13 GtCO<sub>2</sub>-eq. The 2011 gap report assessed the 2020 gap to 6 to 11 GtCO<sub>2</sub>-eq.<sup>3</sup>

In order to bridge the gap, to avoid investments that further “lock in” our societies to high energy and carbon intensive production and consumption patterns, and to accelerate the pace of action in line with the latest climate science findings, several options have been identified. Among the most important ones are 1) stronger commitments, 2) stricter emission accounting rules and 3) up-scaled action through so called International Cooperative Initiatives (ICIs).

Currently, even if the most ambitious level of existing pledges<sup>4</sup> and commitments were achieved by all countries the gap remains considerable. New and more ambitious pledges or over-achieving the current ones are therefore necessary (figure 1). Countries that have made commitments (conditional and/or non-conditional) could set more demanding targets and accelerate their mitigation measures accordingly. Similarly, countries that have not yet made any official commitments could take on commitments and hereby contribute to the global emission reduction effort.

Multiple loopholes in emission accounting rules, especially related to the AAU surplus, double counting and additionality, and Land use, land-use change and forestry (LULUCF), have imposed a serious threat to the integrity of the Kyoto protocol as a whole.<sup>5</sup> Addressing these problems has been, therefore, taken to the agenda at several conferences of parties (COP). LULUCF was largely discussed in COP 17 at Durban and important decisions to restrict AAU surplus were made in COP 18 at Doha. Double counting is likely to be on the agenda at COP 19 in Warsaw. Yet, stricter and more

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<sup>1</sup> Referring to the process to develop a protocol, another legal instrument or an agreed outcome with legal force to come into effect and be implemented from 2020, under the Convention applicable to all parties, launched by Decision 1/CP.17)

<sup>2</sup> UNEP (2012 a), The Emissions Gap Report 2012. United Nations Environment Programme (UNEP), Nairobi.

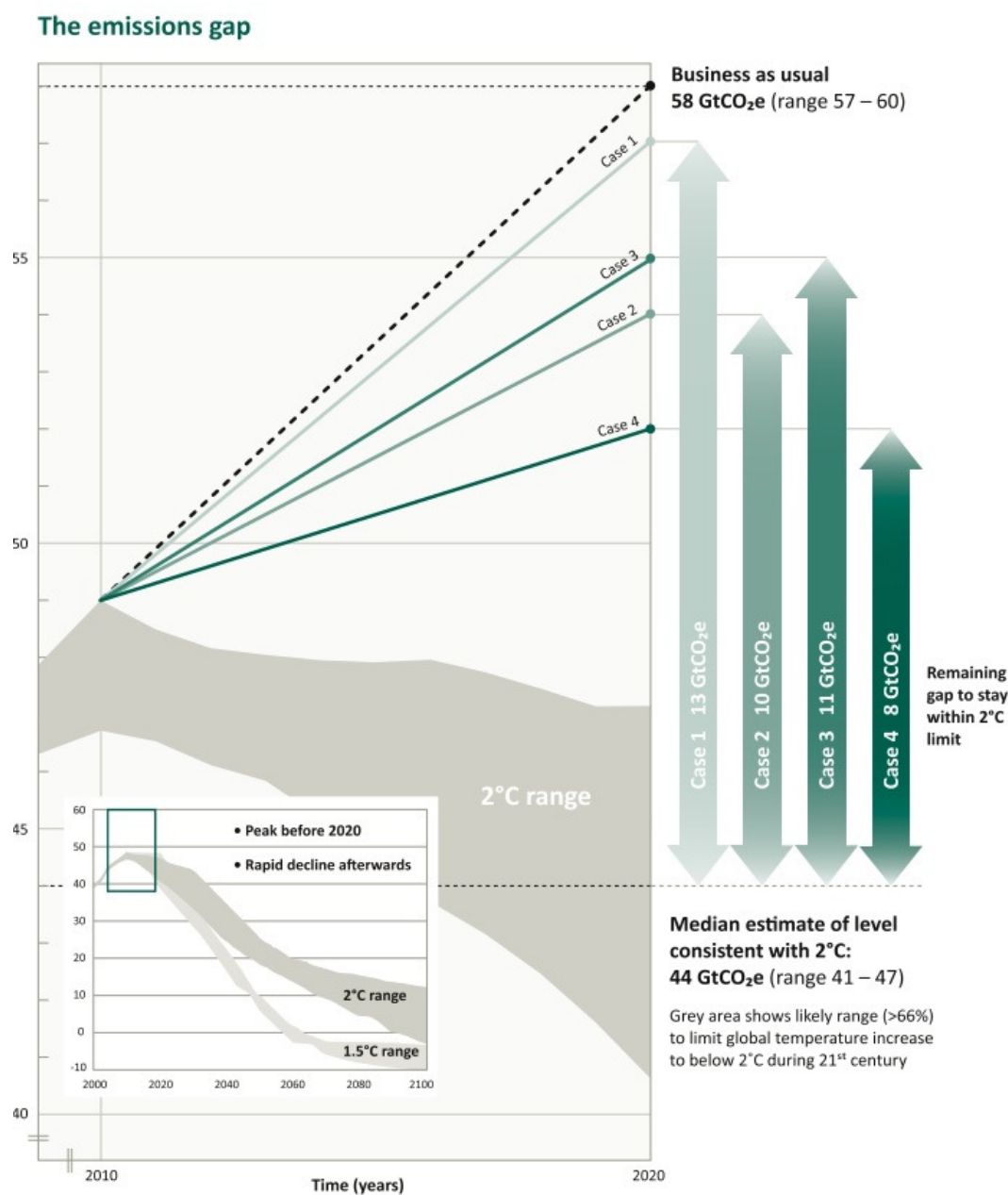
<sup>3</sup> The gap obviously depending on how emission reduction pledges are implemented. The gap in 2012 is larger than in 2011 because of higher than expected economic growth and the inclusion of “double counting” of emission offsets in the calculations. The Emissions Gap Report 2012 A UNEP Synthesis Report November 2012

<sup>4</sup> In this study the word “pledge” is used as a general term encompassing different possible types of GHG emissions-related target, commitment, action or goal put forward by Parties either pre- or post-2020.

<sup>5</sup> CDM Watch (2012), CDM watch at COP 17 Compilation of our writings and activities at COP 17, United Nations Climate Conference 2011, Durban, South Africa.



transparent rules, as part of a comprehensive emission accounting framework<sup>6</sup>, are needed to guarantee real and measurable emissions reductions.



**Figure 1.** The emission as presented in the UNEP 2012 gap report. The 2020 gap is estimated to 8-13 GtCO<sub>2</sub>-eq, based on four different cases, which combine assumptions about pledges (unconditional or conditional) and rules for complying with pledges (lenient or strict).

<sup>6</sup> Prag, Andrew (OECD); Hood, Christina (IEA) and Barata, Pedro (Get2C) (2013), Made to Measure: Options for Emissions Accounting under the UNFCCC. OECD/IEA.



It is also important to note the increasing attention and potential of so called ICIs, which can be considered complementary to the initiatives under the UNFCCC, which represent an interesting further opportunity to catalyze and accelerate emission reduction measures. According to some estimates, harnessing the full potential of ICIs may narrow the emission gap by up to 10 GtCO<sub>2</sub>-eq<sup>7</sup>. This way, ICIs could play a significant role in wedging the emission gap.

A wide range of positive actions are currently taking place within and outside of the UNFCCC process, with a vast number of countries, cities, organizations, businesses and other stakeholders having set and implementing ambitious emission reduction measures. However, on global scale, current and committed action remains too scattered, too slow and quantitatively insufficient, in order to give even a reasonable chance to keep global average temperature increase this century under 2 degrees Celsius.

### **Objectives and scope**

The main objective of this study is to assess the overall scale of emission reduction potential of the above mentioned three most important options as well as their various interlinkages. These topics are and will remain at the core of international climate policy negotiations, and hereby the study can serve negotiators and stakeholders in strategic preparations and identifying needs for further in-depth studies, and encouraging proactive input to find ways to bridge the emission reduction gap internationally, as well as nationally.

The UNEP Emissions Gap Report outlines various emission pathways (with four scenarios and respective global total greenhouse gas emission levels between 52–57 GtCO<sub>2</sub>-eq, see figure 1) with the analysis focusing on how nations are faring towards bringing emissions down to around 44 GtCO<sub>2</sub>-eq<sup>8</sup> or less by year 2020. The report also identifies major emission reduction potentials, with the technical potential for reducing emissions by 2020 estimated to about 17 ± 3 GtCO<sub>2</sub>-eq<sup>9</sup>, which in principle would be enough to close the gap between Business As Usual (BAU) emissions and emissions that meet the 2°C or even the 1.5°C target.

As part of the Copenhagen, Cancún, Durban and Doha conferences, more than 90 developed and developing countries have made emission reduction or limitation pledges for 2020. Even if these pledges cover some 80% of global emissions, they are not ambitious enough to put global emissions on a path that will hold global warming below 2°C. It is also important to note that pledges by both developed and developing countries have been expressed in a variety of ways and are not necessarily comparable.<sup>10</sup>

Against this background, this study reviews any latest research and assessments, taking note of any new developments (such as any recent changes in emission reduction commitments, accounting rules, in ICIs emission reduction potentials) since the publication of the 2012 gap report. The study

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<sup>7</sup> Blok, K. et al. (2013), Bridging the greenhouse-gas emissions gap, Nature climate change.

<sup>8</sup> The level of annual global GHG emissions that would give a likely chance of meeting the 2°C target.

<sup>9</sup> At a marginal costs below US\$ 50-100/ tCO<sub>2</sub>-eq reduced. Marginal costs are the costs of the last tonne of equivalent CO<sub>2</sub> removed. The average costs of all the reductions together are much lower.

<sup>10</sup> As commitments are based on national circumstances rather than commonly-applied accounting rules, the pledges currently differ from one another in a number of ways including their scope, period of application, coverage of land-use emissions and removals and use of units from market mechanisms.

hereby provides an expert assessment of what kinds of emission reduction potentials could actually be realized through the various options by 2020.<sup>11</sup> Through selected country reviews it provides an indication of overall progress (or lack thereof) towards wedging the gap, highlighting concrete policy measures taken and/or planned to reduce GHG emissions by 2020.

### Approach and Methodology

The study has been conducted primarily as a literature review that has served as a basis for expert analysis by the project team. The literature review and analysis have been complemented by a number of targeted interviews. The semi-structured interviews have served to cover information gaps<sup>12</sup> and to reflect on and validate the expert team's analysis findings and conclusions (Annex 3. List of people consulted).

While this study does not include any new modeling, our approach is built upon the following key steps and overall methods:

- firstly, our work has been anchored to the UNEP gap reporting process, which serves as a key international forum to assess the global GHG emission reduction gap. The UNEP 2012 Gap report serves as the basis for our analysis and as a source of comparison, in order to analyze the GHG emission development 2010-2020 and identify any additional potential to narrow the 2020 gap. The countries with pledges (14 largest emitters excluding EU) and without pledges (9 largest emitters) analyzed in this report are chosen based on the Gap report emission data from 2010. The emission estimates for 2010 are directly from the UNEP Gap Report<sup>13</sup>. Also the 2020 BAU estimates presented in summary tables<sup>14</sup> for countries with pledges originate from the UNEP Gap Report background data<sup>15</sup> unless otherwise informed.
- secondly, based on our desk review of available documentation and complementary interviews, we have identified alternative scenarios, i.e. an optimistic scenario and a pessimistic scenario for GHG emission development by 2020, looking into countries with and without emission reduction commitments, alternative accounting rules as well as emission reduction potentials that could be achieved through various ICIs. Taking note of considerable ranges for 2020 BAUs (for many countries) and in many cases limited overall comparability of pledges, our aim has been to transparently note how the optimistic and pessimistic country scenarios relate to available BAUs and pledges.
- thirdly, where feasible, we have provided our expert view on the likelihood of GHG emission development by 2020, whether we consider it more or less likely to follow any of the two scenarios. In some cases it has not been feasible or reasonable to develop alternative scenarios based on available information, e.g. due to lacking data, major uncertainties in

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<sup>11</sup> Our study does not take any position on what would be a fair share in achieving required emission reductions.

<sup>12</sup> The interviews have been valuable among other in gaining insight on emission reduction potentials by countries with limited information and/or lacking explicit commitments.

<sup>13</sup> UNEP Gap Report uses Emission Database for Global Atmospheric Research (EDGAR) database

<sup>14</sup> As noted below, and described in the country analyses, for most countries a range of BAU emissions for 2020 have been produced, depending on the assumptions made in various studies. For transparency and consistency reasons our summary tables note the BAU as included in the UNEP 2012 Gap Report.

<sup>15</sup> UNEP (2012 c) Background data from the Emission Gap Report 2012 including the BAU estimates of a selection of countries. Data received from UNEP Risø Centre

GHG accounting, in overall economic policy development, in GDP or population growth forecasts, cleaner technology deployment and energy choices.

- fourthly, finally and where feasible, we have compared our expert view with the estimated 2020 GHG emission levels included in the UNEP Gap report, in order to identify whether based on our assessment, additional emission reductions could be expected by 2020 (i.e. in comparison to the UNEP 2012 gap report).

It is important to note that for many countries important uncertainties still remain related to basic GHG emission information, be it GHG inventories and baseline data & scenarios, and in particular on the role of land-use and land-use changes and forestry. As pointed out above, current pledges differ from one another in a number of ways including their scope, period of application, coverage of land-use emissions and removals and use of units from market mechanisms. Also, depending on assumptions made in various studies, considerable differences in available mitigation potentials can be noted. While several initiatives are currently on-going to identify means to narrow the gap, and a comprehensive and updated review of the situation is expected in the forthcoming UNEP 2013 gap report, by being as transparent as possible about these limitations and uncertainties, this study aims to contribute to that overall process in a constructive manner. A description of any chapter specific and/or more detailed assumptions is presented in the beginning of sections 2 to 5.

Following this introductory section, Section 2 presents a review of selected major GHG emitting countries with conditional or unconditional commitments already made (including Australia, USA, China, Brazil, India, Russia, South-Africa, Indonesia, Japan, Kazakhstan, Ukraine, South-Korea and Mexico) assessing their progress in meeting their commitments as well as the likelihood of further contributions towards wedging the gap. Due to the relative importance of China and the USA, a more in-depth analysis of these two countries has been presented in section 2.

Section 3 presents a review of selected countries with no commitments so far (including Iran, Malaysia, Myanmar, Vietnam, Turkey, Pakistan, Thailand, Saudi- Arabia and Venezuela) investigating their readiness to take on some sort of pre-2020 commitments and contribute to stepping up global action to cut greenhouse gas emissions before 2020.

Section 4 presents an analysis of recent decisions and additional opportunities for increased emission reductions through stricter emission reduction accounting rules, with a particular focus on accounting rules related LULUCF, assigned amount units surpluses and double counting.

An overview of emission reduction potential through ICIs is presented in section 5. As noted above, this section builds strongly on a parallel NOAK study focusing explicitly on ICIs, conducted by Ecofys and the University of Cambridge Programme for Sustainability Leadership.<sup>16</sup>

The key findings and conclusions are presented in section 6. Additional information is provided in Annexes.

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<sup>16</sup> The Nordic Council (2013), Enhancing Ambition through International Cooperative Initiatives, The Nordic working group for global climate negotiations (NOAK).

## 2 Countries with commitments

The analysis of countries with emission reduction commitments focuses primarily on countries with the largest GHG emissions. These included China, United States, India, the Russian Federation, Brazil, Indonesia, Japan, Canada, Mexico, South Korea, Australia, South Africa, Ukraine and Kazakhstan. The countries are ordered according to their emissions in 2010. While the commitments are based on national circumstances rather than commonly-applied accounting rules, the pledges currently differ in a number of ways including their scope, type, period of application, coverage of land-use emissions and removals and use of units from market mechanisms. Consequently the pledges are not necessarily comparable. As noted in chapter 1, baseline data for 2010 as well as BAU 2020 emission levels presented in the summary tables after each section are from the UNEP Gap Report<sup>17</sup>, unless otherwise informed.

However, based on available studies and complementary interviews for selected countries, an expert judgment for the likelihood of fulfilling the commitments and any opportunities for further increased ambition by the respective countries are provided. With regards to mitigation potentials, where information has been readily available in different categories, measures that can be considered no-regrets as well as measures with clearly identified and considerable co-benefits have been used as one criterion to assess the likelihood of getting identified emission reduction measures implemented pre-2020.<sup>18</sup> A more in-depth analysis has been produced on China and USA, with more concise reviews provided for other countries.

### 2.1 China

China has pledged to reduce its CO<sub>2</sub> emissions per unit of GDP by 40–45 % by 2020 compared with the 2005 level. The intensity target was proposed in November 2009 and submitted to the Copenhagen Accord on 28 January 2010 with the other targets, namely to increase the share of non-fossil fuels in primary energy consumption to around 15 % by 2020 and to increase forest coverage by 40 million ha and forest stock volume by 1.3 billion m<sup>3</sup> by 2020 compared with the 2005 levels. China further emphasized in its submission to the UNFCCC that these domestic mitigation actions are voluntary in nature.<sup>19</sup>

China's international emissions intensity target (carbon dioxide emissions/GDP) of 40–45 % reduction by 2020 from 2005 levels and its target to achieve a share of 15 % non-fossil energy consumption translates into emissions of about 13 000 MtCO<sub>2</sub>-eq by 2020.<sup>20</sup> The range of business

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<sup>17</sup> UNEP Gap Report uses Emission Database for Global Atmospheric Research (EDGAR) database

<sup>18</sup> In line with Fekete et al. (2013) i) *No-regret measures* refer to mitigation measures with no or negative costs, ii) *Measures with co-benefits*, refer to measures that come at moderate positive cost or at higher cost with significant co-benefits that lower overall cost to society; and iii) *Ambitious measures*, refer to measures that are available at higher cost and potential co-benefits do not outweigh these costs in a societal view.

<sup>19</sup> UNFCCC (2011), Compilation of information on nationally appropriate mitigation actions to be implemented by Parties not included in Annex I to the Convention, FCCC /AWGLCA/2011/INF.1, 18 March 2011.

<sup>20</sup> The Climate Action Tracker (2012 a), China.



as usual scenarios points to a level of emissions between 13 300 and 13 800 MtCO<sub>2</sub>-eq in 2020.<sup>21</sup> A thorough assessment of the Chinese target is difficult because details on the basis of the proposed target, such as assumed emissions or GDP growth, have not been provided.

China is the world's biggest emitter of greenhouse gasses, but there exists a level of uncertainty of the exact level of current emissions. Some estimate the emissions to be 9 900 MtCO<sub>2</sub>-eq in 2008,<sup>22</sup> and between 8 000 and 9 000 MtCO<sub>2</sub>-eq in 2010.<sup>23</sup> China is also world leader in CO<sub>2</sub> emissions. The EIA estimates that the CO<sub>2</sub> emissions of China are 8 700 MtCO<sub>2</sub>-eq in 2011,<sup>24</sup> while the National Bureau of Statistics of China estimates them to 7 700 MtCO<sub>2</sub>-eq in 2011.<sup>25</sup>

The uncertainty of China's current emissions is substantial. In June 2011, scientists from China, Britain and the US reviewed data from China's National Bureau of Statistics and found that country's total emissions from 1997 to 2010 may be 20 % (1 400 MtCO<sub>2</sub>-eq) higher than reported. Chinese emissions are in the focus of international attention because of their significance. However, these levels of uncertainty aren't unique to China among developing and emerging economies, which "all have less-developed data systems than those that have been built up over decades to serve energy markets and environmental regulation in the United States and other industrialized countries".<sup>26</sup>

China's total energy consumption is dominated by coal with 67.3 % and oil with 16.8 %, while biofuels and waste accounted for 9 %, hydro 2.3 %, gas 3.3 % and nuclear 0.8 % and other renewables (wind, solar, geothermal) 0.5 % in 2009.<sup>27</sup> The largest share of the energy demand comes from industrial sector (70 % of the total) – which consumes a lot of energy in the form of electricity. The largest energy consuming subsectors are iron, steel and cement production. China's electricity generation is particularly coal dominated, with 80 % share in 2011.<sup>28</sup>

Wind power and solar energy have been growing remarkably in recent years, and in absolute terms, at the end of 2011, China led the world in total installed generating capacity for renewables with 282 GW, including 62 GW of wind, 3 GW of solar, and 212 GW of hydro and the National Energy Administration announced in January 2013 that the country plans to add 49 GW of renewable generating capacity by the end of the year, including 10 GW of solar, 18 GW of wind, and 21 GW of hydro.<sup>29</sup>

The perception of Chinese energy sector changes radically when speaking in absolute or relative terms, gigawatts or percentages, as China is the energy and emissions giant of the 21<sup>st</sup> century.

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<sup>21</sup> Fekete, H. et al. (2013), Emerging economies – potentials, pledges and fair shares of greenhouse gas reduction. Umwelt Bundes Amt. Climate Change 06/2013

<sup>22</sup> European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency (2011), Emission Database for Global Atmospheric Research (EDGAR), release version 4.2.

<sup>23</sup> The Climate Action Tracker (2012 a)

<sup>24</sup> The US Energy Information Administration (2012), China country analysis brief overview.

<sup>25</sup> Statistics are available in Chinese at: <http://www.stats.gov.cn>. They are quoted in China Climate Policy Data Sheet by Yale Center of Environmental Law and Policy.

<sup>26</sup> Perry, C. (2012), Atmospheric scientists release first "bottom-up" estimates of China's CO<sub>2</sub> emissions, Harvard School of Engineering and Applied Sciences, 6 July 2012.

<sup>27</sup> IEA (2011), Energy Statistics.

<sup>28</sup> World Resources Institute (2013), Why is China Taking Action on Clean Energy and Climate Change? China FAQs Issue Brief, May 2013.

<sup>29</sup> Ibid.

## Actions and meeting the target

As noted above, the Chinese CO<sub>2</sub> intensity pledge is close to business as usual. The second target of 15 % non-fossil energy, however, adds reductions beyond BAU in most studies. The impact of the third target on forestry is typically considered small. Recent energy and emissions data combined with China's 12th Five-year plan announced in March 2011 indicate that China is likely to go beyond the intensity pledge contributing for further emission reductions. However, at the same time, it is possible that economic growth will be faster than expected, and also emissions in 2020 may be higher than some previous estimates indicate.<sup>30</sup>

According to a recent report by Ecofys, Wuppertal and Climate Analytics, the annual overall mitigation potential of China with "standard measures" is estimated between 1 250 and 2 340 MtCO<sub>2</sub>-eq below BAU. Of this 540 to 750 MtCO<sub>2</sub>-eq are covered by "no-regret measures", 380 to 490 MtCO<sub>2</sub>-eq by "moderate costs and co-benefits" and 330 to 110 MtCO<sub>2</sub>-eq by "ambitious policies". Most no-regret measures are found in efficiency of appliances, transport, processes and power plants.<sup>31</sup>

Increase in nuclear energy is one of China's targets, and with 26 nuclear reactors under construction, China is the most active country in the world in developing nuclear capacity. Reduction potential could be annually 86–246 MtCO<sub>2</sub>-eq in 2020. Hydro, wind and solar photovoltaic power could, according to McKinsey, contribute even 570 MtCO<sub>2</sub>-eq per annum in 2020 – but part of this potential is likely to be already in the baseline of the Climate Analytics report.<sup>32</sup> The key prices for wind and solar energy production in China have dropped in recent years and the renewables sector is a strategic priority as it brings significant co-benefits in terms of creating new industrial branches and economic diversification. Energy efficiency in industrial processes is another key factor that could bring 137–275 MtCO<sub>2</sub>-eq per annum while efficiency improvements in transport could, perhaps surprisingly, also add 138 to 403 MtCO<sub>2</sub>-eq annual reductions in 2020. Low energy housing and efficiency of appliances have the potential for 290 and 270 MtCO<sub>2</sub>-eq reductions, respectively. Fuel switch in transport could add another 170 MtCO<sub>2</sub>-eq reduction.<sup>33</sup>

The Climate Analytics study does not consider any significant fuel switch from coal to gas – natural gas has for long been seen as a high cost route to emission reductions. However, shale gas production may provide a "wild card" in this regard. China probably holds the world's largest reserves of shale gas. According to the Ministry of Land and Resources, China's geological shale gas reserves and recoverable shale gas reserves have reached 134 trillion and 25 trillion cubic metres respectively. However, test drilling in China has only just begun in 2013 and many commercial and geological uncertainties remain. Government-capped prices together with limited extraction capacity, know-how, pipelines and other infrastructure will make the development of Chinese unconventional gas rather slow. On the other hand, the current US example of cheap gas, improved self-sufficiency and emission reductions sets a powerful example for other states to follow.

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<sup>30</sup> The Climate Action Tracker (2012 a)

<sup>31</sup> Fekete H. et al. (2013). In this study *No-regret measures* refer to mitigation measures with no or negative costs.

<sup>32</sup> McKinsey & Company (2009), China's green revolution. Prioritizing technologies to achieve energy and environmental sustainability.

<sup>33</sup> Fekete H. et al (2013)



Experts suggest that shale gas would at first be used in China as a feedstock for the chemical and fertilizer industries, reducing the use of gasified coal. One estimate is that this could lower China's annual carbon dioxide emissions by as much 100 to 150 MtCO<sub>2</sub>-eq, or roughly 1–1.5 % of the nation's cumulative carbon emissions in 2020.<sup>34</sup>

## Conclusions

Several scholars and analysts have pondered on the apparent paradox of China's weak international commitment and rather aggressive domestic policies.<sup>35</sup> The World Resources Institute lists five key motivations for China to decarbonise its economy, namely i) a broader notion of development ii) economic competitiveness iii) energy security iv) climate change impacts and v) international challenges and opportunities.<sup>36</sup> Number iii) stands out as something that is worth underscoring here. As mentioned, coal provides China with 70 % of its energy, and nearly 80 % of its electricity. China possesses over 13 % of the world's coal reserves, but if current production rates continue, it could run out in just 33 years. China either needs to find alternatives to coal or “bear the energy-security risks of becoming a massive coal importer”.<sup>37</sup>

Much anticipated improvements in energy efficiency in different sectors of the economy could come via the emissions trading schemes that are set to play an important part in the next phase of China's climate change policy. China's pilot schemes will already represent the world's second largest emission trading schemes and are expected to lead to a nationwide system in 2015-2016.

An interesting signal was the US-China agreement on June 8 this summer to work together to phase down the HFCs.<sup>38</sup> The effects of the possible phase down will kick in mostly after 2020: global cumulative benefits are estimated about 1 900 MtCO<sub>2</sub>-eq through 2020, and about 84 000 GtCO<sub>2</sub>-eq through 2050. Numbers and timetables were left out of the US-China agreement, which is hardly surprising, as both will want to do that negotiation under the Montreal Protocol. The annual COP/MOP takes place in October 2013. Over 110 countries have supported launching negotiations on HFC phase down, and the recent agreement unlocks one of the key stumbling blocks – China's willingness to begin that negotiation. Judging from the history of the Montreal Protocol, the final details could be adopted very quickly.

Though the HFCs comprise a relatively small portion of Chinese climate policy to meet the 2020 target, the willingness to compromise on this issue is a notable indicator. This, coupled with the relatively sluggish economic growth in 2013, gives rise to some optimism for China to go well below the projected business-as-usual by 2020.

It is likely that the pledge submitted to the Copenhagen Accord will be overachieved. The Copenhagen pledge is estimated at about 13 000 MtCO<sub>2</sub>-eq which is reflected here as a pessimistic scenario. The potential measures identified by Climate Analytics can end up with Chinese annual emissions at about 12 000 MtCO<sub>2</sub>-eq in 2020. This consists of our optimistic scenario, and would

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<sup>34</sup> Tollefson, J. (2013), China Slow to Start Fracking for Natural Gas in Shale. *Scientific American*, 20 February 2013.

<sup>35</sup> Ong, H. (2012), The Apparent 'paradox' in China's Climate Policies: Weak International Commitment on Emissions Reduction and Aggressive Renewable Energy Policy. *Asian Survey* 52 (6).

<sup>36</sup> World Resources Institute (2013)

<sup>37</sup> Gallagher, K. (2013), Why and How Governments Support Renewable Energy. *Daedalus* 142 (1), pp. 59-77.

<sup>38</sup> The White House (2013 a), The United States and China Agree to Work Together on Phase Down of HFCs, 8.6.2013.

contribute one gigaton to closing of the gap between the pledged and the needed. However, to reach this some ambitious measures will have to be taken. The most important exogenous factors are, naturally, macroeconomic growth and possible scale and pace of shale gas production in China. The optimistic and pessimistic scenarios of China's emissions are presented in table 1.

**Table 1.** China's emissions in 2010 and BAU emissions (including LULUCF), optimistic and pessimistic scenarios for 2020. The pessimistic scenario refers to BAU development while our optimistic estimate is based on identified emission reduction potentials and some recent developments in Chinese macroeconomic growth, energy and climate politics.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
11 180 MtCO <sub>2</sub> -eq	13 795 MtCO <sub>2</sub> -eq	12 000 MtCO <sub>2</sub> -eq	13 000 MtCO <sub>2</sub> -eq <sup>39</sup>

## 2.2 United States

On 28 January 2010, the United States associated with the Copenhagen Accord with their pledge to reduce nationwide emissions “in the range of 17 %” from 2005 levels by 2020. The US submission included a footnote noting that the pathway set forth by this reduction – and the pending US legislation – would entail a 30 % reduction in 2025 and a 42 % reduction in 2030, in line with the goal to reduce emissions 83 % by 2050, all with the base year of 2005.<sup>40</sup> The Energy Information Agency (EIA) reports that emissions in 2005 were 6 740 MtCO<sub>2</sub>-eq equivalent. The target identified in Copenhagen would result in emissions of 5 900 MtCO<sub>2</sub>-eq in 2020.<sup>41</sup>

When it became evident that the Obama administration could not push through the climate legislation – most notably the Waxman-Markey bill – the international audience was highly skeptical of U.S. meeting its target. In 2013, however, the situation seems more promising, yet unsure. Fuel switch from coal to gas due to the shale gas boom,<sup>42</sup> sluggish economic growth, policies implemented by the Obama administration via Environmental Protection Agency (EPA) under the Clean Energy Act, and reduced demand for transportation fuel, partly as a result of higher petroleum prices, lower miles travelled, and more efficient vehicles have indeed reduced the U.S. emissions. According to modelers, the 17 % reduction from 2005 is “within reach”,<sup>43</sup> but US “may well not meet it”,<sup>44</sup> or its emissions are expected to be “lower than estimated before, but still above the pledge”.<sup>45</sup> Lastly, a prominent analyst from Shell estimated that “it may be possible for the US to reach its target, but post-recession growth is uncertain as is the impact of Clean Air Act”.<sup>46</sup>

<sup>39</sup> Den Elzen, M., Roelfsema, M., Hof, A., Böttcher, H., Grassi, G. (2012), Analysing the emission gap between pledged emission reductions under the Cancún Agreements and the 2 °C climate target.

<sup>40</sup> UNFCCC (2010), Letter of Association to the Copenhagen Accord.

<sup>41</sup> UNEP (2012 c).

<sup>42</sup> Vihma, A. (2013), The Shale Gas Boom: The global implication of unconventional fossil fuel. FIIA Briefing Paper 122.

<sup>43</sup> The Washington Times (2013), Emissions pledge seen within reach, 13 February 2013.

<sup>44</sup> Scientific American (2013), U.S. May Come Close to 2020 Greenhouse Gas Emission Target, 7 February 2013.

<sup>45</sup> Höhne, N. et al. (2012 b), Greenhouse gas emission reduction proposals and national climate policies of major economies. Policy brief. Ecofys, Utrecht, the Netherlands & Cologne, Germany. 31 p.

<sup>46</sup> Hone, D. (2011). Hone is the Climate Change Advisor for Shell.



The U.S. total emissions in 2011 were 6 700 MtCO<sub>2</sub>-eq, of which 84 % were carbon dioxide, 9 % methane, 5 % nitrous oxide and 2 % fluorocarbons.<sup>47</sup> Energy-related activities are the primary sources of U.S. total emissions, accounting for 86 % of total greenhouse gas emissions.<sup>48</sup> This includes 97 % of country's carbon dioxide emissions. These carbon dioxide emissions from energy related activities were at their highest in 6 020 MtCO<sub>2</sub>-eq in 2007, and in 2011 they were 5 470 MtCO<sub>2</sub>-eq and 2012 already down to 5 290 MtCO<sub>2</sub>-eq, on par with the year 1992.<sup>49</sup>

Washington has not officially commented on the recent reports<sup>50</sup> on meeting the 17 % target. The latest official statement is from Doha COP-18, where the US delegation highlighted that the US has “taken strong action at home, dramatically increasing fuel standards for vehicles, doubling our share of renewable energy, sharply boosting appliance efficiency standards in buildings, making historic investments in clean energy R&D and more”.<sup>51</sup> Special Envoy Todd Stern further noted that “we need to do more and we intend to do more” and that “we are making good progress in reducing our emissions in the range of 17 % below 2005 levels by 2020”.<sup>52</sup>

President Obama highlighted in his inaugural address (21 January 2013) the threats of climate change, including rising sea levels, floods, droughts and other devastating consequences, and underscored that “the path towards sustainable energy sources will be long and sometimes difficult, but America cannot resist this transition – we must lead it”.<sup>53</sup> In his State of the Union speech (12 February 2013), President Obama promised to take executive action if Congress failed to pass climate legislation.<sup>54</sup> In June 2013, six months into Obama's second term, President announced his climate plan.

The plan is definitely set in the context of achieving the 17 % goal. Whether it actually gets the US there depends on how aggressive the various actions are – particularly the standards for existing stationary sources. The plan itself does not provide enough details to conduct a comprehensive analysis of the overall reductions that will likely be achieved; those details will only emerge as the various elements of the plan are implemented. However, the plan puts a marker in the ground that the Obama Administration is ready to take climate change seriously.

### **Actions and meeting the target**

The most significant potential for US executive action has been identified in:

- setting emission limits rules on existing coal plants;
- addressing other gasses, particularly HFCs;
- addressing methane emissions; and
- implementing energy efficiency measures

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<sup>47</sup> National Greenhouse Gas Emissions Data, the EPA.

<sup>48</sup> The EIA (2013 a), Annual Energy Outlook.

<sup>49</sup> The EIA (2013 b), Monthly Energy Review, April 2013.

<sup>50</sup> Bianco, N M. et al. (2013), Can the U.S. Get There from Here? Using Existing Federal Laws and State Action to Reduce Greenhouse Gas Emissions. World Resource Institute.

<sup>51</sup> UNFCCC (2012 a), Statement by the US, 5 December 2012.

<sup>52</sup> Stern, T. 2013, Remarks for High Level Segment, 5.12.2012, Doha Climate Meeting.

<sup>53</sup> The Washington Post (2013), President Obama's second inaugural address, January 21, 2013.

<sup>54</sup> The White House (2013 b), Remarks by the President in the State of the Union Address.

Three recent modelling exercises have been conducted on the US emissions trajectory. According to estimates by Resources for the Future,<sup>55</sup> substantial uncertainty remains because important regulations are still pending. Nonetheless, their estimate indicates that the United States is near to reaching the 17 % goal; currently the country is on course to achieve reductions of 16.3 % from 2005 levels in 2020. According to World Resources Institute (WRI),<sup>56</sup> the picture is less clear; unless proper policies are put in place, US may well achieve only 12 % reduction from 2005. However, with ambitious policies in place on federal and state level and other factors favourable, the emission reductions can be even 20 % by 2020. Ecofys outlines that current policies will not be sufficient to reach the stated target, but end up to in the range of 6.3–6.5 GtCO<sub>2</sub>-eq, instead of the 5.6 pledged.

The most important issue is to invoke the EPA's authority under the Clean Air Act to limit carbon pollution from stationary industrial sources, chiefly the power plants.<sup>57</sup> The agency is currently reworking a proposed rule to limit emissions from new power plants – a more complex and politically charged task is to devise rules for existing power plants. Power plants account one-third of the total U.S. greenhouse gas inventory. According to the WRI projection, standards to reduce carbon pollution from existing power plants accounts for 48 % of total emissions gap between business-as-usual (BAU) and the 2020 target.

Secondly, a “low hanging fruit” exists in phasing out the use of certain hydrofluorocarbons (HFCs). As noted, they represent a small share of total U.S. emissions, but can be phased out in a cost-effective manner.<sup>58</sup> According to WRI, this could contribute 23 % of the emissions gap between BAU and the 2020 target. Third, standards to reduce methane emissions from natural gas systems could deliver 11 % of the needed gap. Fourth, actions to improve energy efficiency in the residential, commercial, and industrial sectors have the potential to contribute 8 % to the needed reductions.

The WRI further identifies three different levels of ambition for executive action: “go-getter” with 17 %, “middle-of-the road” with 12 % and “lackluster” with 8 % reduction from 2005 levels. In the “go-getter” scenario, power plants emit 1 468 MtCO<sub>2</sub>-eq, the HFCs 181 MtCO<sub>2</sub>-eq and natural gas systems 73 MtCO<sub>2</sub>-eq. With “lackluster” regulation, power plants would emit 1 883 MtCO<sub>2</sub>-eq, HFCs 232 MtCO<sub>2</sub>-eq and natural gas systems 145 MtCO<sub>2</sub>-eq in the year 2020.<sup>59</sup>

To further complicate the picture, if the U.S. Administration were to pursue policies with “lackluster” ambition, for example, states could pick up the slack by fostering similar regulations. According to the WRI scenarios, should the federal government pursue a “lackluster” effort, even a go-getter effort by states is unlikely to achieve the 17 % reduction goal. However, middle of the road action by federal government and go-getter by states could even overshoot the US target and yield 19 % reduction from 2005 level by 2020.

The greatest uncertainty, according to most analysts, is the design and stringency of the possible performance standards for existing stationary sources under the Clean Air Act. Second factor are the

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<sup>55</sup> Burtraw, D. & Woerman, M. (2012), US Status on Climate Change Mitigation, Resources for the future.

<sup>56</sup> Bianco, N. et al. (2013)

<sup>57</sup> Standards under §111(b) of the Clean Air Act apply to new sources (these are termed new source performance standards), and those under §111(d) to existing sources.

<sup>58</sup> Bianco et al. (2013)

<sup>59</sup> Ibid.

secular trends in fuel prices and energy efficiency. Indications suggest that EPA will not issue standards that require a major substitution away from coal. Instead, the agency is looking initially at improving the operating efficiency of power plants and refineries while rewarding, but not requiring, the substitution from coal to natural gas. The relative fuel prices have led to a substantial shift toward the use of natural gas and away from coal for electricity generation, and force of this trend is uncertain to the year 2020. It is affected, for example, by the economics of shale gas extraction and the possible exporting of American gas to the Atlantic market. Third factor that brings notable uncertainty are the subnational efforts to reduce emissions, including cap and trade in California and nine north-eastern states (RGGI), renewable portfolio standards for electricity generation in 29 states, and energy efficiency resource standards in 24 states. The most significant attention currently is focused on California, which will launch a cap-and-trade program affecting the electricity and industrial sectors in 2013; the program will expand to include the transportation sector, covering 85 % of Californian greenhouse gas emissions in 2015. Implementation of the law is expected to yield emissions reductions of 88 MtCO<sub>2</sub>-eq per year from business as usual. Emissions covered by the RGGI program have constantly been significantly below the policy's cap. Nonetheless, the price floor in the program auction has returned nearly a billion dollars in revenue that has been directed in large part toward energy efficiency investments in the region.<sup>60</sup> Lastly, naturally, the macroeconomic trend of recovery and industrial production adds to the uncertainty

### Concluding remarks

Observers will soon find out more about Obama's second term priorities. If climate change regulation is to be ambitious, it is of great importance to get started soon and push relentlessly for ambition in the standards. The most important of Obama's first-term environmental initiatives — the fuel economy standards that will double the efficiency of America's cars and light trucks — took more than three years to complete.

The main news of President's climate plan launched in June 2013 was that it commits the US to address carbon pollution in existing power plants. On energy efficiency, the President announced a new goal to reduce carbon dioxide pollution by a total of 3 billion tons through 2030 via new and existing efficiency standards for appliances and federal buildings. The plan calls for doubling renewable energy in the United States by 2020 and opening public lands for renewable energy development and an additional 10 GW of installed renewable capacity on those lands by 2020. The plan also recognizes the importance of curbing emission of methane and acknowledges that there is more the United States can and should be doing to eliminate its domestic emissions of HFCs. President Obama also called for greater engagement internationally.<sup>61</sup>

Several commentators noted that the details of Obama's climate action plan are yet to be seen. Some may have missed a "Presidential Memorandum" that was published separately and outlined a timeline for proposing and finalizing the standards for power plants. As Resources for the Future, Natural Resources Defence Council and WRI have outlined, this is the action under existing U.S. law that will get the biggest emissions reduction. Standards for *new* power plants are proposed "no later

<sup>60</sup> Hibbard et al. (2011), The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States. Analysis Group.

<sup>61</sup> The White House (2013 c), The President's Climate Action Plan.

than Sept 20, 2013”, but there are different “political scenarios” for the best timeframe to finalize the *new* power plant standards. Standards for *existing* power plants are to be proposed “no later than June 1, 2014” and final standards are to be issued “no later than June 1, 2015”.<sup>62</sup>

Republican resistance to Obama is not expected to be toned down on Obama’s second term not in general, nor in environmental matters in particular. Also several democrats from coal-dominant states have frequently voted against climate initiatives. The Republican Party is almost categorically opposed to the EPA controlling carbon emissions. Obama’s nominee to run the EPA (Gina McCarthy) is considered moderate and has served two Republican governors. In May 2013, however, Senate Republicans tried forcefully to derail her nomination, due to her positive take on EPA’s climate governance.<sup>63</sup> The issue was finally solved in July 2013, and the final nomination is expected to take place soon.

The differences between the perceptions of modelers and analysts seems to lie not so much in the effects of policies, but the estimated probability of additional measures in Obama’s second term. Resources for the Future, for one, includes further regulation, most importantly on existing stationary sources, in their optimistic take on reaching the target. WRI and Ecofys reports were more careful in their approach, and outline that US is missing its target unless it delivers on these additional measures.

The recent evidence shows that Obama is in the process of taking further executive action. As noted above, the speeches of President Obama, as well as recent writings of Secretary of State John Kerry,<sup>64</sup> indicate that the issue of climate change is personal and on the top of the international agenda of the White House. Furthermore, the trend of relative fuel prices being advantageous to natural gas over coal seems more secure in mid-2013 than it did in early 2012, the time of writing the studies quoted in this chapter.

It is still possible that the US will not quite reach its Copenhagen pledge (5 900 MtCO<sub>2</sub>-eq in 2020), and this is reflected as our pessimistic scenario as emissions of 6 000 MtCO<sub>2</sub>-eq. Taking into account the current political signals, this is not a likely pathway, as meeting the target seems like a serious political objective and a contribution to Obama’s legacy. However, it is also within the realm of the possible for the US to contribute to closing the gap, in case Obama “puts the pedal to the floor” in 2013 and 2014 *and* the exogenous trends are favorable to climate policy. In the optimistic scenario, following the actions outlined by WRI and the Natural Resources Defence Council,<sup>65</sup> which include inter alia, strict federal level regulation on stationary sources, ambitious action by California, and continuous fuel switch towards natural gas could end up at emission levels of some 5 000 MtCO<sub>2</sub>-eq in 2020, which would contribute 900 MtCO<sub>2</sub>-eq to closing the gap. The optimistic and pessimistic scenarios are presented in table 2.

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<sup>62</sup> The White House (2013 d), Presidential Memorandum, June 25, 2013.

<sup>63</sup> The New York Times (2013), Climate Warnings, Growing Louder. May 18 2013.

<sup>64</sup> Kerry, J. (2013), We Work on Climate Change Every Day, Grist, June 19, 2013.

<sup>65</sup> NRDC (2012), Using the Clean Air Act to Sharply Reduce Carbon Pollution from Existing Power Plants, Creating Clean Energy Jobs, Improving Americans’ Health, and Curbing Climate Change.

**Table 2.** The GHG emission of U.S. in 2010 and BAU emissions (not including LULUCF), optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
6 715 MtCO <sub>2</sub> -eq	7 286 MtCO <sub>2</sub> -eq	5 000 MtCO <sub>2</sub> -eq	6 000 MtCO <sub>2</sub> -eq <sup>66</sup>

## 2.3 India

With its 2010 emission level of 2 692 MtCO<sub>2</sub>-eq India is one of the key emerging economies, with a share of approximately 5 % of global GHG emissions. India has made a voluntary pledge to reduce the emission intensity of its GDP by 20–25 % by 2020 in comparison to the 2005 level through domestic mitigation actions. The official quantification provided by India of 2020 emissions, based on this pledge, foresees an emission level between 3 600 and 4 000 MtCO<sub>2</sub>-eq in 2020, depending on projected GDP.<sup>67</sup>

However, with regards to assessing the 2020 emissions for India, several uncertainties remain. Partly these uncertainties reflect the data constraints in having a solid national GHG inventory, partly they reflect major uncertainties in the overall Indian development path, in addition to GDP growth assumptions. According to recent studies, India's BAU emissions differ dramatically from source to source, with the range from some 3 000 to 4 350 MtCO<sub>2</sub>-eq in 2020. In summary, the average emissions under the pledge resulting from the different sources are at about the same level as the average BAU scenario (3 490 MtCO<sub>2</sub>-eq per year).<sup>68</sup>

Within this overall landscape it is quite challenging to assess the likelihood of reaching the low or high-end of the range, or possibly even lower or higher emission levels in 2020. However, several federal and state level activities are on-going giving some indication of potential direction. The country's Five Year Plans and the National Action Plan for Climate Change (NAPCC)<sup>69</sup> set an overall framework for climate action. Currently states are in the process of producing State Action Plans on Climate Change and work on low carbon strategies for inclusive growth is on-going. Several energy supply initiatives and energy efficiency measures (in particular addressing industry) are being implemented, as well as measures addressing buildings and transport sectors.

It is highly unlikely that India would take on any binding absolute emission reduction targets in the coming years. Most studies indicate that the existing voluntary pledge actually corresponds to the average of BAU level. This would mean that no major additional emission reductions could be expected from India, to help narrowing the global gap, without any further decisive measures. However, several studies have identified considerable emission reduction potentials in particular in the areas of renewable energy and energy efficiency. A recent study estimates the overall GHG

<sup>66</sup> Den Elzen et al. (2012)

<sup>67</sup> Based on annual GDP growth projections of 8% and 9%. Planning Commission, Government of India (2011), Interim Report of the Expert Group on Low Carbon Strategies for Inclusive Growth, New Delhi.

<sup>68</sup> Fekete, H. et al. (2013)

<sup>69</sup> Government of India, Prime Minister's Council on Climate Change (2008), National Action Plan on Climate Change (NAPCC).

mitigation potential of India between 600 and 1 470 MtCO<sub>2</sub>-eq in 2020, with so called no-regrets measures and measures with positive costs but relevant co-benefits jointly amounting to some 380 - 700 MtCO<sub>2</sub>-eq annually.<sup>70</sup> It is likely that the supportive role of the international community in harnessing these potentials will be decisive, in particular when looking into pre-2020 development. Also the forthcoming elections in India may considerably influence the likelihood of a more optimistic or pessimistic scenario (table 3).

**Table 3.** India's emissions in 2010 and BAU emissions (including LULUCF), optimistic and pessimistic scenarios for 2020. The pessimistic scenario reflects the 2020 emission level based on average of pledges (as well as average baselines) with the optimistic scenario assuming that part of the identified mitigation options are being harnessed.

Emissions 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
2 692 MtCO <sub>2</sub> -eq	3 857 MtCO <sub>2</sub> -eq	2 500 – 3 000 MtCO <sub>2</sub> -eq	3 500 MtCO <sub>2</sub> -eq

## 2.4 Russian Federation

Emissions from the Russian Federation in 2010 were 2 510 MtCO<sub>2</sub>-eq per year which equals 5.0 % of the global emissions and makes Russia the fourth largest GHG emitter globally. The main source of emissions is energy which in 2011 constituted 83 % of total emissions. Other important sources were industrial processes (7.5 %), agriculture (6.2 %) and waste (3.5 %).<sup>71</sup> According to a recent report by the Russian Ministry of Economic Development, the GHG emissions are expected to peak between 2020 and 2030 at levels lower than in 1990.<sup>72</sup>

In Copenhagen Accord, president, Medvedev expressed 15–25 % emission reduction target by 2020 from 1990 levels<sup>73</sup>. No target has been stipulated in the law, however. In addition, the unconditional target is above the BAU scenario as the emissions decreased dramatically after the post-Soviet collapse of the economy. Russia has also set a target to reduce the energy intensity of GDP by 40 % by 2020 compared to 2007 level but reaching this target seems very unlikely<sup>74</sup>.

Perhaps the most visible action in Russian climate policy was the refusal to join the second commitment period of Kyoto Protocol. It was announced first at COP 16 in Cancún in 2010 and confirmed a year later at COP 17 in Durban. The main argument for the withdrawal was that the protocol could not resolve the problem of global warming or secure the 2 degree target as long as the most important emitters including U.S. and China are not participating. The decision is easy to understand as there would have been little benefits for Russia from joining.

<sup>70</sup> Fekete, H. et al. (2013). The study looks into mitigation opportunities in energy supply, industry, transport, buildings, AFOLU and waste sector.

<sup>71</sup> United Nations Climate Change Secretariat (2012), Summary of GHG Emissions for Russian Federation.

<sup>72</sup> Dobrovidova, Olga (2013), Russia emissions expected to peak by 2030, Responding to Climate Change,

<sup>73</sup> The 15 % unconditional emission reduction equals 2 846 MtCO<sub>2</sub>-eq in 2020. The 25 % conditional target would lead to emission levels of 2 513 MtCO<sub>2</sub>-eq in 2020 (the figures exclude LULUCF). It is applicable if i) Russian's forestry is appropriately considered towards the pledge and if ii) all major emitters are committing to legally binding obligations.

<sup>74</sup> Ibid.

Despite the withdrawal from Kyoto Protocol, Russia has from time to time taken an active role in international climate discussions. Towards the Copenhagen climate summit, Russia launched the climate doctrine which was followed by a plan for implementation a year later. In 2012, an application for Russia to join the Clean Air and Climate Coalition (CCAC) was submitted. These policies and measures have, however, involved very little real actions.

There are several of reasons for Russian's lack of interest towards climate policy and cooperation. The anthropogenic climate change has encountered severe scepticism in some sections of the political and scientific elite of Russia. In addition, climate change is often assumed to have a positive impact on Russia. Most notable the famous climate sceptic, director of the Russian Academy of Sciences' Global Climate and Ecology Institute, and one of Putin's most influential scientific adviser, Juri Izrael has claimed that there is no scientific evidence on anthropogenic climate change or a negative impact on Russia. These viewpoints are deeply rooted in the public opinion. According to public polls, Russian people don't in general see climate change problem urgent or consider mitigation as Russia's responsibility. This way, there is no internal pressure supporting climate actions.<sup>75</sup>

The current leadership in Russia has been involved in the climate politics mainly from the perspective of protecting its economic interests such as oil and gas exports and using the climate negotiations as a vehicle to increase and show political power. Yet there is a small emerging climate coalition in Russia. Although the coalition has still very marginal political power it has succeeded in improving the status of climate change in the political agenda. There is also a process aiming to deliver binding emission targets into Russian law but it is too early to say whether this law will come to pass. In international climate negotiations Russia will probably hold the current stand-by mode until the U.S. and China make clear commitments. It seems unlikely that Russia will engage in any significant new climate actions during the next years.

The emissions in 2010 and the BAU, optimistic and pessimistic estimations of emission levels in 2020 are presented in table 4. In the UNEP Gap Report<sup>76</sup> the 2020 BAU emissions are nearly 2 600 MtCO<sub>2</sub>-eq whereas Höhne et al. (2012)<sup>77</sup> suggest that the BAU emissions levels between 2 400–2 800 MtCO<sub>2</sub>-eq. As no further mitigation actions can be assumed and the unconditional Copenhagen pledge is above the BAU, the optimistic and pessimistic scenarios are derived from the low and high end of these BAU projections.

**Table 4.** Russian's emissions in 2010 and BAU emissions (not including LULUCF), optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
2 510 MtCO <sub>2</sub> -eq	2 584 MtCO <sub>2</sub> -eq	2 400 MtCO <sub>2</sub> -eq	2 800 MtCO <sub>2</sub> -eq

<sup>75</sup> Turkowski, Andrzej (2012), Russia's International Climate Policy, No. 27, April 2012, PISM.

<sup>76</sup> UNEP (2012 c)

<sup>77</sup> Höhne et al. (2012 b)



## 2.5 Brazil

Brazil is among the top ten greenhouse gas emitting countries, with a share of approximately 4% of global GHG emissions. Brazil's Second National Communication to the UNFCCC provides greenhouse gas emission inventories for the period of 1990 to 2005, indicating the particular characteristic of the Brazilian emission structure. The 2005 emissions were estimated to 2 193 MtCO<sub>2</sub>-eq, with changes in land use contributing to some 60 % of Brazilian emissions and agriculture and husbandry some 20 %.<sup>78</sup> The energy sector ranks only third as a main source of greenhouse gas emissions.<sup>79</sup>

While the overall monitoring capacity of deforestation is rapidly improving (including satellite imagery), considerable uncertainties remain with regards to corresponding CO<sub>2</sub> emissions, in particular due to lack of reliable data on the biomass densities of the different kinds of forests and savannahs ( "cerrados" ) affected. This is also reflected in the BAU projections and subsequent estimates for 2020 GHG emission levels.

In run-up to COP 15 in Copenhagen 2009 Brazil, as one of the first large developing countries, proposed under the UNFCCC a voluntary target to reduce between 36.1 and 38.9 % of the country's projected 2020 GHG emissions.

However, the projections for Brazil's BAU emissions in 2020 vary widely from approximately 1.4 to 3.2 MtCO<sub>2</sub>-eq, depending on the assumptions<sup>80</sup> made in different studies, with the national BAU, published in December 2010 at the high end of this range. Consequently also the total emission reductions by Brazil that could contribute to narrow down the global emissions gap by 2020 (as estimated in the UNEP gap report, 2012) remain uncertain. Taking the official national BAU projection as such, Brazil's pledge would result in absolute terms into a reduction of approximately 1 210 to 1 260 MtCO<sub>2</sub>-eq and a resulting annual emission level of 1 997 to 2 023 MtCO<sub>2</sub>-eq in 2020<sup>81</sup>, which is rather close to the 2005 emission level.

Taking note of the existing legal framework, i.e. The National Climate Change Policy Law,<sup>82</sup> several sectoral and state level initiatives, a number of policies and incentives for energy efficiency and renewables, and in particular the successes in recent years to reduce land-use based emissions<sup>83</sup>, it is likely that Brazil will meet its voluntary pledge for 2020. However, due to uncertainties still related to the assessment of emissions from forestry, agriculture and land use, it is difficult to assess the likelihood and potential size of any additional emission reductions from Brazil by 2020. One

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<sup>78</sup> Brasil (2010), Brazil's Second National Communication to the United Nations Framework Convention on Climate Change. Ministry of Science and Technology. Brasília, November 2010.

<sup>79</sup> Some 45% of Brazil's total energy supply is generated by renewable energy sources, with major contributions by hydropower and renewable biomass (ethanol from sugar cane, wood and charcoal from forest plantations, and biodiesel from vegetable oils cultivation).

<sup>80</sup> E.g. related to assumption of GDP growth, growth rate of fossil fuel consumption based on major Brazilian discoveries in recent years, population growth, methodological choices of whether certain policy driven factors (such as increases in renewable energy production and energy efficiency) are /are not included in the baseline etc.)

<sup>81</sup> Fekete, H. et al. (2013)

<sup>82</sup> The law of 2009 formalizes Brazil's commitment of reducing between 36.1 and 38.9 per cent of its projected GHG emissions by 2020 and establishes the key principles, objectives, and instruments of the National Policy on Climate Change (Política Nacional sobre Mudança do Clima).

<sup>83</sup> Major cuts in deforestation rates have been achieved in past years, driven mainly by PPCD-Am: The Plan for Prevention and Control of Deforestation in the Amazon, which was launched in 2004, and PPCerrado: The Plan for Prevention and Control of Deforestation and Forest Fires.



indication of the major uncertainties related to Brazilian emission reductions, is exemplified by the fact that some of the existing BAU projections<sup>84</sup> for Brazilian 2020 emission levels, are considerable lower than the voluntary commitment level for 2020. At the same time this indicates that further, major emission reduction potentials could be achieved, mainly through further efforts in the land-use sector. A recent study estimates a GHG mitigation potential for Brazil, with so called no-regrets measures and measures with positive costs but relevant co-benefits jointly amounting to some 430 – 1 300 MtCO<sub>2</sub>-eq annually.<sup>85</sup>

**Table 5.** Brazil's emissions in 2005 and BAU emissions (including LULUCF), optimistic and pessimistic scenarios for 2020. The pessimistic scenario reflects potential 2020 emission levels based on the national BAU and Brazil's voluntary emission reduction commitment.

Emissions 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
1 621 MtCO <sub>2</sub> -eq	3 126 MtCO <sub>2</sub> -eq	1 500 MtCO <sub>2</sub> -eq	2 000 MtCO <sub>2</sub> -eq

## 2.6 Indonesia

Indonesia is responsible for 3.9 % of total global GHG emissions or about 1 946 MtCO<sub>2</sub>-eq in 2010. The most recent National Greenhouse Gases Inventory (NGHGI) was carried in Indonesia out using Tier 1 and Tier 2 of the 2006 IPCC Reporting Guidelines. The total emissions for the year 2000 were estimated at 1 455 MtCO<sub>2</sub>-eq<sup>86</sup>. This means that the annual increase of GHG emissions has been about 4 % per year during the last decade.

Indonesia's president Susilo Bambang Yudhoyono made an unconditional pledge in the G-20 summit in 2009 to reduce Indonesia's greenhouse gas emissions by 26 % from BAU with domestic financial resources by 2020 or by 41 %<sup>87</sup> with international assistance. The presidential pledge does not define any reference value or baseline year for the BAU scenario, which makes any calculation of the emission reduction potential difficult. Here, we assume that (a) the reference year is 2010, (b) the optimistic scenario is the 26% pledge, (c) the pessimistic scenario is the BAU, and (d) there is a high uncertainty in emissions from the LULUCF sector. Indonesia has also set a target of 15 % renewable energy sources in 2020<sup>88</sup>. The above calculation has several sources of uncertainty.

The emissions from the LULUCF sector, including peatland fires, account for about 80 % of the current and more than 50 % of projected future emissions. In addition, it is difficult to build

<sup>84</sup> Fekete, H. et al. (2013)

<sup>85</sup> Fekete, H. et al. (2013). The study looks into mitigation opportunities in energy supply, industry, transport, buildings, AFOLU and waste sector.

<sup>86</sup> Indonesia Ministry of Environment (2009), Indonesia second national communication under the United Nations Framework Convention on Climate Change (UNFCCC). Summary for policy makers, Jakarta. 43 p.

<sup>87</sup> Indonesia's high case commitment of 41% is not included in the Copenhagen Accord. It was announced prior to COP15 by the President of Indonesia.

<sup>88</sup> Höhne, N., Braun, N., Fekete, H., Brandsma, R., Larkin, J., Elzen, M.d., Roelfsema, M., Hof, A., Böttcher, H., 2012. Greenhouse gas emission reduction proposals and national climate policies of major economies. Policy brief. Ecofys, Utrecht, the Netherlands & Cologne, Germany. 31 p.

consistent data sets for historical, current and BAU emissions. The UNEP Emission Gap report estimates that there is a large discrepancy between emission levels assumed for Indonesia both historically and projected for the BAU (range of almost 2 000 MtCO<sub>2</sub>-eq in 2020).<sup>89</sup>

This situation has two major implications for any emission reduction scenario: i) there is very large and persistent uncertainty in the estimations of these GHG emissions and discrepancy between emission estimates made by different organizations, and ii) the current national policies (including REDD+, bioenergy, and other LULUCF- related policies) are not strong enough to counteract the expected BAU future land-use change due to expansion of agriculture (including bioenergy), mining, and forestry activities<sup>90,91</sup>. This leads to a conservative estimate that the expected GHG emissions of Indonesia in 2020 are close to those of the BAU emission scenarios.

**Table 6.** Indonesia's emissions in 2010 and BAU emissions (including LULUCF), optimistic and pessimistic scenarios for 2020

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
1 946 MtCO <sub>2</sub> -eq	2 533 MtCO <sub>2</sub> -eq	1 300-2 100 MtCO <sub>2</sub> -eq	2 200-2 700 MtCO <sub>2</sub> -eq

## 2.7 Japan

Japan's emissions in 2010 were 1 379 MtCO<sub>2</sub>-eq which represents 2.8 % of global emissions and puts the country among the largest emitters in the world. In 2007 the main sources of emissions included fuel combustion for energy (34.4 %), industry (30.3 %) and transportation (18.5 %).<sup>92</sup> Japan has set an emission reduction target of 25 % below 1990 levels by 2020 which corresponds around 950 MtCO<sub>2</sub>-eq emission levels. The BAU emissions in 2020 according to the UNEP Gap Report would be around 1 330 MtCO<sub>2</sub>-eq<sup>93</sup> which is in line with 1 200 – 1 300 MtCO<sub>2</sub>-eq estimate in Höhne et al. (2012)<sup>94</sup>. The 2020 target is conditional and requires a fair and effective international framework with ambitious climate targets including all major economies in order to be enforced. In addition, Japan has set an 80 % emission reduction target for 2050.

Japan announced a carbon tax scheme in late 2012 on oil, natural gas and coal which will be fully implemented by 2016. After that the annual revenue from the carbon tax is estimated to be around \$ 1 billion and will be used to finance green initiatives.<sup>95</sup> At the same time, after the meltdowns at the Fukushima Daiichi plant caused by a tsunami in 2011 Japan made a commitment to phase out

<sup>89</sup> UNEP (2012 a)

<sup>90</sup> Angelsen, A., Brockhaus, M., Sunderlin, W.D., Verchot, L.V. (Eds.) (2012), Analysing REDD+: Challenges and choices. CIFOR, Bogor, Indonesia.

<sup>91</sup> Murdiyarso, D., Dewi, S., Lawrence, D., Seymour, F., (2011), Indonesia's forest moratorium: a stepping stone to better forest governance? CIFOR, Bogor. 13 p.

<sup>92</sup> Government of Japan (2010), Japan's Fifth National Communication Under the United Nations Framework Convention on Climate Change

<sup>93</sup> UNEP (2012 c)

<sup>94</sup> Höhne et al. (2012 b)

<sup>95</sup> Maeda, Risa (2012), Japan's new carbon tax to cost utilities \$1billion annually, Reuters.

nuclear power during the 2030s. This marks a dramatic shift from earlier plans to increase Japan's dependence on nuclear power from the current 30% to 50% by 2030 and may lead to significant increase in emissions. The new government has, however, announced that it will review the commitment due to economical aspects.<sup>96</sup>

The government of Japan has also recently suggested a revision to climate change legislation which may abandon 2020 and 2050 emission reduction targets. The revision was explained to be necessary to consider the impact of Fukushima disaster to energy sector in the climate targets. At the same time, Japan announced that it will compile a Climate change action plan before the next U.N. climate talks in Warsaw.<sup>97</sup>

It is yet very difficult to estimate the emissions in 2020 in Japan as it depends largely on the future energy plan still under discussion. Also the recent announcement of reviewing emission targets reflects the uncertainty that currently shades the climate actions in Japan. Table 7 shows the current emission level and BAU, optimistic and pessimistic scenarios for emission growth towards 2020. The BAU scenario is set as the pessimistic scenario. The 25 % emission reduction target yet remains as the optimistic scenario although it may be abandoned soon as a result of the revision of the climate legislation.

**Table 7.** Japan's emissions in 2010 and BAU emissions (not including LULUCF), optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
1 379 MtCO <sub>2</sub> -eq	1 330 MtCO <sub>2</sub> -eq	950 MtCO <sub>2</sub> -eq	1 330 MtCO <sub>2</sub> -eq

## 2.8 Canada

Canada's emissions in 2010 were 728 MtCO<sub>2</sub>-eq which is around 1.5 % of global emissions. The main sources of emissions are fossil fuel combustion including fugitive gases (82.2 %), agriculture (8.0 %) and industrial processes (6.9 %).<sup>98</sup> Canada has set an emission reduction target of 17 % by 2020 compared to 2005 levels in align with U.S. This implies an emission target of 607 MtCO<sub>2</sub>-eq.<sup>99</sup> The BAU emissions in Canada in 2020 are estimated to be in Höhne et al. (2012)<sup>100</sup> between 730 and 780 MtCO<sub>2</sub>-eq without LULUCF which is close to the estimate used in the UNEP Gap Report<sup>101</sup>.

The government of Canada has set, in addition to 17 % emission reduction target, some environmental goals, targets, and implementation strategies. These include a national goal of producing 90 % of country's electricity need from non-emitting sources by 2020, 5 % renewable fuel target for 2020 and sustained action to build a low-carbon economy. Other important climate

<sup>96</sup> BBC (2012), Japan says it will review plans to abandon nuclear power.

<sup>97</sup> The Japan Times (2013), Warming bill to ax long-term emissions goal.

<sup>98</sup> Government of Canada (2010), Fifth National Communication on Climate Change.

<sup>99</sup> Environment Canada (2012), Canada's Emissions Trends 2012.

<sup>100</sup> Höhne et al. (2012 b)

<sup>101</sup> UNEP (2012 c)

policies include carbon standards for coal plants and efficiency standards for light vehicles. All targets and actions have been compiled in the country's first Federal Sustainable Development Strategy which established a framework for sustainable development planning and reporting for 2010-2013.<sup>102</sup> Despite the strategy, a recent progress report 2012<sup>103</sup> suggests that with the current actions Canada is on the way to reaching about half the emission reductions necessary for the 17 % target.

The new draft of Federal Sustainable Development Strategy for 2013-2016 is currently in public consultation.<sup>104</sup> It emphasizes a sector-by-sector regulatory approach to regulate GHG emissions. However, it does not provide concrete roadmap to reaching the emission target and clearly lacks ambition to new significant emission reduction actions. With the sectoral approach, it seems unlikely that Canada would meet its emission target as the current regulations in place only cover a proportion of the emission sources and it takes years to implement new sector-level regulations.<sup>105</sup> According to Climate Change Performance Index<sup>106</sup>, Canada climate change policy ranks the worst in western countries.

With the current government actions the emissions are estimated to be 710 MtCO<sub>2</sub>-eq by 2020.<sup>107</sup> This is assumed to be the pessimistic scenarios. Reaching the pledged 17 % target that is 607 MtCO<sub>2</sub>-eq by 2020 is assumed to be the optimistic scenario although it seems currently very unlikely. Reaching the target would require quickly new significant additional emission reduction plans but there are no signs of such plans being under preparation. The 2010 emissions and different emission scenarios are presented in table 8.

**Table 8.** Canada's emissions in 2010 and BAU emissions including LULUCF (\*) and excluding LULUCF along with optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
728 MtCO <sub>2</sub> -eq	773/832* MtCO <sub>2</sub> -eq	607 MtCO <sub>2</sub> -eq	710 MtCO <sub>2</sub> -eq

## 2.9 Mexico

With a share of roughly 1.3 % of global GHG emission Mexico can be considered as a major emerging GHG emitting economy. With a steady, approximately 30 % growth of emissions since 1990, the 2010 emissions reached a level of around 700 MtCO<sub>2</sub>-eq (the UNEP Gap report 2012 refers to 2010 mission levels of some 660 MtCO<sub>2</sub>-eq while the recently published National Climate Change Strategy

<sup>102</sup> Environment Canada (2010), Planning for a sustainable future: a federal sustainable development strategy for Canada.

<sup>103</sup> Environment Canada (2013 a), The 2012 Progress Report of the Federal Sustainable Development Strategy.

<sup>104</sup> Environment Canada (2013 b), Planning for a sustainable future: a federal sustainable development strategy for Canada 2013-2016

<sup>105</sup> Office of Auditor General Canada (2012), 2012 Spring Report of the Commissioner of the Environment and Sustainable Development

<sup>106</sup> Burck, Jan; Hermwille, Lukas; & Krings, Laura (2013), Climate Change Performance Index 2013. Germanwatch & Climate Action Network Europe

<sup>107</sup> Environment Canada (2012)

(ENCC)<sup>108</sup> estimates the 2010 emissions at 748 MtCO<sub>2</sub>-eq). The major sources of emissions are industry (48 %), transport (25 %) and energy supply (14 %)<sup>109</sup>. The wide range is partly explained for by uncertainties related to emissions in the land use change and forestry sector, and consequently this diversity is also reflected in the range provided for various 2020 projections. According to a recent study, BAU projections for 2020 range from 741 to 920 MtCO<sub>2</sub>-eq per year<sup>110</sup>, with Mexico's Special Program on Climate Change (PECC, 2009) providing a BAU estimate of 882 MtCO<sub>2</sub>-eq in 2020. The National Climate Change Strategy (ENCC, June 2013) provides a new BAU estimate for 2020 emissions at the level of 960 MtCO<sub>2</sub>-eq.<sup>111</sup>

Mexico's Special Program on Climate Change (PECC), published in August 2009, set Mexico a long-term climate change agenda including aspirational medium-term goals for adaptation and mitigation.<sup>112</sup> These goals were 20 % and 40 % emission reduction goals for 2020 and 2030 with respect to baseline. The 2020 conditional target was upgraded to 30 % and new target to reduce emissions by 50 % below 2000 levels by 2050 was set in the General Law on Climate Change, adopted in April 2012. As for several other developing countries the conditionality is related to adequacy of international financial and technological support from developed countries.

Several studies have identified considerable emission reduction potentials for Mexico, with “no-regret measures” and measures with important co-benefits in multiple sectors roughly corresponding jointly<sup>113</sup> to the size of the conditional pledge. Taking note of Mexico's leadership in international climate negotiations and progress in its national enabling environment<sup>114</sup>, tapping concretely into the available mitigation potential could be considered more likely than in several other developing countries. Also, mitigation potential beyond the pledge has been identified, and it is likely that e.g. with international support additional mitigation measures helping to narrow the global emissions gap could be harnessed. The newly launched National Climate Change Strategy (ENCC), in compliance with the 2012 General Law on Climate Change, which comprises both adaptation and mitigation, aims to explicitly merge Mexican climate policy into national development planning and low-emission development aspirations<sup>115</sup>, and could further facilitate the harnessing of additional emissions reductions in Mexico.

Taking note of the wide diversity presented in historical and projected emissions, our pessimistic estimate for 2020 missions is in the range of 800-900 MtCO<sub>2</sub>-eq, assuming that the conditional pledge will not be fully implemented due to lack of international support, despite many of identified mitigation measures being described as no regrets. Our optimistic estimate 600 MtCO<sub>2</sub>-eq is based

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<sup>108</sup> Government of Mexico (2013), The National Climate Change Strategy (Estrategia Nacional de Cambio Climático, visión 10-20-40, ENCC for its acronym in Spanish), June 2013.

<sup>109</sup> Höhne, Niklas et al. (2012 a). Assessment of Mexico's policies impacting its greenhouse gas emissions profile – Climate Action Tracker. Ecofys and Climate Analytics.

<sup>110</sup> Fekete, H. et al. (2013)

<sup>111</sup> ENCC, Figure 14. The PECC baseline was developed top-down in 2009 using an in-house model, and has been updated towards a bottom-up approach to give more specificity to particular sectors to be more comprehensive.

<sup>112</sup> Mexico's Special Program on Climate Change, 2009 (Programa Especial de Cambio Climático, PECC, for its Spanish acronym)

<sup>113</sup> Fekete, H. et al. (2013). According to this study, for Mexico the estimated *no-regrets* and *co-benefits* mitigation potential is in the range of 180 – 360 MtCO<sub>2</sub>e/a.

<sup>114</sup> Referring in particular to institutional capacity for mitigation, quality of research and data availability in different sectors.

<sup>115</sup> With several synergies with the green growth agenda in Mexico.

on an assumption that Mexico continues its constructive approach and decisively starts implementing identified priority mitigation measures.

**Table 9.** Mexico's emissions in 2010 and BAU emissions (including LULUCF), optimistic and pessimistic scenarios for 2020.

Emissions 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
661 MtCO <sub>2</sub> -eq	882 MtCO <sub>2</sub> -eq	600 MtCO <sub>2</sub> -eq	800-900 MtCO <sub>2</sub> -eq

## 2.10 South Korea

In 2010, South Korea accounted for 647 MtCO<sub>2</sub>-eq of GHG emissions, which equals 1.3 % of the global emissions. The emissions have increased approximately by 26 % since 2000. According to Korea's Third National Communication under the UNFCCC<sup>116</sup>, 84.9 % of the emissions in 2009 originated from the energy sector, 9.3 % from industrial processes, 3.3 % from the agriculture sector, and 2.5 % from the waste sector. The increased use of fossil fuels to meet the demand of growing energy intensive sectors has been the main contributor to GHG emission growth.

In 2008, *Low Carbon Green Growth* was announced as a new national vision for the next 60 years: Today, Korea is one of the leading countries in terms of GHG emission reduction actions and targets. In Copenhagen 2009, the country approved voluntary to reduce 30 % of GHG emissions compared to the BAU projection by 2020 – a decreasing trend is expected after 2015 according to the National Communication. The sector specific targeted reductions in 2020 are estimated as follows: 51 % in industrial processes sector, 27 % in energy sector, 7 % in agriculture sector, and 12 % in waste sector. In turn, some conflicting objectives already exist as in the sixth master plan for electricity supply and demand the targeted emissions in 2020 are 10 % higher compared to the original target.<sup>117</sup>

According to Kang et al.<sup>118</sup> Korea's green growth strategy is based on two cornerstones: the early adoption of global mitigation options, and the creation of competitive advantage for domestic industries in the global low-carbon technology market. South Korea introduced the Framework Act on Low Carbon Green Growth in 2009. The act provides a legislative basis for implementing relevant measures, building the implementation system, and planning institutional systems to promote low-carbon green growth.<sup>119</sup> The practical measures for achieving the reduction targets include, for example, such activities as increasing the share of renewable energy from 2007's 2.4 % to 6.1 % in 2020, building new nuclear power plants and investing on CCS technologies, smart grid, energy efficiency and green car technology. The measures for expanding renewable energy include feed-in tariff (FIT) and renewable portfolio system (RPS). The FIT was implemented in 2002 to expand

<sup>116</sup> The Republic of Korea (2012), Korea's Third National Communication under the United Nations Framework Convention on Climate Change.

<sup>117</sup> Young-won, K. (2013), S. Korea likely to fall short of emissions reduction target. The Korea Herald.

<sup>118</sup> Kang, S. I., Oh J., Kim, H. (2012), Korea's Low-Carbon Green Growth Strategy. OECD Development Centre, Working Paper No. 310.

<sup>119</sup> Ministry of Government Legislation, South Korea (2009), Framework Act on Low Carbon, Green Growth.

market for RE, but currently the focus has been changed to RPS, which sets obligatory target shares of RE for each power generation company.

Additionally to technological means, relevant regulatory policy measures include a target management system (TMS), an emission trading system (ETS), and carbon tax. The TMS, a regulative system, encourages large emitters towards low carbon activities and it applies currently to units responsible for around 60% of the country's total GHG emissions. The system includes sector specific annual reduction targets, penalties, and incentives set by the government, and broadly the same controlled entities will also participate in ETS. The launch of ETS, that is said to be the world's most ambitious one,<sup>120</sup> is expected in 2015. The ETS is estimated to create demand for emission reductions units worth 238 MtCO<sub>2</sub>-eq or 29 %, and to cover around 70 % of South Korea's GHG emissions by 2020.<sup>121</sup> However, additional domestic offset projects are needed as the project pipeline is currently insufficient and, according to the current ETS regulation, no international credits are allowed before 2021. Moreover, due to the high demand, there is an evident risk that the carbon price could rise too high, which would complicate achieving the emission reduction target. Carbon tax, in turn, is planned to be integrated in the Korean energy price system. According to the government, the carbon tax on energy would rather complement than duplicate the ETS, as it would make low carbon choices present in energy prices at the demand side.

Altogether, the government of South Korea is actively pursuing towards sustainable growth. As the improvement and implementation of the mitigation policies and measures has actively began, considerable emission reductions can be expected by 2020. Current emissions and scenarios towards 2020 presented in the Third National Communication are shown in table 10 – active approach stands for the optimistic scenario including the 30 % reduction compared to pessimistic scenario which is assumed to end 10 % below the BAU. Whether the target will be fully achieved, depends ultimately on the implementation and final design of the ETS and the implementation of other policies.

**Table 10.** South Korea's emissions in 2010 and BAU emissions (including LULUCF), optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
647 MtCO <sub>2</sub> -eq	745 MtCO <sub>2</sub> -eq	522 MtCO <sub>2</sub> -eq	671 MtCO <sub>2</sub> -eq

## 2.11 Australia

Australia's emissions in 2010 were 628 MtCO<sub>2</sub>-eq which means that the country was responsible for 1.3 % of total global GHG emissions. In 2011 the most important emission sources were electricity and direct fuel combustion (51 %), transport (16 %), agriculture (14 %) and industrial processes and fugitive emissions (13 %). During the first Kyoto protocol commitment period (2008-2012) Australia

<sup>120</sup> EcoSeed (2013), South Korea to launch world's most ambitious emission trading scheme – report.

<sup>121</sup> Bloomberg Finance (2013), South Korea's Emission Trading Scheme.



emissions are estimated to be 105 % of 1990 level which means that Australia is on the track to meet its Kyoto Protocol commitment of limiting emissions to 108 % of 1990 levels.<sup>122</sup> For the second commitment period, Australia has committed to reduce its GHG emissions as follows:

- unconditionally by 5 % below 2000 levels by 2020
- conditionally by up to 15 % below 2000 levels by 2020 if there is a global agreement which falls short of securing atmospheric stabilization at 450 ppm CO<sub>2</sub> equivalent and under which developing economies commit to substantially restrain emissions and advanced economies take commitments comparable to Australia
- conditionally by 25 % below 2000 levels by 2020 if the world agrees to an ambitious global deal capable of stabilizing GHG levels at 450 ppm CO<sub>2</sub>-eq or lower<sup>123</sup>

Furthermore, Australia's government has set a target to reduce GHG emissions by 80 % compared with 2000 levels by 2050. These targets are based on country's net national emissions and cover the emissions from the sectors/source categories included in Annex A of the Kyoto Protocol as well as from afforestation, reforestation and deforestation (AR&D).

The primary vehicle to reach Australia's unconditional emission targets by 2020 and 2050 is the Clean Energy Bill 2011<sup>124</sup> which was brought into effect on 1<sup>st</sup> July 2012. The Clean Energy Bill establishes a carbon pricing scheme in which carbon prices will be fixed but increasing and carbon units untradeable until 2015. Thereafter, the carbon prices will be flexible but the allowances will be limited by a tightening cap. According to a very recent statement by the prime minister, the expensive carbon tax scheme may be replaced with the cap and trade system already in 2014.<sup>125</sup> The Clean Energy Bill concerns the Australia's biggest carbon emitters, covering around 60 % of Australia's total emissions. A shortfall charge creates an incentive to obey the rules. The GHG calculations in the scheme follow the Australia's national GHG reporting guidelines<sup>126</sup>.

According to Australia's government projections<sup>127</sup>, the carbon pricing scheme will cut the emissions by 155 MtCO<sub>2</sub>-eq by 2020. 55 MtCO<sub>2</sub>-eq will be achieved domestically and the rest 100 MtCO<sub>2</sub>-eq through abatement overseas. The projections suggest that Australia should meet its unconditional target. During the first six months of the scheme carbon emissions from the electricity sector reduced by 9 % due to reductions in consumption (3 %) and change to renewable energy (6 %).<sup>128</sup>

According to the recent WWF study<sup>129</sup>, the estimated cost of achieving the 25 % target could be only one fourth of the earlier estimations in 2009. The difference is largely due to the lower emission unit market prices. Higher emission reduction target may also reduce the risk of locking in a high carbon

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<sup>122</sup> Department of Climate Change and Energy Efficiency (2012 a), Australia's Emissions Projections.

<sup>123</sup> UNFCCC, Appendix I - Quantified economy-wide emissions targets for 2020

<sup>124</sup> Department of Climate Change and Energy Efficiency (2011), Clean Energy Bill 2011 - A Bill for an Act to encourage the use of clean energy, and for other purposes.

<sup>125</sup> CBC (2013), Australia to scrap carbon tax in favour of emissions trading.

<sup>126</sup> Australia introduced in 2007 the National Greenhouse and Energy Reporting which is a single framework for corporations to report their GHG emissions.

<sup>127</sup> Department of Climate Change and Energy Efficiency (2012 a)

<sup>128</sup> Uren, David (2013), Emissions drop signals fall in carbon tax take. National Affairs.

<sup>129</sup> Vivid Economics (2013), The costs and benefits of greater Australian emissions reduction ambition. Report prepared for WWF Australia



development path which might lead to higher costs in the medium to long run. Therefore, Australia is suggested to pursue 25 % target unconditionally. There is also a growing international and domestic pressure supporting more ambitious targets.

Due to the Green Energy Bill and the cap and trade carbon tax scheme in place, it seems likely that Australia will meet its unconditional emission reduction target of 5 % below 2000 levels by 2020. The Green Energy Bill, originally very unpopular, has recently also gained increasing approval and support among Australian people.<sup>130</sup> Therefore, it seems unlikely that the next government would overturn the scheme although for example liberal party has vowed to do so if elected<sup>131</sup>. However, due to the strong opposition already to the Green Energy Bill, it seems very unlikely that the emission target would be increased to e.g. 25 % within the next years. As presented in the table 11, 5 % and some 15 % reduction in emissions compared to 2000 levels are taken as the pessimistic and optimistic scenario.

**Table 11.** Australia's emissions in 2010 and BAU emissions including LULUCF (\*) and excluding LULUCF along with optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
629 MtCO <sub>2</sub> -eq	650/632* MtCO <sub>2</sub> -eq	480 MtCO <sub>2</sub> -eq	532/538* MtCO <sub>2</sub> -eq

## 2.12 South Africa

South Africa's emissions in 2010 were 422 MtCO<sub>2</sub>-eq, which equals 0.82% of the global emissions. Since 2000, the total increase of emissions has been 7 %. According to the Second National Communication to UNFCCC<sup>132</sup>, 83 % of the GHG emissions in 2000 originated from the energy sector, 7 % from industrial processes, 8 % from agriculture, and 2 % from the waste sector. South Africa's economy is characterized by heavy reliance on coal energy, mining and mineral processing, which have led to relatively high emissions.

In the National Climate Change Response White Paper<sup>133</sup> (NCCRWP) South Africa set conditional pledges to reduce emissions by 34 % by 2020 and by 42 % by 2025 with respect to BAU. The 2020 pledge is conditional on adequate support from developed countries. No unconditional target has been announced. In the National Communication, major areas with the largest mitigation potential have been identified: energy efficiency, electricity generation, and transport. According to the Integrated Resource Plan for electricity 2010–2030, some 48 % of the electricity generation in 2030 is targeted to be covered by renewable sources.<sup>134</sup> In 2012, the country's RE market was one of the

<sup>130</sup> White, Alexander (2013), Australia's 'unpopular' carbon price isn't to blame for Labor's poor polling. The Guardian.

<sup>131</sup> Sydney Morning Herald (2011), Opposition vows to repeal carbon tax.

<sup>132</sup> Department of Environmental Affairs, Republic of South Africa (2011), South Africa's Second National Communication under the United Nations Framework Convention on Climate Change.

<sup>133</sup> Government of the Republic of South Africa (2011), National Climate Change Response White Paper.

<sup>134</sup> Department of Energy, South Africa (2011), Integrated resource plan for electricity 2010-2030.

world's most attractive ones with the biggest annual clean energy investment growth rate,<sup>135</sup> and with 10.4 % of total primary energy supply originating from RE sources<sup>136</sup>. Department of Energy's Draft Second National Energy Efficiency Strategy<sup>137</sup>, set a target to reduce energy intensity for all uses of energy by 12 % by 2015.

Additionally, other short and medium term mitigation options including CCS in the fuel industry, agriculture emissions mitigation, and promoting sustainable consumption and production patterns are recognized in the NCCRWP. Compared to many other developing countries, South Africa has limited possibilities to cut emissions by tackling deforestation as the country is characterized by low forest cover and low rate of deforestation.

As presented in the NCCRWP, the key elements of South Africa's mitigation scheme include: 1) setting the performance benchmark; 2) identifying sectoral mitigation targets; 3) defining carbon budgets for the most important GHG emitting sectors; 4) requiring mitigation plans from companies; 5) developing and implementing various mitigation policies, measures and actions; 6) using economic instruments; and 7) monitoring and evaluation. The performance benchmark, a National GHG Emission Trajectory Range (NGETR), has been established and is used for measuring the efficacy of mitigation actions. The NGETR is projected to 2050 and reflects the country's overall mitigation contribution: with current plans, South Africa's emissions will peak between 2020 and 2025, and start declining from 2036 onwards. The carbon budget (CB) approach, in turn, is being developed for significant GHG emitting sectors for specifying desired emission reduction outcomes consistent with the NGETR, and to offer flexible mitigation options through market-based mechanisms. CBs are planned to be developed and implemented by the end of 2014.

National Treasury of South Africa has recently published the Carbon Tax Policy Paper for public comment.<sup>138</sup> Carbon tax is one of the instruments for implementing the carbon budget, and in short to medium term it is considered as a cornerstone of the country's mitigation effort - ETS can complement or replace the carbon tax at a later stage. The carbon tax is planned to be implemented in 2015 with a broad coverage. Concern exists, however, on the readiness of the tax design by 2015 and on its implications on the economy and power prices.<sup>139</sup>

The climate change policies of South Africa are well advanced for a developing country, but much of the desired emissions mitigation impact depends on implementation issues. The conditional pledge does not provide a credible target, and thus a unilateral pledge would be a strong signal of political commitment on emission reductions. The current emissions and scenarios towards 2020 for South Africa are shown in table 12. The optimistic scenario corresponds the conditional emission pledge with a 34 % emissions reduction target below the BAU. This target is unlikely but possible to be achieved with a strong support from developed countries. BAU is considered as the pessimistic scenario.

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<sup>135</sup> Energati (2013), Africa's Challenging but Bright Renewable Energy Future.

<sup>136</sup> Mali, Thembakazi (2013), Energy in South Africa.

<sup>137</sup> Department of Energy, South Africa (2012), National Energy Efficiency Strategy of the Republic of South Africa.

<sup>138</sup> National Treasury, Rep. of South Africa (2013), Carbon Tax Policy Paper.

<sup>139</sup> Creamer, Terence (2013), Carbon tax will not be implemented if not ready – Treasury official. Engineering News.

**Table 12.** South Africa's emissions in 2010 and BAU emissions (including LULUCF), optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
422 MtCO <sub>2</sub> -eq	715 MtCO <sub>2</sub> -eq	493 MtCO <sub>2</sub> -eq	715 MtCO <sub>2</sub> -eq

## 2.13 Ukraine

Ukraine's emissions in 2010 were 397 MtCO<sub>2</sub>-eq which corresponds 0.79 % of global emissions. The emissions have fallen to less than half of the emission levels in 1990 due to the collapse of the USSR. The main source of emissions in Ukraine is energy with around 76 % share. Other important sources include agriculture (9.0 %) and industrial processes (12.2 %).<sup>140</sup> In the BAU scenario, the emissions in 2020 would be between 440 and 670 MtCO<sub>2</sub>-eq.<sup>141</sup> The high end of the BAU spread originating<sup>142</sup> from the 5<sup>th</sup> National Communication is very unlikely, however.

Ukraine has set a target to reduce emissions by 20 % from 1990 levels by 2020. The target has been labelled as inadequate as it is at the high end of the emission levels in BAU scenario and, therefore, is unlikely to require any additional mitigation actions.<sup>143</sup> Ukraine has also accumulated a large amount of excess emission units during the first commitment period (2008–2012) which totals to around 2 650 MtCO<sub>2</sub>-eq<sup>144</sup>.

Due to the Doha decisions (see section 4.2) to freeze the emissions to 2008–2010 levels, the Ukrainian 20 % emission reduction target under the second commitment period in Kyoto Protocol has been effectively replaced with 58 % emission reduction target. In addition, Ukraine is not allowed to use its accumulated AAUs from the first commitment period to reach this target. Ukraine together with a group of other countries opposed these decisions which were “hammered through” despite their opposing views. From Ukrainian perspective, the Doha decision allocating no space for future emission growth from 2008–2010 levels remarks a dramatic deviation from the original pledges. In addition, the emission levels in 2008–2010 were below the normal development trend due to the financial crisis. In the current weakened position, it seems highly unlikely that Ukraine would comply with the Doha decisions during second commitment period. Ukraine also gave up with the plans to develop an emission trading scheme after Doha.<sup>145</sup>

Despite the Doha and in addition to the 20 % emission reduction target, Ukraine has set in 2006 a target to decrease energy intensity by 50 % below 2005 levels by 2030 and established a renewable energy scheme based on feed-in-tariffs for wind and solar electricity. Especially the energy intensity

<sup>140</sup> UNFCCC (2013), Greenhouse Gas Inventory Data.

<sup>141</sup> Höhne, N. et al. (2012 b)

<sup>142</sup> With modifications from according to Höhne, N. et al. (2012 b)

<sup>143</sup> e.g. The Climate Action Tracker (2012 b), Ukraine.

<sup>144</sup> Ukraine received 920 MtCO<sub>2</sub>-eq CP1-AAUs annually for 2008-2012. The annual emission during that period have been around 390 MtCO<sub>2</sub>-eq. This way, Ukraine has accumulated 530 MtCO<sub>2</sub>-eq \* 5 = 2650 MtCO<sub>2</sub>-eq surplus by the end of CP1.

<sup>145</sup> Korppoo, Anna (2013), The Doha Dead End? Transition Economies and the New Kyoto Rules

target may generate significant emission reduction. Ukraine is currently also preparing a national climate change adaptation plan concerning agriculture, energy and healthcare.<sup>146</sup>

BAU, optimistic and pessimistic emission scenarios for 2020 are presented in table 13. The pessimistic scenario assumes that Ukraine will not engage in any new significant emission reduction activities and the emission level correspond the high end of BAU scenario provided by Höhne et al. (2012) but remains below the 20 % target (around 745 MtCO<sub>2</sub>-eq) level. However, very high emissions seem very unlikely. The optimistic target assumes that all relevant implemented policies would be followed and Ukraine would stay on the track towards the 50 % energy efficiency improvement target of 2030.<sup>147</sup> Taking also note of the UNEP Gap Report 2020 BAU emissions estimate for Ukraine, 444 MtCO<sub>2</sub>-eq, based on our assessment we are inclined to believe that the emissions are likely to be closer to optimistic than pessimistic scenario.

**Table 13.** Ukraine's emissions in 2010 and optimistic and pessimistic scenarios for 2020

Emission 2010	2020 BAU scenario	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
397 MtCO <sub>2</sub> -eq	444 MtCO <sub>2</sub> -eq	350 MtCO <sub>2</sub> -eq	670 MtCO <sub>2</sub> -eq

## 2.14 Kazakhstan

Kazakhstan's emissions in 2010 were 318 MtCO<sub>2</sub>-eq which is around 0.63 % of global emissions. Kazakhstan's emissions collapsed by around 50 % since early 90s but have grown rapidly since 2000 due to thriving energy and mining sectors.<sup>148</sup> Kazakhstan has one of the highest emissions to GDP ratio worldwide. The main sources of emissions are energy (81 %), industry (6 %) and agriculture (9 %).<sup>149</sup> According to the UNEP Gap Report the BAU emissions in 2020 would be around 261 MtCO<sub>2</sub>-eq<sup>150</sup>. This however, seems very unlikely as the economy is estimate to grow rapidly<sup>151</sup>. In the The Climate Action Tracker<sup>152</sup> the emissions are estimated to grow by around 20 % from 2010 levels which suggests a BAU around 382 MtCO<sub>2</sub>-eq. In the country's Second National Communication to UNFCCC, the BAU emissions are estimated to be around 480 MtCO<sub>2</sub>-eq by 2020.

Kazakhstan has set a 15 % emission reduction target for 2020 and indicated a 25 % target for 2050, both relative to the emission levels in 1992. Kazakhstan also recently approved a state program according to which the oil-rich country will spend roughly 1 % (~€ 2.5 billion) of GDP to invest on renewable energy until 2050.<sup>153</sup> The programme aims to reduce Kazakhstan's share of coal in electricity production from current 80 % to 49 % by 2030. The same target has been stipulated in the

<sup>146</sup> Interfax Europe (2013), Ukraine preparing national climate change adaptation plan, say officials. June 8, 2013.

<sup>147</sup> Höhne, N. et al. (2012 b)

<sup>148</sup> EDF & IETA (2013), Kazakhstan, The World's Carbon Markets: A Case Study Guide to Emissions Trading

<sup>149</sup> Ministry of Environment Protection, Kazakhstan (2009), Kazakhstan's Second National Communication to the Conference of the Parties of the United Nations Framework Convention on Climate Change.

<sup>150</sup> UNEP (2012 a)

<sup>151</sup> IMF (2013), World Economic and Financial Surveys, World Economic Outlook Database.

<sup>152</sup> The Climate Action Tracker (2012 c) Kazakhstan

<sup>153</sup> Nurshayeva, Raushan (2013), Oil-rich Kazakhstan kickstarts 'green revolution' for energy, Reuters.

“Kazakhstan-2050” strategy published in December 2012.<sup>154</sup> The ministry of energy, industry and trade adopted in 1999 the Energy Sector Development Programme until 2030 which sets rehabilitation and energy efficiency of the existing power plants as the main focus areas. Energy efficiency has not, however, been stressed in “Kazakhstan-2050” strategy.

Kazakhstan was the first Asian country to launch a nationwide ETS and undertake an economy-wide cap in the beginning of 2013. The adoption of the ETS is instrumental in reaching the 15 % emission reduction target.

The new Doha decision had impact also in Kazakhstan’s emission target. The 15 % target was effectively replaced with around 35 % target. Despite the decision was made against Kazakhstan’s views, Kazakhstan did not join the group of countries blocking the negotiations in the recent Bonn Climate Change Conference. This can be interpreted as a positive sign that Kazakhstan is at least willing to negotiate the topic.

There is, however, no sign that Kazakhstan would pursue the 35 % target and, therefore, the 15 % target is shown as the optimistic scenario in the Table 14. Given the vast emission reduction potential, this target seems very achievable. As Kazakhstan has already taken many actions and decisions that reduce the emissions the pessimistic scenario is assumed to equal the emission levels in 2010. As the emissions in 1992 were around 324 MtCO<sub>2</sub>-eq, the 15 % target translates to 277 MtCO<sub>2</sub>-eq annual emissions. The UNEP Gap Report proposes the BAU emissions in 2020 to be around 261 MtCO<sub>2</sub>-eq.

**Table 14.** Kazakhstan’s emissions in 2010 and optimistic and pessimistic scenarios for 2020. The BAU emissions for 2020 are based on the emission growth estimation from The Climate Action Tracker<sup>155</sup> and 2010 emissions from the UNEP Gap Report<sup>156</sup>.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
318 MtCO <sub>2</sub> -eq	382MtCO <sub>2</sub> -eq	277 MtCO <sub>2</sub> -eq	318 MtCO <sub>2</sub> -eq

<sup>154</sup> The Republic of Kazakhstan (2012), “Strategy Kazakhstan-2050”, new political course of the established state.

<sup>155</sup> The Climate Action Tracker (2012 c) Kazakhstan

<sup>156</sup> UNEP (2012 a)

## 2.15 Summary of countries with pledges

Table 15 summarizes the main conclusions from section 2.

**Table 15.** The country level summaries of countries with emission pledges and the most important recent trends and potential contribution to narrow the gap. The countries are ordered according to their emissions in 2010. The BAU emissions and pledges are marked with an asterisk (\*) if the figure includes LULUCF emissions. The emissions are expressed in MtCO<sub>2</sub>-eq.

Country	Emissions 2010	BAU emissions 2020	Emissions 2020 Optimistic scenario	Emissions 2020 Pessimistic scenario	Unconditional pledge 2020	Conditional pledge 2020
China	11 180	13 795*	12 000	13 000	13 519*	13 375*
	China is likely to over-achieve its pledge, which was set close to BAU. The potential measures identified by various analysts indicate that Chinese annual emissions could be even one gigaton lower, at about 12 000 MtCO <sub>2</sub> -eq in 2020. To back up the probability of the optimistic scenario, a macroeconomic slowdown in Chinese economic growth seems to be taking place in 2013. Many analysts, including the World Bank, have recently cut their growth predictions.					
United States	6 715	7 286	5 000	6 000	n.a.	5 961
	The US is quite possibly reaching its pledge, which was considered highly unlikely at the time it was announced in 2009. Most importantly, the recent evidence shows that president Obama is making climate change a priority and is in the process of taking further executive action. Depending on the level of ambition of this further regulation, the US will achieve, miss or even slightly overshoot its 17 % reduction target for 2020.					
India	2 692	3 857*	2 500–3 000	3 500	3 664	n.a.
	The pessimistic scenario reflects the 2020 emission level based on average of pledges (and average baselines) with the optimistic scenario assuming that part of the identified mitigation options are being harnessed. When looking into recent developments e.g. in renewable energy or energy efficiency initiatives, state level progress in climate matters, on-going work on low- carbon strategies for inclusive growth, it could be hoped that part (some hundreds of MtCO <sub>2</sub> -eq) of the pre-2020 potential					

	could actually be harnessed beyond BAU, assuming some international support (be it public or private (climate) finance or FDI).					
<b>Russian Federation</b>	2 510	2 584	2 400	2 800	2 864	2 513
	Very little real mitigation action has taken place and Russia will probably hold the current stand-by mode until the U.S. and China make clear commitments. It seems unlikely that Russia would engage in any significant new climate actions before 2020. Therefore, the spread in the BAU scenarios define the optimistic and pessimistic scenarios.					
<b>Brazil</b>	1 621	3 126*	1 500	2 000	2 067*	n.a.
	Despite the major emission reduction potentials, it is not likely that Brazil would take on any new and/or additional pledges (above the BAU, presented as the pessimistic scenario) in the run-up to 2015. However, considerable emission reduction potentials above the voluntary pledge have been identified in several studies, and could additionally help bridging the gap identified in the 2012 UNEP gap report, possibly in the range of 500 MtCO <sub>2</sub> -eq. In Brazil, a.o. important improvements in MRV of land-use sector are taking place, progress in sectoral initiatives is visible, lessons learned from Amazon Fund and National Fund on Climate change as well as experiences from market mechanisms are being witnessed and harnessed, and hereby the components of a functional overall framework for tapping into the “optimistic” emission reduction potentials could be operationalized.					
<b>Indonesia</b>	1 946	2 533*	1 300-2 100	2 200-2 700	1 816*	1 548*
	In 2009, Indonesia made an unconditional pledge to reduce Indonesia’s greenhouse gas emissions by 26 % from BAU with domestic financial resources by 2020 or by 41 % with international assistance. In 2010, Indonesia signed an agreement with Norway to reduce emissions from deforestation and land use change ( $\approx$ 80 % of the emissions). This was followed by a two-year moratorium on new land clearing declared in 2011. In may 2013 the moratorium was extended by two additional years. Currently, Indonesia is in the process of setting up its national REDD bodies.					
<b>Japan</b>	1 379	1330/1330*	950	1 330	n.a.	950 / 955*
	Japan has set a conditional emission reduction target of 25 % below 1990 levels by 2020 assuming a fair, effective and sufficiently comprehensive and ambitious international climate framework. In addition, Japan has an 80 % emission reduction target for 2050. However, the meltdown at the Fukushima Daiichi plant in 2011 have led to political debate regarding					

	abandoning the emission targets as reducing nuclear energy would lead to higher emissions. It is yet too early to estimate the development of emissions in Japan as it depends on largely the future energy plan which is still under discussion.					
<b>Canada</b>	728	773/832*	607	710	n.a.	609 / 636*
	Canada has set an emission reduction target of 17 % by 2020 compared to 2005 levels in align with US. The current Canadian climate policy clearly lacks ambition and a concrete roadmap towards the target. With the current actions Canada is heading towards the pessimistic scenario and is unlikely to meet its pledge.					
<b>Mexico</b>	661	882*	600	800–900	n.a.	617*
	Mexico's constructive approach in international climate negotiations and progress in its national enabling environment (including National Climate Change Strategy (ENCC), launched in June 2013), tapping concretely into the available mitigation potential could be considered more likely than in several other developing countries. This provides some hope that Mexico could reach its voluntary 30 % below BAU pledge by 2020. While cost-efficient mitigation potential even beyond the pledge has been identified, a likely range of Mexican emissions in 2020 could be 600–700, MtCO <sub>2</sub> -eq, assuming a certain level of international support.					
<b>South Korea</b>	647	745*	522	671	522*	n.a.
	South Korea has approved voluntarily to reduce 30 % of GHG emissions by 2020 with respect to BAU, and the government expects decreasing trend in GHG emissions after 2015. South Korean climate strategy includes sector specific annual reduction targets, penalties, and incentives set by the government, and an ETS. Given the strong policies in place, considerable emission reductions can be expected by 2020. However, reaching the 30 % emission reduction target may be too optimistic.					
<b>Australia</b>	629	650/632*	480	532 / 538*	532 / 538*	420 / 425*
	Australia has committed to reduce its GHG emissions unconditionally by 5 % and conditionally by up to 25 % below 2000 levels by 2020. In addition, Australia has set an 80 % emission reduction target by 2050. Australia's Clean Energy Bill sets strong emission reduction scheme including emission carbon pricing scheme, which will be replaced with cap-and-trade system in 2015 (or 2014). Due to strong implementation of the targets in the policy, it seems likely that Australia will reach the unconditional target. However, the incoming elections may change the status quo towards less shiny direction.					



<b>South Africa</b>	422	715*	493	715	n.a.	493*
	South Africa has set pledges, conditional on adequate support from developing countries, to reduce emissions by 34 % by 2020 and 42 % by 2025 with respect to BAU. Achieving the targets is unlikely with currently implemented policies. It is likely that South Africa's emissions in 2020 would be in the range of 491–600 MtCO <sub>2</sub> -eq. The South African mitigation scheme is clearly defined in the National Climate Change Response White paper. A carbon tax, a critical mechanism for mitigation, is planned to be introduced in 2015. Looking into clean energy investment growth rates, South Africa's renewable energy market was one of the most attractive ones in the world.					
<b>Ukraine</b>	397	444	350	670	744	n.a.
	Ukraine has set a target to reduce emissions by 20 % from 1990 levels by 2020 which requires no real mitigation actions. Due to the Doha decisions, the Ukrainian 20 % emission reduction target has, however, been effectively replaced with a 58 % emission reduction target. As a result, Ukraine is likely to back off from the Kyoto Protocol second commitment period. The Doha decision process received a strong negative response from Ukraine and led the country to abandon the emission trading scheme under development. The pessimistic scenario originates from the 5 <sup>th</sup> National Communication and may be dealt with prudence.					
<b>Kazakhstan</b>	318	382	277	318	277	n.a.
	Kazakhstan has set a 15 % emission reduction target with respect to emissions in 1992. Kazakhstan launched an emission trading scheme in the beginning of 2013 which should play an instrumental role in achieving the target. The oil-rich country has also recently approved a state program to spend roughly 1 % of GDP to invest on renewable energy until 2050. This will significantly reduce the country's reliance on coal. Despite the Doha decisions had an unfavourable impact on Kazakhstan the country has not yet indicated interest to back off from the Kyoto Protocol second commitment period.					
<b>Total</b>	<b>31 800</b>	<b>39 100 – 39 200</b>	<b>29 000 – 30 300</b>	<b>35 200 – 35 900</b>	<b>n.a.</b>	<b>n.a.</b>

## 3 Countries with no commitments

In this section a group of important countries with no commitments have been analysed. These countries include Islamic Republic of Iran, Turkey, Thailand, Myanmar, Pakistan, Malaysia, Venezuela, Saudi Arabia and Vietnam. The countries are arranged according to their emissions. The analysis is conducted separately for each country.

Taking note of limitations to data availability, and to enhance comparability of our analysis dealing with estimates for 2010 GHG emission levels and 2020 emissions, the following assumptions have been made:

- 2010 emissions are taken from EC's EDGAR database<sup>157</sup> which is also used as the emission data source in the UNEP Gap Report<sup>158</sup>
- The emission intensity of GDP is calculated based on 2010 emissions in EDGAR and 2010 GDP estimate provided in IMF's World Economic Outlook Database<sup>159</sup>
- World Economic Outlook Database also includes the estimations of GDP growth until 2018. This estimation is extrapolated to 2020 using the same growth rate as estimated in the database for 2018.
- Then the BAU emission estimation in 2020 is calculated by multiplying the emissions per GDP rate from 2010 with GDP 2020 estimate.

There are a number of reasons to use this approach. First, although all countries without pledges have submitted national communications on climate change for UNFCCC, some of them are old and contain no BAU estimate towards 2020. Furthermore, the emission and BAU estimates in these reports follow various calculation methods and therefore, the communications would provide non-comparable results. The emission estimates also differ sometimes vastly from the estimates in the international emission databases such as the EDGAR or WRI's CAIT database<sup>160</sup>. A common way to calculate the emissions and BAUs reduces some aspects of uncertainty in assessing emission levels and pre-2020 reduction potentials, and hereby makes the results more comparable. EDGAR database serves as the source of emission data in the UNEP Gap Report which is as a starting point for this work.

### 3.1 Islamic Republic of Iran

The total emissions of Islamic Republic of Iran (later Iran) were 528 MtCO<sub>2</sub>-eq in 2010 which equals 1.1 % of global emissions. Based on the second National Communication to UNFCCC<sup>161</sup>, 77 % of the emissions in 2000 came from Energy sector, 9 % from agriculture, 6 % from both industrial processes

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<sup>157</sup> European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency (2011)

<sup>158</sup> UNEP (2012 a)

<sup>159</sup> IMF (2013), World Economic and Financial Surveys, World Economic Outlook Database. A

<sup>160</sup> WRI (2013), Climate Analysis Indicators Tool (CAIT 2.0).

<sup>161</sup> Department of Environment, Iran (2010), Iran Second National Communication to UNFCCC.

and waste and only 2 % from forestry. In the BAU scenario the emissions from energy sector are expected to grow at the rate of 8.4 % whereas the growth in other sectors combined would be 3.6 % per year.

The National Communication to UNFCCC identifies significant emission reduction potential in Iran. In the BAU scenario, the annual emissions would reach about 2 400 MtCO<sub>2</sub>-eq by 2025. However, the energy sector holds annual mitigation potential of around 1 200 MtCO<sub>2</sub>-eq in 2025. This would, however, require strong action for example to improve energy efficiency, install renewable and other low-carbon energy capacity and increase the share of natural gas in industry as well as in commercial and residential sectors. In other areas the emission reduction potential is moderate estimated to be around 50 MtCO<sub>2</sub>-eq.

While there are no national emission targets or strategies for climate change, mitigation and adaptation are not considered in national and regional development plans. These include such issues as sustainable agriculture, water management and pollution prevention. The major problem driving the increasing emissions are the heavy state subsidies for fossil fuels encouraging and sustaining inefficient and polluting consumption patterns. Furthermore the country suffers from serious deforestation.

Due to lack of political will, it seems unlikely that Iran would take strong action to cut emissions before 2020. Therefore both, the optimistic and pessimistic scenarios reflect the assumed BAU baselines scenario.

**Table 16.** Iran's emissions in 2010 and optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
528 MtCO <sub>2</sub> -eq	610 MtCO <sub>2</sub> -eq	610 MtCO <sub>2</sub> -eq	610 MtCO <sub>2</sub> -eq

## 3.2 Turkey

Turkey's emissions in 2010 were 420 MtCO<sub>2</sub>-eq which equals 0.84 % of global emissions. The emissions have increased by 33 % since 2000. According to the National Greenhouse Gas Inventory Report 1990–2011<sup>162</sup>, 71.3 % of the emissions in 2011 originated from the energy sector, 13.3 % from the industrial processes, 8.6 % from the waste sector, and 6.8 % from the agriculture sector.

In the National Climate Change Strategy 2010–2020<sup>163</sup> (NCCS), the goals for GHG emission control (short, medium and long-term) are set for major emitting sectors. For energy sector, the following goals are presented among others: the share of renewable energy in total electricity generation to be increased up to 30 % by 2023; and GHG emissions from electricity generation to be decreased by 7 % compared to BAU scenario by 2020. The Ministry of Energy and Natural Resources has published

<sup>162</sup> Turkish Statistical Institute (2013), National Greenhouse Gas Inventory Report 1990-2011.

<sup>163</sup> Ministry of Environment and Urbanization, Turkey (2010), Climate Change Strategy 2010-2020.

a Strategic Plan (2010–2014)<sup>164</sup>, in which the energy sector specific strategic themes and targets are presented. For example by 2023, the primary energy density is planned to be reduced by 20 % compared to the figure in 2008. Additionally, the NCCS stipulates goals for transportation, industry, waste, agriculture, and LULUCF sectors.

For implementing the National Climate Change Strategy, National Climate Change Action Plan<sup>165</sup> (NCCAP) was prepared and published in 2011. Focusing mainly on mitigation and adaptation, the NCCAP includes a specific GHG emission control action plan for all relevant sectors and crosscutting issues, in which actions, schedule, outputs and indicators, responsible and relevant organizations are specified for every objective. Even though the plan seems comprehensive, it lacks concrete targets, and the participation of relevant NGOs of the civic society.<sup>166</sup>

For achieving GHG emission mitigation, VCM (Voluntary Carbon Market) is identified as an important instrument in the NCCAP. In 2012, the number of registered VCM projects in Turkey were 201 with 15 MtCO<sub>2</sub>-eq of estimated annual emission reductions.<sup>167</sup> Additionally, a new regulatory framework on GHGs emissions' monitoring is adopted and the MRV system will be implemented for energy and industry sectors by 2016. Related to these market-based approaches on GHG mitigation, Turkey is one of the implementing countries of World Bank's Partnership for Market Readiness (PMR).

In table 17, the current emissions and the optimistic and pessimistic scenarios towards 2020 are presented for Turkey. The pessimistic scenario is considered as the BAU, and a 10 % reduction is assumed in the optimistic scenario. Even though the country has no emission reduction pledge, the optimistic scenario may be achieved as a result of implementation of NCCAP.

**Table 17.** Turkey's emissions in 2010 and optimistic and pessimistic scenarios for 2020.

Emissions 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
420 MtCO <sub>2</sub> -eq	651 MtCO <sub>2</sub> -eq	586 MtCO <sub>2</sub> -eq	651 MtCO <sub>2</sub> -eq

### 3.3 Thailand

Thailand's emissions in 2010 were 413 MtCO<sub>2</sub>-eq which equals 0.82 % of the global emissions. Since 2000, the emissions have increased by nearly 46 %. According to The Eleventh National Economic and Social Development Plan (2012-2016)<sup>168</sup>, 63 % of GHG emissions in 2004 originated from the industry and energy generating sector, 17 % from the agriculture and livestock sector, 7 % from

<sup>164</sup> Ministry of Energy and Natural Resources, Turkey (2010), Strategic plan (2010-2014).

<sup>165</sup> Ministry of Environment and Urbanization, Turkey (2011), National Climate Change Action Plan 2011-2023.

<sup>166</sup> Gundogan, A. C. (2011), Time for Walking the Talk: Climate Change Action Plan, August 1, 2011.

<sup>167</sup> Türkmenoglu, E. (2012), Climate Change Policies in Turkey.

<sup>168</sup> National Economic and Social Development Board, Thailand (2011), The Eleventh National Economic and Social Development Plan (2012-2016).

industrial processes, and 4 % from the waste sector. Thailand's Second National Communication<sup>169</sup> was submitted in 2011.

In the National Economic and Social Development plan's strategy towards sustainability for the years 2012-2016, the promotion of a low carbon emission society is among the main objectives. General development guidelines are provided for production and transport sectors, urban planning, and for the modification of consumption patterns. For example, such means as domestic carbon market, tax and loan benefits for renewable energies, and market mechanisms (NAMA, REDD+, CDM) are considered. The establishment of national registry and MRV system for monitoring GHG emission reductions at project and country level are also considered important. Until today, CDM has been a widely used instrument with 221 projects approved.<sup>170</sup> A voluntary carbon market (VCM) is planned to be launched in October 2014.<sup>171</sup>

A more specific plan already exists for the energy sector, which is presented in Thailand 20-Year Energy Efficiency Development Plan (EEDP)<sup>172</sup>. The target is to reduce energy intensity by 15 % and 25 % in 2020 and 2030 respectively compared with 2005 levels, which leads to around 20 % reduction in energy consumption. EEDP is estimated to yield 49 MtCO<sub>2</sub>-eq cumulative emission reductions per year. In addition, the 10-Year Alternative Energy Development Plan 2012-2021<sup>173</sup> is targeting to increase the share of renewable and alternative energy to 25 % of total energy consumption by 2021. This would require multiplying the use of renewable energy sources. However, a conflict between different strategic plans can be noticed: Thailand Power Development Plan 2012-2030<sup>174</sup> targets to achieve only 20 % of the EEDP's energy intensity reduction target of 25 % due to high electricity demand growth prediction.

According to the official plans, Thailand is strongly pursuing GHG emission reductions in all sectors, the main focus being on energy efficiency and renewable energy. Although the country is considered a pioneer in RE policies in the region<sup>175</sup>, many uncertainties on implementation still remain related for example to support mechanisms, finance, and conflicting objectives. In table 18, the current emission level and GDP-related optimistic and pessimistic scenarios are presented for emission growth towards 2020. In comparison with BAU, which is considered as the pessimistic scenario, a 15 % decrease in emissions is estimated in the optimistic scenario.

**Table 18.** Thailand's emissions in 2010 and optimistic and pessimistic scenarios for 2020.

Emissions 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
413 MtCO <sub>2</sub> -eq	635 MtCO <sub>2</sub> -eq	540 MtCO <sub>2</sub> -eq	635 MtCO <sub>2</sub> -eq

<sup>169</sup> Ministry of Natural Resources and Environment, Thailand (2011), Thailand's Second National Communication.

<sup>170</sup> Thailand Greenhouse Gas Management Organization (2013), Status of CDM projects in Thailand.

<sup>171</sup> Chestney, Nina (2012), Carbon trading schemes around the world. Reuters.

<sup>172</sup> Ministry of Energy Thailand (2011), Thailand 20-Year Energy Efficiency Development Plan (2011-2030).

<sup>173</sup> Ministry of Energy Thailand (2012), The Renewable and Alternative Energy Development Plan for 25 Percent in 10 Years.

<sup>174</sup> Ministry of Energy Thailand (2012), Summary of Thailand Power Development Plan 2012-2030 (PDP2010: Revision 3).

<sup>175</sup> CDKN (2013), Pioneering renewable energy options: Thailand takes up the challenge.

### 3.4 Myanmar

Myanmar's emissions in 2010 were 362 MtCO<sub>2</sub>-eq which equals 0.72 % of the global emissions. According to National GHG Inventory of INC Project<sup>176</sup>, 54.3 % of GHG emissions in 2000 accounted for LULUCF sector, 30.7 % for agriculture and livestock sector, 10.6 % for energy sector, 3.8 % for waste sector, and just 0.6 % for industrial sector. LULUCF sector is therefore the biggest GHGs emitting sector, but carbon removal by this sector actually makes the country a net negative emitter of GHGs. Myanmar has, however, one of the earth's highest rates of forest loss.<sup>177</sup>

National climate change strategy does not exist for Myanmar, and the country is one of the least advanced countries when it comes to meeting reporting obligations to UNFCCC.<sup>178</sup> The Initial National Communication (INC) project started in 2008 and the first national communication was finalized only in December 2012, but is not yet available to the public. Slow progress is, overall, understandable for a country at an opening and historic development stage where the new constitution was accepted in 2008 and military junta abolished in 2011.

In 2011, Myanmar joined the UN-REDD programme, and a REDD+ Readiness Roadmap is currently under development.<sup>179</sup> According to UNEP RISØ, the greatest emission reduction potential in the country relate to forest carbon options – reforestation under the CDM and the possibility to avoid deforestation through REDD+. So far, however, CDM projects have generally remained underdeveloped, and a lot of work and policy defining is required before REDD+ activities become reality.

As a highly sensitive country to climate changes and a net negative emitter of GHGs, the country will most probably concentrate principally on adaptation and disaster risk reduction actions. Currently, The Myanmar Comprehensive Development Plan emphasizing environmental conservation is being prepared and estimated to be finalized by the end of 2013. At the phase of transition, there is a good possibility to encourage a low carbon development model through internationally supported development projects. The emissions in 2010 and scenarios towards 2020 are shown in table 19 – significant emission reduction activities by 2020 are not expected.

**Table 19.** Myanmar's emissions in 2010 and optimistic and pessimistic scenarios for 2020.

Emissions 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
362 MtCO <sub>2</sub> -eq	688 MtCO <sub>2</sub> -eq	688 MtCO <sub>2</sub> -eq	688 MtCO <sub>2</sub> -eq

<sup>176</sup> Swe, Khin Lay (2012), National GHG Inventory of INC Projects, Myanmar.

<sup>177</sup> UNEP RISØ (2013), Emission Reduction Profile – Myanmar.

<sup>178</sup> UNFCCC (2009), Least developed countries under the UNFCCC.

<sup>179</sup> UN-REDD (2013), Myanmar.

### 3.5 Pakistan

Pakistan's emissions in 2010 were 340 MtCO<sub>2</sub>-eq which equals 0.68 % of the global emissions. Since 2000, the emissions have increased by almost 40 %. According to Pakistan's first National Climate Change Policy<sup>180</sup>, officially launched in February 2013, in 2008 nearly 51 % of the emissions came from energy sector, 39 % from agriculture sector, 6 % from industrial processes, and 3 % from LULUCF sector.

The recent National Climate Change Policy (launched in early 2013) has identified energy and agriculture sectors as the most relevant sectors in terms of emission mitigation efforts in Pakistan. However, the country has not set any specific GHG reduction targets, but only very general and non-quantifiable sector specific sets of policy measures to be taken have been presented. These sectors are energy, transport, town planning, industries, agriculture and livestock, carbon sequestration and forestry. For example, in the case of energy sector, the measures include the promotion and prioritization of renewable and nuclear energy, and the possibility to introduce carbon tax on fossil fuel energy generation.

Pakistan has been actively involved in international climate change discussions. Until today, 67 CDM projects have been approved in Pakistan by the government, and the readiness for NAMAs and REDD+ is being increased.<sup>181</sup>

The government has signalled to be currently working on action plan covering short, medium and long-term actions including mitigation measures especially targeted on energy production and forests<sup>182</sup> but a concrete national action plan with details, budgets and schedules is missing, and thus the implementation of mitigation measures is unsecure.<sup>183</sup> In practice, climate change mitigation and adaptation remains low at the government's priority list, limitations in the overall enabling framework and capacity hamper implementation of identified measures and promised funds have not been granted due to budget cuts.<sup>184</sup>

The table 20 shows the current emission level and GDP-related scenarios for emission growth towards 2020<sup>185</sup>. It is unlikely to take any significant mitigation actions before 2020. A new government has taken office in May 2013, and several climate and development related initiatives, some addressing renewable energy, have been highlighted. However, at this stage it is not possible to make an assessment of the potential mitigation impacts and emission levels in 2020. It is, however, almost certain that the Pakistani emission will grow by 2020, taken note of continued population growth and projected GDP growth rates.

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<sup>180</sup> Government of Pakistan, Ministry of Climate Change (2012), National Climate Change Policy.

<sup>181</sup> Murphy D., Parry J., Keller M. (2013), Priority CCD actions for Pakistan, featured article at Climate & Development Knowledge Network. CDKN.

<sup>182</sup> Khan, Rina Saeed (2013), Pakistan: National climate change policy to the rescue? APAN.

<sup>183</sup> Bhalla, Nita (2013), Pakistan launches first national climate change policy. Reuters.

<sup>184</sup> Shaikh S., Tunio S. (2013), Government budget cuts threatens Pakistan's climate change efforts. Thomson Reuters Foundation.

<sup>185</sup> The figures for 2020 are based on assumption noted in the beginning of section 3.



**Table 20.** Pakistan's emissions in 2010 and optimistic and pessimistic scenarios for 2020.

Emissions 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
340 MtCO <sub>2</sub> -eq	462 MtCO <sub>2</sub> -eq	462 MtCO <sub>2</sub> -eq	462 MtCO <sub>2</sub> -eq

### 3.6 Malaysia

Malaysia's emissions in 2010 were 330 MtCO<sub>2</sub>-eq which equals 0,7 % of global emissions. According to Malaysia's communication to the UNFCCC, the main sources of emissions in 2000 included energy supply (37 %), industry (17 %) and transport (16 %). In addition, waste and LULUCF are significant emissions sources. Over 50 % of Malaysia's land are is covered with forests, which serve as a major carbon sink estimated to sequester up to 250 MtCO<sub>2</sub>-eq annually.<sup>186</sup>

Malaysia has set some important climate targets. At COP 15 in Copenhagen Malaysia's Prime Minister announced that Malaysia would voluntarily reduce its emissions intensity of GDP by up to 40 % by 2020 with respect to 2005 levels. In 2005, the emission intensity of GDP was around 0.62 tonnes CO<sub>2</sub>-eq/thousand MR<sup>187,188</sup> Given the estimated GDP growth of based on assumption of country's successful progress, the emissions in 2020 should be limited to around 335 MtCO<sub>2</sub>-eq. Furthermore, Malaysia pledged in the Rio Summit to ensure that at least 50 % of country's land area remains as forests. This pledge was confirmed at Copenhagen.

Malaysia has recently taken on promising initiatives to improve energy efficiency. Previously the Malaysian Industrial Energy Efficiency Improvement Programme (MIEEIP, concluded in 2009) was able to identify no-cost energy efficiency improvement potential.<sup>189</sup> Now the Tenth Malaysia Plan<sup>190</sup> applicable from 2011 to 2015 underlines measures to improve effective sourcing and delivery of energy. It for example sets a target to secure 5.5 % of its energy capacity with renewable by 2015. The prime minister has furthermore stated that Malaysia aims to increase the total energy capacity from renewable energy to 11 % by 2020.<sup>191</sup> The renewable energy production is supported for example with feed-in-tariffs. The new national Energy Efficiency Master Plan, announced to come out during June 2013, will strategise country's efforts related to energy security, global warming and climate change. The proposed plan aims to achieve major energy savings from industry, commercial and building sectors within the next 10 years which are estimated to equal 59 MtCO<sub>2</sub>-eq in emissions. Finally, Malaysia has set a target to reduce its final energy consumption in the industrial, commercial and residential sectors by 10 % from 2011 to 2030.<sup>192</sup>

<sup>186</sup> Ministry of Natural Resources and Environment Malaysia (2011), Second National Communication to the UNFCCC.

<sup>187</sup> Malaysian Ringgits (1 € is around 4 MR)

<sup>188</sup> Ministry of Natural Resources and Environment Malaysia (2011)

<sup>189</sup> Green Prospects Asia (2012), Malaysia's new energy policy emphasises market-based energy pricing.

<sup>190</sup> The economic planning unit (2010), The Malaysia plan 2011-2015. Prime minister's department, Putrajaya.

<sup>191</sup> The Star Online (2012), Malaysia targets 5.5% total energy capacity from renewable sources by 2015.

<sup>192</sup> Eurocham (2011), Market Potential in Energy Efficiency in Southeast Asia, a systematic approach to opportunities and challenges in Southeast Asian Countries. The Sustainability Committee of the European Chamber of Commerce. European Commission.

Despite the promising initiatives, Malaysia's ability to achieve the ambitious targets has been questioned. The estimated strong economic growth of some 6 % per year<sup>193</sup> is estimated to lead in around 50 % increase in energy demand during the next 10 years<sup>194</sup>. The new installed renewable energy capacity provides only a marginal contribution to this. Furthermore, reaching the renewable energy targets require more successful experiences and sufficient incentives for investors and overcoming administrative and sociocultural challenges will need time to change.<sup>195</sup>

The number of climate positive targets and strategies reflect strong interest towards energy efficiency, renewable energy and emission reductions in general. On the other hand, the strong economic and energy demand growth and the high priority of raising living standards and eradicating poverty, make it unlikely that the announced targets would be met. The optimistic target for emissions in 2020 is in line with the target to reduce emission intensity of GDP by 40 % by 2020 from 2005 levels. The pessimistic target is based on BAU estimate.

**Table 21.** Malaysia's emissions in 2010 and optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
330 MtCO <sub>2</sub> -eq	550 MtCO <sub>2</sub> -eq	340 MtCO <sub>2</sub> -eq	550 MtCO <sub>2</sub> -eq

### 3.7 Venezuela

Venezuela's emissions in 2010 were 310 MtCO<sub>2</sub>-eq which equals 0.62 % of the global emissions, and is about 20 % greater compared to the year 2000. According to the first and yet only National Communication on Climate Change to UNFCCC from 2005<sup>196</sup>, 74.8 % of the emissions originated from the energy sector, 17.2 % from the agriculture sector, and few percents from industrial processes in 1999. This is the latest GHG inventory data of Venezuela available.

It is highlighted in the National Communication on Climate Change that the options for GHG mitigation are limited due to the facts that 70 % of the country's energy need is covered by hydro power, and natural gas is the primary source of energy in 81 % of thermoelectric plants to meet the industrial, commercial and residential energy demand. Sector specific (energy, transport, waste, forestry) mitigation options are, however, discussed at general level, but there is no concrete plan for implementation. Venezuela has announced to launch a program in 2013 to reduce GHG emissions across the four sectors, but critics suggest that it is unlikely that any real mitigation actions are taken.<sup>197</sup> Public information about the program is currently not available.

<sup>193</sup> OECD (2011), ASEAN countries returning to pre-crisis growth, OECD website.

<sup>194</sup> Höhne, Niklas et al. (2012)

<sup>195</sup> Sumiani, Yusoff; Roozbeh, Kardoan (2012), Barriers and challenges for developing RE policy in Malaysia. 2012 International Conference on Future Environment and Energy. IPCBEE vol.28(2012)

<sup>196</sup> Venezuelan Ministry of Environment and Natural Resources (2005), Primera Comunicación Nacional en Cambio Climático de Venezuela.

<sup>197</sup> Edwards, Guy (2013), Peru and Venezuela compete to host COP20 in 2014. Intercambio Climático.

There are only few countries in Latin America without a single registered CDM project Venezuela being one of them.<sup>198</sup> From international point of view, Venezuela is a pivotal participant in climate change discussion as it possesses almost 25 % of the World's known oil reserves<sup>199</sup>. If these reserves were fully exploited, it will most likely have a crucial and negative effect on limiting global warming to 2°C.<sup>200</sup> However, a robust climate change treaty would conflict with Venezuela's development programmes. The country has not set any specific emissions reduction targets or carried out mitigation actions until today, but after the death of the long-term leader Hugo Chavez, the door might be open for climate policy initiatives.

Table 22 shows the current emission level and GDP-related scenarios for emission growth towards 2020. Due to the lack of mitigation targets, the optimistic and pessimistic scenarios are the same.

**Table 22.** Venezuela's emissions in 2010 and the scenarios for 2020.

Emissions 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
310 MtCO <sub>2</sub> -eq	405 MtCO <sub>2</sub> -eq	405 MtCO <sub>2</sub> -eq	405 MtCO <sub>2</sub> -eq

### 3.8 Saudi Arabia

Saudi Arabia's emissions in 2010 were 495 MtCO<sub>2</sub>-eq which equals 0.99 % of global emissions and is 60 % more compared to the year 2000. According to Second National Communication to UNFCC<sup>201</sup>, 92.1 % of CO<sub>2</sub> emissions in 2000 originated from the energy sector, 7.4 % from the industrial processes sector, and 0.5 % from the agriculture sector.

Saudi Arabia has not pledged to cut GHG emissions. According to Germanwatch, Saudi Arabia has generally been among the lowest ranking countries in climate policy.<sup>202</sup> The Second National Communication highlights that the development of renewable energy sources and rational use of energy are the key steps towards sustainability in the country. The National Energy Efficiency Program (NEEP) has been launched, and a bunch of relatively small-scale renewable energy initiatives and projects have been carried out.

According to ABB's Energy Efficiency Report of Saudi Arabia<sup>203</sup>, NEEP pursues to reduce the electricity intensity by 30 % between 2005 and 2030, and to cut the peak demand growth by 50 % compared to the average increase of 2000-2005. The Saudi Energy Efficiency Center was created in 2010 for the development of energy efficient technologies and conservation policies. In the beginning of 2013, Saudi Arabia's Renewable Energy Strategy and Solar Energy Deployment Roadmap<sup>204</sup> was published: the target is to generate 23–30 % of the electricity from renewable

<sup>198</sup> The World Bank (2009), Venezuela – Country Note on Climate Change Aspects in Agriculture.

<sup>199</sup> OPEC (2012), OPEC Share of World Crude Oil Reserves 2011.

<sup>200</sup> Edwards, G., Mage, S. (2013), Death of Hugo Chávez gives Venezuela a choice on climate change. The Guardian.

<sup>201</sup> Presidency of Meteorology and Environment (2011), Second National Communication: Kingdom of Saudi Arabia.

<sup>202</sup> Germanwatch (2012), The Climate Change Performance Index: Results 2013.

<sup>203</sup> ABB (2012), Saudi Arabia – Energy efficiency report.

<sup>204</sup> K.A. Care (2013), Saudi Arabia's Renewable Energy Strategy and Solar Energy Deployment Roadmap.

energy sources by 2032. As a part of the strategy, the country aims to attract \$109 billion of investments for creating a massive solar industry.<sup>205</sup>

Saudi Arabia has been one of the problematic countries when it comes to climate change mitigation. As the leading oil producer and exporter, the kingdom is highly dependent on oil and thus sensitive to changes in oil market. However, due to the probable changing dynamics of the energy market in general, Saudi Arabia seems to have identified the importance of the development of an alternative energy mix and the ambitious plans may well become reality due to vast financial resources. However, the country remains distant in international climate change negotiations. The current emissions and scenarios towards 2020 for Saudi Arabia are presented in table 23. In the optimistic 2020 scenario, a 10 % decrease compared to BAU is estimated due to possibly implemented renewable energy production. The pessimistic scenario is considered as BAU.

**Table 23.** Saudi Arabia's emissions in 2010 and optimistic and pessimistic scenarios for 2020.

Emissions 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
310 MtCO <sub>2</sub> -eq	805 MtCO <sub>2</sub> -eq	725 MtCO <sub>2</sub> -eq	805 MtCO <sub>2</sub> -eq

### 3.9 Vietnam

Vietnam's emissions in 2010 were 306 MtCO<sub>2</sub>-eq which equals 0.6 % of global emissions. The emissions have almost doubled since 2000. According to the national communication to UNFCCC<sup>206</sup>, in 2000 some 42 % of the emissions came from energy and industrial processes, 43 % was related to agriculture and 10 % came from LULUCF sector. The share of energy has, however, increased rapidly since then.

The national communication identifies vast emission reduction potentials especially related to LULUCF but also in industry and agriculture. Vietnam has also shown active interest in harnessing this potential by setting a number of targets for emission reduction. The most important targets and guidelines are presented in the Vietnam Green Growth Strategy<sup>207</sup> and in the National Strategy on Climate Change<sup>208</sup>. In addition, Vietnam has set a separate 20 % GHG reduction target in agriculture and rural development sector to be achieved by 2020.<sup>209</sup>

The prime minister approved recently the Vietnam Green Growth Strategy<sup>210</sup> which includes targets for economic restructuring and improvement of living standards as well as tangible environmental targets for the period 2011–2020 including reducing GHG emissions by 8–10 %, improving energy

<sup>205</sup> Mahdi, Wael (2013), Saudi Arabia Starts Survey of Renewable Energy Potential. Bloomberg.

<sup>206</sup> Ministry of natural resources and environment Vietnam (2010), Viet Nam's second national communication to the United Nations framework convention on climate change.

<sup>207</sup> Ministry of Planning and Investment Viet Nam (2012), The Vietnam Green Growth Strategy - Decision No.1393/QD-TTg

<sup>208</sup> The Prime Minister (2011), Decision on approval of the National Climate Change Strategy. Decision No. 2139/QD-TTg

<sup>209</sup> Ministry of agriculture and rural development Vietnam (2011), Decision on approving programme of Green House Gas (GHG) emissions reduction in the Agriculture and Rural Development sector up to 2020, Decision No. 3119 /QD-BNN-KHCN

<sup>210</sup> Ministry of Planning and Investment Viet Nam (2012)

consumption/GDP ratio by 1–1.5 % annually, and cutting the GHG emissions in the energy sector by 10–20 %<sup>211</sup>. The strategy also highlights the importance of strengthening state management, increasing public awareness and number of other aspects including education, financing and developing information databases necessary to attain targets set in the strategy.

The National Strategy on Climate Change comprises of 10 strategic tasks to deal with climate change. It outlines general climate objectives, priority programmes for 2011–2015, and plans for 2016–2025 along with future objectives for 2050 and a vision for 2100. It also sets some quantitative targets including for example a target to increase the share of renewable energy to 5 % by 2020 and 11 % by 2050 of total commercial primary energy. The strategic targets concentrate on encouraging adaptation and mitigation actions, sustainable use of natural resources and international climate cooperation as well as safeguarding people's life and property.

Vietnam's first climate change response, the National Target Programme to Respond to Climate Change<sup>212</sup> in 2008 focused almost unanimously on adaptation. However, the recently set mitigation targets reflect increasing interest towards cutting emissions.

The quantitative targets, especially the 20 % target set on agriculture and rural development sector are unrealistic. The targets are technically achievable but in practice they require faster changes in energy systems, industry, farming and forestry than the country is likely to witness. For example the 20 % target in agriculture and rural development requires a complete reform of the irrigation and farming systems which requires a long period of time. Showing strong action on climate change is also a political decision to attract investments, intensify technology transfer and achieve better position in international climate negotiations. By taking an active role, Vietnam has a lot to gain and very little to lose.

Capping the fossil fuel and electricity prices amounts a substantial indirect government subsidies to energy prices. These subsidies form currently the main barrier to reach the climate targets. Phasing out these subsidies require reform of the state owned energy enterprise and strengthening the ongoing energy markets reform.<sup>213</sup> These objectives are in line with the Green Growth Strategy which sets a target to prepare a roadmap to phase out the fossil fuel subsidies. Any quick changes in the current energy system are very unlikely, however.

Another important hindrance to mitigation actions is the lack of capacity which significantly slows down mitigation efforts such as technology transfer and clean energy production. For example REDD+ hold vast emission reduction potential but there are still many important gaps to fill<sup>214</sup>.

The table 24 shows the current emission level and optimistic and pessimistic scenarios for emission growth towards 2020. The optimistic scenario is based on the target of 10 % reduction in emissions. The pessimistic scenario is based on BAU estimate. The optimistic scenario is technically possible but in practice very unrealistic as 2020 is too soon to carry out the reforms necessary to reach the target. On the other hand, the pessimistic scenario would only take place if no important mitigation actions

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<sup>211</sup> 10 % voluntarily and 10 % depending on international support

<sup>212</sup> Ministry of natural resources and environment Vietnam (2008), National target program to respond to climate change, unofficial Translation of Vietnamese Draft Version of 27/7/2008

<sup>213</sup> UNEP (2012 b), Fossil Fuel Fiscal Policies and Greenhouse Gas Emissions in Viet Nam.

<sup>214</sup> Stephenson, Jim (2012), Viet Nam – REDD+ Capacity Building Services Assessment.

are taken. As the Green Growth Strategy and National Strategy on Climate Change have just recently been published it is too early to estimate their impacts.

**Table 24.** Vietnam's emissions in 2010 and optimistic and pessimistic scenarios for 2020.

Emission 2010	BAU emissions 2020	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
306 MtCO <sub>2</sub> -eq	520 MtCO <sub>2</sub> -eq	280 MtCO <sub>2</sub> -eq	520 MtCO <sub>2</sub> -eq

The table 25 on next section summarises the key findings from our analysis, providing an indication (where possible) of likely development of GHG by 2020.

### 3.10 Summary of countries with no pledges

Table 25 summarizes the main conclusions from section 3.

**Table 25.** The country level summaries of countries with no emission pledges and the most important recent trends and potential contribution to narrow the gap. The countries are ordered according to their emissions in 2010.

Country	Emissions 2010 (MtCO <sub>2</sub> -eq)	BAU emissions 2020 (MtCO <sub>2</sub> -eq)	Emissions 2020 Optimistic scenario (MtCO <sub>2</sub> -eq)	Emissions 2020 Pessimistic scenario (MtCO <sub>2</sub> -eq)
<b>Islamic Republic of Iran</b>	528	610	610	610
	Iran has no national emission targets or strategies for climate change or green growth. Actions supporting sustainable development, mitigation and adaptation are considered only in some national and regional development plans. Due to lack of political will, it seems unlikely that Iran would take strong action to cut emissions before 2020.			
<b>Turkey</b>	420	651	586	651
	Turkey has not set an emission reduction targets. However, Turkey has elaborated a comprehensive National Climate Change Action Plan to implement the National Climate Change Strategy 2010–2020. The plan includes an action plan for all relevant sectors and crosscutting areas although it would benefit from more concrete targets. Turkey has also taken an active role in carrying out mitigation actions including developing a voluntary carbon market and MRV system. The targets for energy sector include increasing the share of renewable energy in total electricity generation up to 30 % by 2023 and decreasing GHG emissions from electricity generation by 7 % compared to BAU 2020. Turkey is also implementing World Bank's Partnership for Market Readiness. The optimistic scenario estimates assumes some 10 % reductions by 2020 compared to the pessimistic scenario reflecting BAU.			
<b>Thailand</b>	413	635	540	635
	Thailand has not set any emission reduction targets, but the country has shown positive signs towards actively pursuing a low carbon emission society. The most important mitigation actions to be expected are related to the energy sector, for which the objectives are set in the			

	20-Year Energy Efficiency Development Plan and the 10-Year Alternative Energy Development Plan 2012–2021. The relevant targets include the reduction of energy intensity by 15 % in 2020 compared to levels in 2005, and increasing the share of renewable energy to 25 % of total energy consumption by 2021. Major uncertainties relate to support mechanisms, finance, and conflicting objectives between different strategic papers. If Thailand succeeds to reach the energy-related targets, the country may achieve 15 % emission reductions (optimistic scenario) compared to the pessimistic scenario reflecting the BAU. However, the emission level in 2020 are likely to be somewhere near 600 MtCO <sub>2</sub> -eq.			
Myanmar	362	688	688	688
	Myanmar is currently in a historic development stage where a new constitution was accepted in 2008 and military junta abolished in 2011. Myanmar has no national climate change strategy or reduction targets and GHG emissions are expected to grow by 2020. Myanmar is one of the least advanced countries when it comes to meeting reporting obligations to UNFCCC and the process of climate change policy creation has only recently begun.			
Pakistan	340	462	462	462
	Pakistan has not set any specific GHG reduction targets, only general non-quantifiable sector specific sets of policy measures covering energy, transport, town planning, industries, agriculture and livestock, carbon sequestration and forestry. It is unlikely to take any significant mitigation actions before 2020. A new government has taken office in May 2013, and several climate and development related initiatives, some addressing renewable energy, have been highlighted. However, it is almost certain that the Pakistani emissions will grow by 2020, taken note of continued population growth, projected GDP growth rates, as well as considerable reserves of coal, which may be used to answer to growing electricity needs. At this stage it is not possible to make any quantitative assessment of the mitigation potential for Pakistan by 2020.			
Malaysia	330	550	340	550
	Malaysia has announced that it will voluntarily reduce its emissions intensity of GDP by up to 40 % by 2020 with respect to 2005 levels. This would limit the total emissions to around 340 MtCO <sub>2</sub> -eq. Furthermore, the country has pledged that at least 50 % of the country's land area remains as forests and has set renewable energy target and sectoral target for energy savings. Despite promising action towards targets, the strong economic and energy demand growth and the high priority of raising living standards and eradicating poverty, make it unlikely that the announced targets will be met.			
Venezuela	310	405	405	405
	No GHG emission reductions from Venezuela are expected before 2020. The country has submitted an initial communication on climate change, but there are no concrete signals of carrying out any mitigation actions. Venezuela has announced to launch a program in 2013 for reducing GHG emissions across the major emitting sectors, but no official information is yet available.			
Saudi Arabia	310	805	725	805
	Saudi Arabia has not pledged to cut GHG emissions, and the country has shown generally low			



	<p>interest towards climate actions. Some GHG emission reductions can, however, be expected before 2020 due to the recent ambitious Renewable Energy Strategy and National Energy Efficiency Program. The major target is to generate 23–30 % of the electricity from renewable energy sources by 2032. A GHG emission reduction of 10 % is assumed in the optimistic scenario but the emissions are more likely to be somewhere near 750 MtCO<sub>2</sub>-eq in 2020.</p>			
<b>Vietnam</b>	306	520	280	520
	<p>Vietnam has taken an active role in promoting mitigation actions and set a number of strategic targets including for example 20 % GHG reduction target in agriculture and rural development sector. The targets are technically achievable but in practice they require faster changes in energy systems, industry, farming and forestry than the country is likely to witness.</p>			
<b>Total</b>	<b>3 300</b>	<b>5 300</b>	<b>4 600</b>	<b>5 300</b>

## 4 Changes to accounting rules

Emission accounting rules have a major impact on the actual emission reductions.<sup>215,216</sup> This section discusses the three main challenges in emission accounting rules covering i) Land use, land-use change and forestry (LULUCF), ii) assigned amount units (AAU) surplus, and iii) double counting.

### 4.1 Land use, land-use change and forestry

Activities in the LULUCF sector include two main lines of action: (a) increasing the removals of greenhouse gases from the atmosphere (e.g. by planting trees or managing forests), or (b) by reducing emissions (e.g. by curbing deforestation).

LULUCF emissions represent 22 % of the total global greenhouse gas emissions in 2010 (calculated as in CO<sub>2</sub>-eq.) as follows: agriculture 11 %, CO<sub>2</sub> and N<sub>2</sub>O from wood decay 5 %, CO<sub>2</sub> from peatland drainage and peat fires 3%, and forest fires 3%.<sup>217</sup> However, it is important to note that in many developing countries, LULUCF sector emissions are the largest emission category in the country due to the fact that other sectors (e.g. industry and transport) are relatively small compared to e.g. agriculture in the national economy. In addition, thinking about the post-2020 climate deal, the LULUCF sector emissions are likely to increase in developing countries unless decisive efforts are taken to change the trend.

Under Article 3.3 of the Kyoto Protocol, Parties decided that greenhouse gas removals and emissions through, *afforestation* and *reforestation* since 1990 are accounted for in meeting the Kyoto Protocol's emission targets. Under Article 3.4 of the Kyoto Protocol, Annex I Parties could elect additional human-induced activities related to LULUCF, specifically, forest management, cropland management, grazing land management and revegetation.

However, there are several challenges related to the LULUCF sector as a part of global mitigation activities, including the following: (a) it is often difficult to estimate greenhouse gas removals and emissions resulting from activities of LULUCF, (b) the way removals and emissions are calculated (accounting rules) has an influence on the outcomes, (c) permanence of the mitigation action, i.e. greenhouse gases may be unintentionally released into the atmosphere if a sink is damaged or destroyed through human-induced or natural disturbances, such as forest fires or diseases, and (d) currently, only part of the LULUCF activities (e.g. deforestation and forest degradation) are included in the negotiations of the post-2020 climate deal, whereas other activities (e.g. agriculture) have not received the attention they would merit. The future emission reduction potential in the LULUCF sector (Including REDD+) and related challenges are discussed in the Annex 2.

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<sup>215</sup> CDM Watch (2012)

<sup>216</sup> UNEP (2012 a)

<sup>217</sup> Ibid.

## New accounting rules for LULUCF under the Kyoto Protocol

### *Durban decisions*

The parties of the UNFCCC decided in Durban in 2011 to change the LULUCF accounting rules. The main elements of the Durban LULUCF decision are the following:

- Accounting of forest management becomes mandatory. Credits and debits during the commitment period will be calculated by subtracting a 'reference level' from the reported, actual emissions or emission removals. For most countries, this reference level is based on business-as-usual emission projections. There is also a cap on forest management credits equal to 3.5 % of base-year emissions,
- Accounting of afforestation, reforestation and deforestation (ARD), cropland management, grazing land management, and revegetation will remain essentially the same,
- Accounting of harvested wood products becomes mandatory,
- Excluding emissions due to natural disturbances (e.g. wildfires, storms) is allowed,
- Emission fluxes from wetland drainage and rewetting may be included.

### *The main implications of the decision taken in Durban are:*

- With the new LULUCF accounting rules, countries may receive credits from forest activities (forest management, afforestation/reforestation, deforestation) that could increase CO<sub>2</sub> removals.
- These credits may subsequently be used to achieve pledged emission targets, and thereby actually raise the total allowed levels of greenhouse gas emissions (excluding LULUCF, but including LULUCF credits) resulting from the pledges by Annex I countries. For Annex I countries following the new rules in the second commitment period, the new accounting rules could result in LULUCF credits to the amount of up to 2 % of 1990 emission levels (about 400 MtCO<sub>2</sub>-eq).<sup>218</sup> (Table 26).
- The projected number of LULUCF credits for the EU is relatively small, but for other countries these credits may substantially add to the necessary emission reductions outside the LULUCF sector.

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<sup>218</sup> Elzen et. al. (2012), Analysing the emission gap between pledged emission reductions under the Cancún Agreements and the 2 °C climate target. PBL Netherlands Environmental Assessment Agency (PBL)

**Table 26.** Estimated LULUCF credits for all Annex I countries, by 2020, due to LULUCF accounting rules for the second commitment period<sup>4</sup>

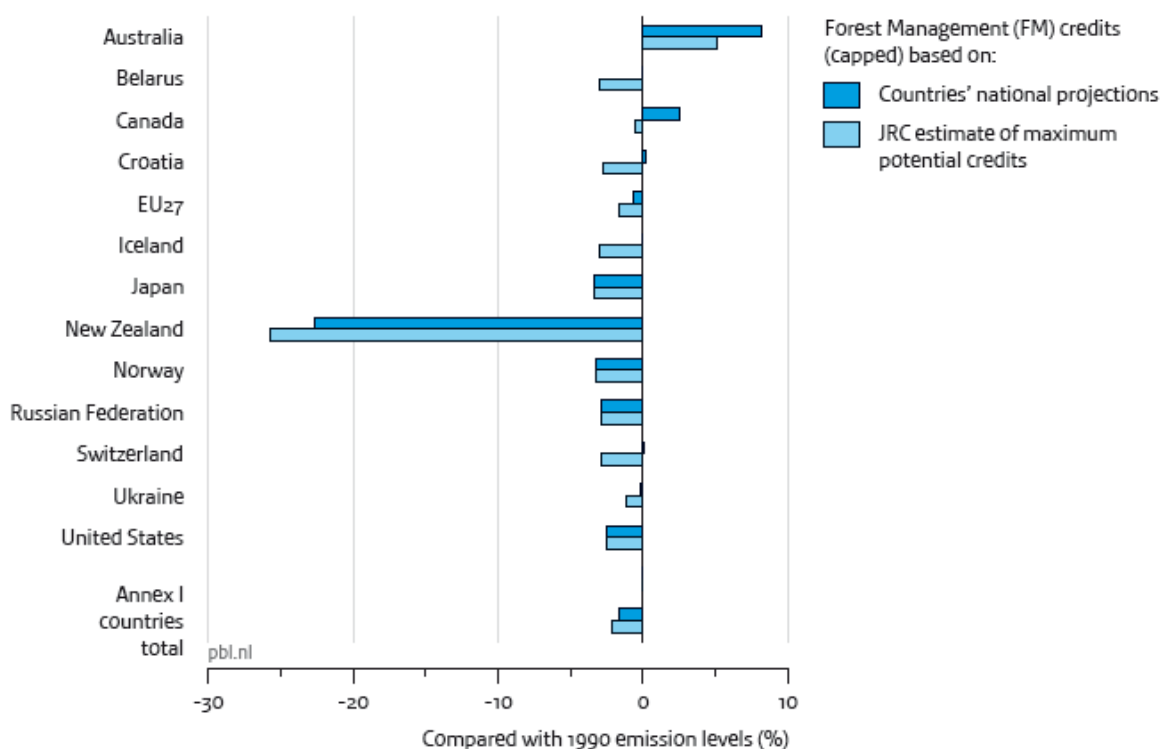
				Estimated LULUCF credits	
				MtCO <sub>2</sub> -eq	Share of 1990 emissions in Annex I countries
Country	projections	for	forest management (FM)	298	1.6%
JRC <sup>219</sup> Maximum estimate of FM credits				403	2.1%

The total in LULUCF credits per country depends on country's forest age structure. When historical net emissions are used as a reference level, a country with an increasing sink due to young and thus fast growing forests would receive credits independent of additional actions, while a country with a declining sink due to old forests would end up with debits – even if its forest management would be sustainable. By introducing the concept of a projected reference level in forest management accounting, the additionality issue could be solved at least in theory, because any credit would reflect additional changes. In practice, the assumptions used in projections add a level of largely unavoidable uncertainty, which may be significant for some countries<sup>220</sup>.

For instance, LULUCF credits resulting from the new accounting rules could change the reduction target for greenhouse gas emissions for New Zealand by more than 25 % of its 1990 emission level, from -20 % (excluding LULUCF credits) to +6 % (including LULUCF credits), relative to 1990 levels for its high pledge. This because of the age structure of New Zealand's forests, which is dominated by young, fast growing plantations (Figure 2, Table 26).

<sup>219</sup> JRC = Joint Research Centre of the European Commission, Ispra, Italy

<sup>220</sup> Grassi et al. (2012), The role of the land use, land use change and forestry sector in achieving Annex I reduction pledges. Climatic Change 115, 873–881.



**Figure 2.** Impact of carbon credits resulting from options for forestry accounting rules, by 2020<sup>221</sup>.

#### *Strict and lenient accounting rules*

Emission reductions expected from unconditional, low and high pledges, for all Annex I countries, with and without maximum estimates of LULUCF credits, are listed in Table 27. This table shows the scale of the impact on emission reductions expected from different countries with or without LULUCF credits with three emission reduction pledge scenarios. The pledges shown in table are scenarios (lowest, low, high) of emission reduction policies and pledges of countries (for more detailed explanation, please see the footnote of the table 27). The impact of the maximum LULUCF credits on aggregated Annex I emission targets (compared to 1990 emission levels) for the low and high pledges is 1.5 % for low pledges and 2.1 % for high pledges, respectively. For the unilateral pledges, no significant impact is expected, as Canada, the EU, Japan, Russia and the United States all have no LULUCF credits<sup>222</sup>, EU by decision and others either not being Parties of the Kyoto Protocol or its second commitment period.

<sup>221</sup> Elzen et. al. (2012), Analysing the emission gap between pledged emission reductions under the Cancún Agreements and the 2 C climate target. PBL Netherlands Environmental Assessment Agency (PBL)

<sup>222</sup> Ibid.

**Table 27.** The impact of the maximum LULUCF credits according to LULUCF accounting rules, for the second commitment period, on the emission reduction targets (below 1990 levels) for Annex I countries for 2020, resulting from the pledges submitted by the Parties in the Cancún Agreements (Elzen et al. 2012).

Relative to 1990 emission levels	Unconditional pledge (*)		Low pledge (**)		High pledge (***)	
	Excluding LULUCF credits (%)	Including maximum LULUCF credits (%)	Excluding LULUCF credits (%)	Including maximum LULUCF credits (%)	Excluding LULUCF credits (%)	Including maximum LULUCF credits (%)
Australia	29	23	29	23	2	–4
Belarus	–5	–2	–5	–2	–10	–7
Canada	27	27	3	3	3	3
Croatia	–5	–2	–5	–2	–5	–2
EU27	–20	–20	–20	–20	–30	–28
Iceland	–30	–27	–30	–27	–30	–27
Japan	5	5	–25	–22	–25	–22
New Zealand	–10	16	–10	16	–20	6
Norway	–30	–27	–30	–27	–40	–37
Russia	–26	–26	–15	–12	–25	–22
Switzerland	–20	–17	–20	–17	–30	–27
Ukraine	–20	–20	–20	–19	–20	–19
United States	18	18	–3	–1	–3	–1
Kazakhstan	–26	–26	–26	–26	–26	–26
Annex 1 total	–5	–5	–12	–11	–18	–16

(\*) Unconditional pledge – Pledges made by countries without conditions attached to their fulfilment. This usually leads to least ambitious (lowest) reductions of emissions.

(\*\*) Low pledge - Low pledges refers to a scenario in which countries with only one (conditional) emission reduction pledge for 2020 implement those pledges.

(\*\*\*) High pledge - These pledges refer to a country's most ambitious and conditional emission reductions by 2020.

The UNEP Emission gap report<sup>223</sup> recommends maximizing the use of “strict” rules and minimizing the use of “lenient” rules for LULUCF credits and surplus emission credits. “Strict” rules mean that allowances from LULUCF accounting and surplus emission credits will not be counted as part of a country meeting its emissions reduction pledges, i.e. in the case of LULUCF accounting, no credits are used towards achieving the emission reduction targets, whereas according to the “lenient” rules, these elements can be counted and used towards achieving the emission reduction targets.

Grassi et al.<sup>224</sup> estimates that the potential contribution of LULUCF accounting under these new rules is relatively modest (maximum 2 % difference between strict and lenient accounting) for all the Annex I Parties of the first commitment period. Based on the same study, the UNEP Emission gap report 2012<sup>225</sup> uses the value of 0 MtCO<sub>2</sub>-eq in the strict case (see Table 28) and 300 MtCO<sub>2</sub>-eq in the lenient case, assuming that all Annex I countries adopt the new rules, whereas UNEP Emission gap report 2010 used the value of 800 MtCO<sub>2</sub>-eq for the lenient case. The 2012 Emission gap report concludes that the value of 300 MtCO<sub>2</sub>-eq used in the report may be an underestimate if countries like Canada and USA adopt different practices than countries inside the monitoring requirements since the quality of the estimates is rewarded. Thus, we used the value of 800 MtCO<sub>2</sub>-eq presented in the 2010 Emission Gap Report instead.<sup>226</sup>

**Table 28.** The potential of LULUCF rules to reduce emissions by 2020 compared to 1990 levels. The optimistic scenario is the “strict rules case” (see the text above), where no credits are used towards achieving the emission reduction targets. The pessimistic scenario is the estimation presented in the UNEP 2010 Emission Gap Report on the potential of the “lenient rules case”, where countries maximally use the credits towards achieving the emission reduction targets.

Optimistic scenario	Pessimistic scenario
0 MtCO <sub>2</sub> -eq	-800 MtCO <sub>2</sub> -eq

## 4.2 Assigned amount units surplus

The fall of communist regimes in Eastern Europe led to economic collapse and major reduction of GHG emissions in the beginning of 1990s. Therefore, Russia (5 800 MtCO<sub>2</sub>-eq), Ukraine (2 600 MtCO<sub>2</sub>-eq), Poland (800 MtCO<sub>2</sub>-eq) and Romania (700 MtCO<sub>2</sub>-eq) have generated very large surplus of Assigned Amount Units (AAUs) during the first commitment period (CP1).<sup>227</sup> Due to the financial crisis in 2008-2009 and subsequent economic downturn, also Western European countries have

<sup>223</sup> UNEP (2012 a)

<sup>224</sup> Grassi et al. 2012.

<sup>225</sup> UNEP (2012 a)

<sup>226</sup> These countries, while respecting principles of conservativeness, would have the capacity to provide higher precision and accuracy in their LULUCF estimates. Grassi et al. (2008), Applying the conservativeness principle to REDD to deal with the uncertainties of the estimates. Environmental Research Letters 3, 1-12.

<sup>227</sup> Point Carbon (2012), Carry-over of AAUs from CP1 to CP2 – future implications for the climate regime. A Briefing by Point Carbon



seen their emissions fall rapidly since 2009.<sup>228</sup> The AAU surplus has been considered as one of the most crucial loopholes in the Kyoto Protocol system.<sup>229</sup> The total amount of excess AAUs from the first commitment period is estimated to be around 13 000 MtCO<sub>2</sub>-eq.

The problem of AAU surplus has been actively discussed as various interest groups introduced proposals to restrict the carry-over of AAUs from the first commitment period to the second commitment period (CP2). At the same time, some parties led by Russia built up strong opposition to new restrictions. A compromise aiming to solve the problems regarding large surplus from CP1 and possible excess accumulation of surplus during CP2 was reached at COP 18 in Doha. This section shortly illustrates the decisions made in Doha and brings up their main impacts and challenges.

### Accumulation of surplus in CP2

Each Annex I party has assigned a quantified emissions limitation and reduction objective (QELRO)<sup>230</sup> for CP2<sup>231</sup>. The ambition levels of the targets vary between parties. In principle, by setting the QELRO inadequately high a party can accumulate surplus units which it can then sell to other parties. This imposed a serious threat to the integrity of the Kyoto Protocol and undermines the emission reduction efforts of other parties. Therefore, new rules were agreed at Doha to prevent excess accumulation of surplus.

The reform was passed as an amendment to Kyoto Protocol (paragraph 3.7ter). The amendment states that *“Any positive difference between the assigned amount of the second commitment period for a Party included in the Annex I and average annual emissions for the first three years of the preceding commitment period multiplied by eight shall be transferred to the cancellation account of that Party.”* This means that a country with a commitment in CP2 will receive at most the number of AAUs that equals its average emissions during 2008–2010 multiplied by 8, the number of years in CP2. This way, a country participating in CP2 has to at least stabilize its emissions to the 2008–2010 average level.

This amendment was resisted by Russia, Ukraine, Kazakhstan and Belarus which initially submitted QELROs much higher than their average emissions during 2008–2010. The EU had also difficulties in coming to a clear negotiation position. With a public statement that the EU will implement CP2 jointly in accordance with Article 4 of the Kyoto Protocol and will therefore interpret that Article 3.7ter will only apply to the EU as a whole, the EU could close a negotiation position in Doha. Ukraine, Kazakhstan and Belarus, however, remained reluctant and have threatened to withdraw from CP2 due to the amendment.<sup>232</sup>

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<sup>228</sup> European Environmental Agency (2011), Why did greenhouse gas emissions fall in the EU in 2009? EEA analysis in brief  
<sup>229</sup> e.g. CDM Watch (2012)

<sup>230</sup> QELROs are expressed as percentage of GHG emissions with respect to country's emissions in base year (mostly 1990).

<sup>231</sup> The QELROs of Annex I countries are listed in: UNFCCC (2012 b). Report of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol. FCCC/KP/CMP/2012/L.9

<sup>232</sup> Abeyasinghe Ashala (2013), Analysing Doha Decisions on Climate Change in the Context of LDC Group Negotiating Positions. International Institute for Environment

## Carry-over of AAUs from CP1 to CP2

The new Doha rules regarding the carry-over and use of AAUs from CP1 during CP2 were passed as a Kyoto decision. The rules regarding carry-over of the AAUs and other Kyoto units from CP1 to CP2 remained unchanged. This means that a party can transfer AAUs fully and ERUs, CERs and RMUs up to 2.5 % of the AAUs it received for CP1 to CP2. AAUs from CP1 are banked to Previous Periods Surplus Reserve (PPSR). They can be used with no limitation to compensate the party's own emissions which exceed its initial assigned amount in CP2. However, trading CP1 surplus AAUs is limited according to following rules:

- A party with emission reduction target in CP2 can buy CP1 surplus units only from another party with a commitment in CP2.
- A party can buy CP1 surplus units only up to 2 % of the amount of AAUs it received for CP1.
- A party with a commitment in CP2 cannot use its own CP1 surplus units to meet CP2 target and then sell AAUs from CP2 to other countries.

In addition, some countries<sup>233</sup> made a political statement to not to buy any AAUs from CP1 in CP2.

Some topics regarding the carry-over and use of AAU surplus from CP1 remained unsolved in Doha. Although countries with no commitment in CP2 cannot sell their CP1 AAUs to countries with commitment in CP2, the status of these AAU units during and after CP2 remained unclear. Also no decision was made concerning what will happen to the surplus of Kyoto units after CP2. These topics are expected to come up again under the Durban Platform discussion on the future climate regime.

## Combined impacts of Doha decisions

The decisions made in Doha have rather complicated combined impacts. The main issue is that countries in CP2 can use CP1 AAU surplus only to meet the initial announced target (that is QELRO). If the 3.7ter, requiring the emissions to be stabilised in 2008–2010 levels, sets a tighter emissions target than QELRO, the country cannot use CP1 surplus to meet the difference in between these two targets. The combined impacts are explained in an example in the Annex I.

## Country level impacts

According to an estimation made by the Carbon Market Watch<sup>234</sup>, freezing of the emission targets to 2008–2010 average levels reduces the AAUs from the whole CP2 by 3 570 MtCO<sub>2</sub>-eq<sup>235</sup>. This reduction is divided between Australia (76 MtCO<sub>2</sub>-eq), Belarus (265 MtCO<sub>2</sub>-eq), Kazakhstan (695 MtCO<sub>2</sub>-eq) and Ukraine (2 532 MtCO<sub>2</sub>-eq). Belarus, Kazakhstan and Ukraine have, however, far lower BAU estimates than their QELROs and, therefore, their real additional demand for emission credits in CP2 are around 90 MtCO<sub>2</sub>-eq, 290 MtCO<sub>2</sub>-eq and 420 MtCO<sub>2</sub>-eq respectively.

Belarus and Kazakhstan had no commitments in CP1. Instead Ukraine which had a target in CP1 has generated a vast AAU surplus (2 650 MtCO<sub>2</sub>-eq). However, as country's BAU emissions are estimated to be much lower than the QELRO and the CP1 AAU surplus can be used only for the part of

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<sup>233</sup> Australia, Japan, Liechtenstein, Monaco, Norway and Switzerland

<sup>234</sup> Kollmuss, Anna (2013), Doha decisions on the Kyoto surplus explained. Carbon Market Watch Policy Brief

<sup>235</sup> The total demand for emission credits in CP2 is estimated to be around 2200 GtCO<sub>2</sub>-eq and therefore, this CP2 AAUs reduction cannot be considered as an additional emission reduction.

emissions exceeding the QELRO, Ukraine is unlikely to benefit from the surplus<sup>236</sup>. Also Australia has generated a small AAU surplus (160 MtCO<sub>2</sub>-eq) from CP1. It can also use this surplus as the country's BAU is larger than QELRO.

Under these circumstances it seems unlikely that Belarus or Ukraine would ratify CP2. Kazakhstan's decisions, however, remains yet to be seen as the country has shown more positive attitude in climate negotiations. For Australia the Doha rules does not have such a great impact and the country has supported the new rules.

### Total impact on emissions

New Doha rules limiting the use of CP1 AAU surplus and surplus accumulation during CP2 successfully improve the integrity of the Kyoto Protocol. According to the UNEP Gap Report the emission reduction potential of limiting carry-over of CP1 surplus would be at best 1 800 GtCO<sub>2</sub>-eq. This estimate is, however, very optimistic. In the report by Carbon Market Watch<sup>237</sup> the total reduction in CP2 AAUs is 3 570 MtCO<sub>2</sub>-eq. However, the required emission reductions from the parties of CP2 compared to BAU are only around 2 200 MtCO<sub>2</sub>-eq. Furthermore, it seems unlikely that Belarus and Ukraine would participate CP2. This reduces the gap between BAU and CP2 AAUs to 1 700 MtCO<sub>2</sub>-eq<sup>238</sup> which is considered as an optimistic evaluation of the impact of Doha rules. As a number of countries participating CP2 are engaging important emission reduction actions the real emission reduction impact of Doha can be pessimistically only around 500 MtCO<sub>2</sub>-eq. For example EU may not need to buy any emission credits from other countries. Also Australia has a strong emission reduction scheme. Despite the impact of Doha decisions may seem minor with respect to the current emission targets, their importance may multiply if more stringent emission targets are set for 2020.

**Table 28.** The impact of Doha decisions on the emissions in 2020 in optimistic and pessimistic cases.

Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
1 700 MtCO <sub>2</sub> -eq	500 MtCO <sub>2</sub> -eq

## 4.3 Double counting

Double counting refers usually to a situation in which the same emission reductions are counted to meet the emission targets of two countries. In addition, double counting can occur if a country uses the same emission reduction credits towards several different, for example emission and financial obligations. Double counting occurs mainly in developing countries where developed countries support emission reductions through CDM-projects or new market mechanisms (NMM). The rules regarding double counting are still largely missing and the importance of tackling the problem has

<sup>236</sup> Belarus may, however, sell some CP1 surplus credits according to the Doha rules. These sells can be estimated to be very low compared to the amount of surplus credits.

<sup>237</sup> Kollmuss, Anna (2013)

<sup>238</sup> Ibid.

not yet been fully understood by all countries although it has been mentioned in a number of UNFCCC statements and decisions<sup>239</sup>. On the contrary, some countries have indeed announced that they use sold emission reduction units also towards their own pledges.<sup>240</sup>

Three general types of double counting can be identified<sup>241</sup>:

- Double issuance: Same credits issued in more than one unit type
- Double claiming: Emission reduction counted by both host and the buyer country to achieve their mitigation targets
- Financial double counting: Purchased credits counted both as mitigation and financial contribution

The first type refers to a situation in which the same emission reduction is utilised for example as both CDM offset and NMM credits. Solving this problem requires a common international transaction tracking system monitoring all offsets and using an individual serial number for each emission unit. It should include various types of emission reduction activities including NAMAs and non-market based activities. In addition to tracking system, a clear set of rules regarding the relationship between CDM, NMM and other trading mechanisms is needed to ensure that the same activities will not generate emission units under multiple crediting schemes.<sup>242, 243</sup>

Double claiming is the double counting type mainly discussed in UNEP Gap report. It could be fixed simply by adding an equivalent amount of emission units to the host country's emission account that it has sold. As above, the establishment of a transparent emission tracking and accounting framework is essential in ensuring the integrity of emission reductions, and advancing NMMs and the framework for various approaches (FVA).

Financial double counting refers to a situation in which a country uses the same purchased emission credits to meet both its emission target and financial or for example technology transfer obligations. This problem is in principle easy to solve. Countries should be allowed to count the purchased credit only towards either the emission or the financial obligation.

Similar suggestions to avoid double counting can be found widely in the literature. Erickson and Lazarus<sup>244</sup> highlight the importance of establishing robust, internationally coordinated offset accounting rules to avoid double counting. Roche<sup>245</sup> suggests that emission units should be *"accurately and consistently recorded and tracked, especially at points of issuance and retirement"*. Prag et al. 2013<sup>246</sup> emphasize adoption of a universally applied emissions accounting framework. Generally, there is a wide consensus and fairly straightforward and feasible technical solutions to

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<sup>239</sup> e.g. FCCC/CP/2011/9/Add.1, paragraph 79 & FCCC/CP/2012/8/Add.1, paragraph 42, 46 and 51

<sup>240</sup> UNEP (2012 a)

<sup>241</sup> Rocha, Marcelo (2013), Elaborating the "framework for various approaches" under the UNFCCC. Prepared for the Climate Change Expert Group (CCXG) Global Forum.

<sup>242</sup> Carbon Market Watch (2013 a), Submission on Framework for Various Approaches, Forum Umwelt und Entwicklung.

<sup>243</sup> Carbon Market Watch (2013 b), Views on the framework for various approaches and the new market mechanism. Forum Umwelt und Entwicklung.

<sup>244</sup> Erickson, Peter; Lazarus, Michael (2011), The Implications of International Greenhouse Gas Offsets on Global Climate Mitigation. Stockholm Environment Institute Working Paper.

<sup>245</sup> Rocha, Marcelo (2013)

<sup>246</sup> Prag, A. et al. (2013)

address double counting. However, the solution requires political will and international cooperation as well as strong action.

Double counting problem has gained increasing attention especially in the deliberations regarding FVA and NMMS. Therefore, the Subsidiary Body for Scientific and Technological Advice (SBSTA) recently called for views from parties regarding framework for various approaches. Most of the submissions emphasised the importance of addressing the double counting problem, which imposes a serious threat to the environmental and financial integrity of international units.<sup>247</sup> The important decisions of how to deal with the problem are, however, yet to be made and the discussion regarding double counting can be expected to continue in COP 19.

According to the UNEP Gap Report solving double counting rules and improving CDM additionality could reduce the emission gap by 1 500 MtCO<sub>2</sub>-eq. The UNEP Bridging the Emissions Gap report 2011<sup>248</sup> estimates that double counting, if not properly addressed, could increase the emission gap by 1 300 MtCO<sub>2</sub>-eq. Erickson and Lazarus<sup>249</sup> suggest that double counting could reduce the current emission reduction ambition by up to 1 600 MtCO<sub>2</sub>-eq. These estimates include, however, only double claiming. The optimistic and pessimistic regarding estimated emission impact of avoiding double counting is presented in table 29. They are very theoretical in nature as the scale of double counting problem is hard to assess. Also, as the number of cap and trade schemes increases globally double issuance may become larger problem than it currently is. The impact of financial double counting remains hard to assess. Therefore, the problem of double counting is somewhat more serious than the figures in the table 29 estimate.

**Table 29.** The potential emission reduction impact of avoiding double counting.

Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
1 300 MtCO <sub>2</sub> -eq	1 600 MtCO <sub>2</sub> -eq

<sup>247</sup> SBSTA (2013), Views on a framework for various approaches. Submissions from Parties.

<sup>248</sup> UNEP (2011)

<sup>249</sup> Erickson, P.; Lazarus, M. (2011)

# 5 International Cooperative Initiatives

## 5.1 The political context

Based on a number of studies and an increasing amount of concrete experiences, actions “outside of the negotiations” through International Cooperative Initiatives (ICIs) represent major opportunities for narrowing the pre-2020 ambition gap, as well as contributing to the subsequent pathway toward low-carbon societies.

The ICIs discussed so far have highlighted various bottom-up actions, which combined into coordinated global initiatives could produce considerable emission reductions. Coordinated actions by major companies, groups of cities and/or citizens, action on special sectors (such as aviation, maritime transport, agriculture, deforestation), accelerating actions on energy efficiency and renewable energy solutions as well as initiatives addressing methane and other air pollutants have been proposed as potential key ICIs.<sup>250</sup>

At the COP18 in Doha the EU encouraged the UNFCCC to recognize ICIs and consider means to increase the transparency of such initiatives, their potential to close the gap and highlighting lessons learned and best practices from such initiatives. Also, several developed countries, such as Japan, US and New Zealand, stressed considerable action that is taking place by a multitude of actors through ICIs. However, a number of Parties (including most vocally many Least Developed Countries) fear that ICIs may weaken (as opposed to complement) the strong and stringent mitigation commitments under the Convention.

In many cases, ICIs afford the types of flexible, nationally-appropriate and innovative approaches that were not historically a part of the formal negotiating process. As the negotiations have become more ‘bottom-up’ and country driven in recent years, and our understandings of the ambition gap increases, it is not surprising that ICIs are being looked at as a key part of the climate puzzle moving forward, both within and outside of the UNFCCC.

## 5.2 Emission reduction potential through ICIs by 2020

ICIs provide opportunities to help bridge the ambition gap, and avoid investments that further “lock in” our societies to high energy and carbon intensive production and consumption patterns, and catalyze action in line with the latest climate science findings.

The study by Blok et al 2012<sup>251</sup> identified a set of 21 initiatives for additional global climate action covering action on energy efficiency, energy supply, methane and other air pollutants, actions by major GHG emitting companies (including Top-1000 companies emission reduction, supply chain emission reductions, green financial institutions, voluntary offsets by companies), action in special

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<sup>250</sup> See e.g. Blok et al. (2012)

<sup>251</sup> Ibid.

sectors (including aviation, maritime transport, fluorinated gases initiative, reduced deforestation, agriculture) as well as other actions such as voluntary offsetting by consumers, action by sub-national governments and the Major cities initiative.

According to this study, considerable emission reduction potential – possibly in the range of 10 GtCO<sub>2</sub>e/a - exist for narrowing the gap through ICIs. This particular study focused on initiatives that are already on-going, with pre-2020 up-scaling potential, and for which there is an organization (or a combination of organizations) available that could lead an up-scaled global initiative. The initiatives included in the study consisted only of measures with an minimum emission reduction potential of 0,5 GtCO<sub>2</sub>e by 2020 GtCO<sub>2</sub>e, and which also have the capacity to produce significant co-benefits (in addition to GHG emission reductions).

Taken note that the preliminary findings indicate the potential of narrowing the gap through ICIs could be considerably higher than what is possible e.g. through stricter accounting rules, it is crucial to understand better various ICIs and how to harness their potential. Obviously, all emission reduction potentials must be scrutinized in detail, taking note of the further emission reduction that will be required also post-2020 and ICIs must be seen as complementary to all other emission reduction efforts. Also, as pointed out above, for several of the ICIs, methodological issues related to MRV and double-counting still pose considerable challenges in rapidly up-scaling these initiatives.

A new study by Ecofys, prepared in collaboration with University of Cambridge (forthcoming in fall 2013)<sup>252</sup>, provides an updated analysis of the emissions reduction potential of selected ICIs and their feasibility<sup>253</sup> to deliver emissions reductions by 2020. The study also explores options for strengthening their uptake and speed-up their up-scaling, options for addressing transparency with regards to the double-counting and additionality of emission reductions. The study also analyses institutional aspects, the roles for potential lead organizations and in particular compares the pros and cons of different options for UNFCCC involvement.

The study focuses on 14 ICIs<sup>254</sup> covering ten sectoral initiatives (or “wedges” to narrow the gap) and four actor type wedges, summarized in table 30 below. The figures analyzed and presented, are based a number of publicly available studies, research conducted by various initiatives and expert estimates.<sup>255</sup> The components (in most cases these ICIs cover a number of activates/sub-initiatives) included under each of these ICIs and sources of the respective emission reduction potential estimates are described in more detail in the Ecofys 2013 study.

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<sup>252</sup> Harrison, N., Bartlett, N., Braun, N., Deng, Y., Dixon-Declève, S. and Höhne, N. (2013) Enhancing ambition through International Cooperative Initiatives. Nordic Council of Ministers. Report commissioned by the Nordic working group for global climate negotiations (NOAK).

<sup>253</sup> Including level of establishment; barriers faced in scaling-up activities; options for scaling-up; scope and leadership capability; and the need for government support e.g. through public finance or legislative/policy changes.

<sup>254</sup> Based mainly on ICIs identified in (Blok et al. 2012) and ICIs identified in 2013 submissions to the ADP.

<sup>255</sup> Whenever feasible, the study differentiates between full technical potential, potential of an initiative, possible full effect of agreed targets and expected effect of implementation of targets. Where available, the study also highlights reductions achieved to date.



**Table 30.** Summary of ICIs and their mitigation potential as identified and analyzed in the Ecofys (2013) study.

Description of ICIs	Emission reduction potential 2020 (MtCO <sub>2</sub> -eq)	Additional remarks on mitigation potential 2020 (MtCO <sub>2</sub> -eq)
<i>ICIs in sector wedges</i>		
Renewables: Boost solar photovoltaic and wind energy	1 000 - 2 500	1 400 (solar) and 1200 (wind) respectively in Blok et al. (2012)
Energy efficiency: Building heating and cooling	600	same as in Blok et al. (2012)
Energy efficiency: Ban of incandescent lamps	~ 500	same as Blok et al. (2012)
Energy efficiency: Electric appliances	~ 300 – 700	600 in Blok et al. (2012)
Energy efficiency: Cars & trucks emission reduction	1 700	700 in Blok et al. (2012) <sup>256</sup>
Energy efficiency: International aviation and maritime transport	~ 400	200 in Blok et al. (2012) <sup>257</sup>
Fossil fuels subsidy reform	1 000 - 4 500	900 Blok et al. (2012) <sup>258</sup> IMF assessing the potential up to 4500 by 2020 <sup>259</sup>
Fluorinated greenhouse gases	300	same as in Blok et al. (2012)
Reduce deforestation	1 000 - 4 000	1 800 (Blok et al, 2012) <sup>260</sup>
Short-Lived Climate Forcers (SLCFs)	~ 1 000	SLCFs here covering black carbon, methane, HFCs
<i>ICIs in actor wedges</i>		
Top 1000 companies	700	same as Blok et al. (2012)
Supply chain emissions reductions	200	same as Blok et al. (2012)
Green Financial Institutions	400	same as Blok et al. (2012)
Major cities	~ 700	same as Blok et al. (2012)
<b>Total</b>	<b>9 800 – 18 200</b>	-

<sup>256</sup> Assuming an initiative that would agree to save one additional litre per 100 km globally by 2020 for cars, and equivalent reductions for trucks, this could result in a global emissions reduction of up to 0.7 Gt CO<sub>2</sub>e .

<sup>257</sup> Assuming that leading aircraft and ship manufacturers could agree to design their vehicles to capture half of the technical mitigation potential of around 0.3–0.5 Gt CO<sub>2</sub>e in 2020, as estimated in the UNEP 2011 Gap report.

<sup>258</sup> Blok et al 2012 estimates the full reduction potential at ~1.8 Gt CO<sub>2</sub>e and suggests international efforts could capture at least 50% of these by 2020, resulting in an emissions reduction of 0.9 Gt CO<sub>2</sub>e.

<sup>259</sup> IMF, 2013. Energy Subsidy Reform: Lessons and Implications. Executive Summary.

<sup>260</sup> Assuming roughly halving of global deforestation by 2020, hereby estimating a potential reduction of up to 1.8 Gt CO<sub>2</sub>e.

## 5.3 Raising ambition through ICIs – priorities and practical steps forward

Several of these ICIs are already moving on the ground and step-wise contributing to emission reductions. Based on available research they also represent important potential for up-scale and hereby opportunities to narrow the global emission reduction gap by 2020 and also beyond. As the table indicates, the estimates for emission reduction potential for a number of ICIs vary considerably – in some cases by several GtCO<sub>2</sub>-eq, depending on assumptions used and time scales - e.g. concerning phasing out of fossils fuel subsidies, reduced deforestation, upscale of renewable technologies.

Taking note of the identified emission reduction potentials, as well as multiple opportunities for co-benefits, many government, non-state and private sector actors are putting significant resources and political will into various ICIs. Across both developed and developing countries, initiatives outside of the formal negotiating process have taken off in recent years, and many key actors see a strong role for ICIs moving forward in supporting low-carbon, climate resilient development in a much broader way than strictly under the UNFCCC process.

In many cases, the elements that make ICIs so attractive and potentially effective are the same factors that make them challenging to formalize. Many ICIs are voluntary, “coalitions of the willing” in particular sector or policy areas. By their nature, most do not have a strong (or any) focus on mandatory measurement, reporting or stringent transparency measures. Broad participation can be achieved given this lack of bindingness. When discussions are brought under the UNFCCC there is often a presumption of applicability of additional transparency or commitment, and commensurate reporting requirements.

There are a number of potential ‘hooks’ for ICIs in the negotiations, including under the newly-formed Durban Platform for Enhanced Action (ADP) track. Discussions related to NAMAs, REDD+, New Market Mechanisms (NMM) and Framework for Various Approaches (FVM) are all taking shape in ways that favour the inclusion of broad-based action and nationally, bilaterally or regionally driven approaches to mitigation. This includes activities not currently under the UNFCCC umbrella. ICIs are also explicitly included in ADP discussions as an option for increasing the pre-2020 ambition. In particular, the importance of other complementary actions and ICIs are noted in the reports emerging from the roundtables held most recently at COP 18 in Doha and from the co-Chair’s reflections for the year ahead.<sup>261</sup>

At the same time, the Durban Platform discussions are very nascent and vague. Though many of the elements of a future agreement have been under discussion for years, there are few substantive placeholders and no negotiating text as of yet. Some Parties are also concerned with overloading the

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<sup>261</sup> One of three guiding questions for roundtable discussions was “How international and national actions that are additional and are therefore supplementary to the pledges made by Parties can be strengthened”. The Chair summary noted that many Parties see the “need for more practical and results oriented discussions on concrete areas of action for increasing ambition, specific actions and best practices at the national level, and specific cooperative initiatives at the international level which can help to bridge the ambition gap, as well as ways to strengthen such actions and initiatives.” For more information: <http://unfccc.int/resource/docs/2012/adp1/eng/9infnot.pdf>

discussions with too many elements, which could pose a challenge for the further integration of ICIs into discussions.

While progress within the UNFCCC framework is insufficient to say the least, and the ICIs globally present huge emission reduction opportunities – at least on the drawing board currently – it is important to note that methodological issues pose challenges both inside and outside of the negotiations. The relationship between the UNFCCC and ICIs is further complicated by issues of double-counting and accounting methodologies. For example, it is difficult to determine what sub-national or city-level initiatives can be considered ‘additional’ based on national level reporting, just as it can be difficult to capture the full scope of private sector emissions reductions in national communications. The challenges in designing effective methods of measurement and accounting are of particular concern in the context of carbon markets. The potential for a credit to be double or even triple counted becomes more of a reality the more bottom-up and complex the process becomes. Issues of double counting and additionality are extremely relevant not only for the emission reductions themselves but also for the financial commitments and actual flows of resources.

The study by Ecofys (2013) suggests some possible ways to address challenges related to additionality and double-counting. Also a number of ICI design aspects, and measures for international oversight and support – including share of roles by UNFCCC and other organizations that could serve to track, support and strengthen ICIs are presented in the forthcoming study.

## 6 Key findings and conclusions

According to the UNEP 2012 gap report, global GHG emissions are on a pathway to grow from the 2010 level of approximately 49-50 to 58 GtCO<sub>2</sub>-eq by 2020 without decisive action. In light of the recent IPCC AR5 this trend is increasingly alarming, taking note of a remaining global carbon budget of less than 1000 GtCO<sub>2</sub>-eq (which would be used up in less than 20 years with current trends), if we wish to have a “likely” chance of keeping the global average temperature rise this century under 2 degrees Celsius.

In light of the recent IPCC AR5 this trend is increasingly alarming, taking note of the remaining global carbon budget of less than 1000 GtCO<sub>2</sub>-eq<sup>262</sup>, if a “likely” chance of being on track to stay below the 2°C is aimed for. Simultaneously, there is a wealth of studies indicating the existence of global emission reduction potentials in excess of the 8 to 13 GtCO<sub>2</sub>-eq emissions gap for a “likely” chance of being on track to stay below the 2°C. Currently there is a consensus among scientists that countries’ current emission pledges and commitments would most likely result in 3.5 to 4°C warming during this century.<sup>263</sup> However, concrete information on actual policy measures, their effectiveness and contribution to narrowing the gap is being produced in a number of initiatives and research efforts.

In our study we have taken a look at selected countries, including key GHG emitting countries, emerging countries as well as some other countries, with total emissions in the range of 35 GtCO<sub>2</sub>-eq, i.e. contributing to some 70 % of global GHG emissions. Our study has made an assessment of the potential of these countries to contribute to narrowing the 2020 gap. The study has also looked into opportunities to reduce emissions through more transparent and stricter GHG emission accounting rules and systematic and speedy up-scaling of International Cooperative Initiatives (ICIs).

Firstly, our study has reviewed the status of selected countries with commitments and countries without commitments. We note several positive developments in the past 12 months, notwithstanding the fact that no major increases in the official pledges have been made and remain highly unlikely in the run-up to 2015. Recent developments major GHG emitting countries e.g. in USA, China (including their bilateral negotiations e.g. on HFCs) as well as a number of key policy measures in Brazil, India and Mexico indicate feasible opportunities for narrowing the gap by 2020. These emission reductions could be guided by their cost-efficiency (major no-regrets potential e.g. in the land-use change sector, in energy efficiency) aspects and driven by major co-benefits (such as reduction of energy poverty, increased energy security, health co-benefits), and in some cases

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<sup>262</sup> The Summary for Policy Makers notes that: *Limiting the warming caused by anthropogenic CO<sub>2</sub> emissions alone with a probability of > 33%, >50%, and >66% to less than 2°C since the period 1861–1880, will require cumulative CO<sub>2</sub> emissions from all anthropogenic sources to stay between 0 and about 1560 GtC, 0 and about 1210 GtC, and 0 and about 1000 GtC since that period respectively<sup>23</sup>. These upper amounts are reduced to about 880 GtC, 840 GtC, and 800 GtC respectively, when accounting for non-CO<sub>2</sub> forcings as in RCP2.6. An amount of 531 [446 to 616] GtC, was already emitted by 2011. If aiming for a >66% probability, the remaining budget would be 800 GtC - 531 GtC = 269 GtC, which translates to approximately 990 Gt CO<sub>2</sub> for the remaining global emission budget. Working Group I Contribution to the IPCC Fifth Assessment Report. Climate Change 2013: The Physical Science Basis, Summary for Policymakers*

<sup>263</sup> The World Bank (2012), Turn Down the Heat: Why a 4°C Warmer World Must Be Avoided. Washington, DC.

facilitated by international climate finance and technology transfer. In addition to the identification of considerable no-regrets emission reduction potentials and reported success stories in various sectors and initiatives, overall positive development in the enabling environments have been considered when assessing the likelihood of concretely tapping into identified potentials pre-2020.

**Table 31.** Summary of countries with commitments. The countries are ordered according to their emissions in 2010. The emissions 2010, BAU emissions 2020 as well as the conditional and unconditional pledges originate from the UNEP GAP report<sup>264</sup>. The BAU emissions represent a median of estimates used by different modelling groups that contributed to the UNEP Gap Report. The BAUs and pledges with an asterisk include LULUCF. It is important to notice that although the BAU and pledges are from the UNEP Gap Report many of them, especially BAUs contain important uncertainties. The emissions are expressed in MtCO<sub>2</sub>-eq.

Country	Emissions 2010	BAU emissions 2020	Emissions 2020 Optimistic scenario	Emissions 2020 Pessimistic scenario	The pledges, the likelihoods to reach the pledge (low, medium, high) and the additional emission reduction potential with respect to (the more ambitious) pledge in MtCO <sub>2</sub> -eq
<b>China</b>	11 180	13 795*	12 000	13 000	Unconditional target, 13 519*: Likelihood to reach: High Conditional target, 13 375*: Likelihood to reach: High Additional reduction potential: ~ 500–1 000
<b>United States</b>	6 715	7 286	5 000	6 000	Conditional target, 5 961: Likelihood to reach: High Additional reduction potential: 0–900
<b>India</b>	2 692	3 857*	2 500 – 3 000	3 500	Unconditional target, 3 664*: Likelihood to reach: Medium Additional reduction potential: ~ 200–300
<b>Russian Federation</b>	2 510	2 584	2 400	2 800	Unconditional target, 2 846: Likelihood to reach: High Conditional target, 2 513: Likelihood to reach: Medium Additional reduction potential: 0–500
<b>Brazil</b>	1 621	3 126*	1 500	2 000	Unconditional target, 2 067*: Likelihood to reach: High Additional reduction potential: 0–500
<b>Indonesia</b>	1 946	2 533*	1 300 – 2 100	1 700 – 2 600	Unconditional target, 1 816*: Likelihood to reach: Medium Conditional target, 1 548*: Likelihood to reach: Medium/low

<sup>264</sup> UNEP (2012 c) Background data from the Emission Gap Report 2012 including the BAU estimates of a selection of countries. Data received from UNEP Risø Centre

					Additional reduction potential: ~
<b>Japan</b>	1 379	1 330 / 1 330*	950	1 330	Conditional target, 950*: Likelihood to reach: Low Additional reduction potential: ~
<b>Canada</b>	728	773 / 832*	607	710	Unconditional target, 607*: Likelihood to reach: Low Additional reduction potential: ~
<b>Mexico</b>	661	882*	600	800-900	Conditional target, 617*: Likelihood to reach: Low Additional reduction potential: 0–100
<b>South Korea</b>	647	745*	522	671	Unconditional pledge, 522*: Likelihood to reach: Medium Additional reduction potential: 0–50
<b>Australia</b>	629	650 / 632*	480	532 / 538*	Unconditional pledge, 532/538* Likelihood to reach: High Conditional high pledge, 420/425*: Likelihood to reach: Low Additional reduction potential: ~
<b>South Africa</b>	422	715*	493	715	Conditional pledge, 493*: Likelihood to reach: Low Additional reduction potential: ~
<b>Ukraine</b>	397	444	320	680	Unconditional pledge, 744: Likelihood to reach: High Additional reduction potential: 300–450
<b>Kazakhstan</b>	318	382 (not from the UNEP gap report)	277	318	Unconditional pledge, 277: Likelihood to reach: Low Additional reduction potential: ~
<b>Total</b>	<b>31 800</b>	<b>39 100 – 39 200</b>	<b>29 000 – 30 300</b>	<b>35 200– 35 900</b>	1 000 - 3800



While we acknowledge that several uncertainties exist related to the step-wise methodology (used in this study (with uncertainty increasing for each step, see Chapter 1, section Approach and Methodology)), where feasible, we have provided in summary table 31 an estimate of the likelihood for countries meeting their pledge, as well as for contributing to narrowing the gap and - for some countries also a rough quantitative estimate of the additional wedge they could contribute with.

Immediate focus should be on harnessing identified country specific potentials, directing efforts at key sectors, with prioritised policy measures (be it unilateral or multilateral). The importance of the enabling environment as well as the need for multi-dimensional commitments (beyond simple emission targets) must be better recognized as preconditions for a more sustained and comprehensive transition to low and zero carbon development.<sup>265</sup> In this respect, while the EU has lost some of its leadership in the overall UNFCCC negotiations, increasing the pledge of the 27 European Union member states (EU 27) from 20% to 30% by 2020 would contribute not only with an additional wedge of some 574 MtCO<sub>2</sub>-eq<sup>266</sup>, but could also serve to better showcase best practices and lessons learned from climate relevant enabling environments.

It is evident that the current official pledges are insufficient to make emissions peak within the required next few years. Unless new pledges are put on the table soon any comprehensive and sufficiently ambitious progress within the UNFCCC ADP work stream 2 is unlikely. However, countries can and based on our estimate several countries also have reasonable possibilities to overachieve their existing pledges, and actually proceed “ahead of the ADP WS2 negotiation process”. The IPCC fifth assessment report should also create a sense of urgency and a momentum for positive developments (as did the fourth IPCC report for the 2007-2009 negotiations and the current pledges), both on the negotiation as well as implementation levels.

With regards to countries without commitments, even our most optimistic scenarios indicate an estimated increase of about 1 300 MtCO<sub>2</sub>-eq in GHG emissions by 2020 for the selected nine countries presented in table 32. Most of these countries are either developing or transition economies. Although some of them have shown strong interest towards climate change related issue such as energy efficiency and renewable energy the overriding development priorities remain sustained growth, improving living standards and poverty (including energy poverty) eradication.

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<sup>265</sup> This case (among many others) is eloquently made in the Submission to the Ad Hoc Working Group on the Durban Platform for Enhanced Action by Wuppertal Institute. See Sterk, W. et al, 2013.

<sup>266</sup> The GHG emissions of the 27 European Union member states (EU27) were 4 999 MtCO<sub>2</sub>-eq in 2010. The unconditional pledge for EU27 by 2020 is to reduce emissions by 20 % below 1990 level<sup>266</sup> (5 734 MtCO<sub>2</sub>-eq<sup>266</sup>) – the reduction target converts to total emission amount of 4 588 MtCO<sub>2</sub>-eq in 2020 and total reductions of 411 MtCO<sub>2</sub>-eq required between 2010 and 2020. The 30 % reduction target converts to total GHG emissions of 4 014 MtCO<sub>2</sub>-eq in 2020.

**Table 32.** Summary of countries without commitments. The emissions are expressed in MtCO<sub>2</sub>-eq.

Country	Emissions 2010	Emissions 2020 Optimistic scenario	Emissions 2020 Pessimistic scenario
Islamic Republic of Iran	528	610	610
Turkey	420	586	651
Thailand	413	540	635
Myanmar	362	688	688
Pakistan	340	462	462
Malaysia	330	340	550
Venezuela	310	405	405
Saudi Arabia	310	725	805
Vietnam	306	280	520
<b>Total</b>	<b>3 300</b>	<b>4 600</b>	<b>5 300</b>

Secondly, our study reviews the literature on improved transparency and stricter accounting rules, which according to the UNEP gap report could contribute to several gigaton pre-2020 emission reductions. While our estimates are slightly lower than the ones presented in the 2012 Gap report, in part due to decisions thereafter taken in Doha, immediate action on accounting rules, especially to eliminate risks of double counting, is considered crucial in order to narrow the gap already in short term. Our study also notes several challenges in national greenhouse gas inventories and emission baselines and consequently highlights the vital importance of establishing *sufficiently* transparent emission accounting rules. Despite resistance in Doha by some countries (with US in particular resisting all efforts to bring the emission accounting rules under the Convention in line with those under the Kyoto Protocol), building comparability to efforts is a precondition for comprehensive and cost-efficient climate action pre-2020 as well as post-2020.

The term *sufficiently* refers to the fact that progress on accounting rules must be made, but the lack of complete or perfect accounting rules should not prevent urgently needed action<sup>267</sup>. E.g. in the case of action on REDD+, with considerable emission reduction potential identified in several countries, detailed globally agreed upon accounting rules for the early REDD+ action is not absolutely necessary. Obviously they become essential in the case of REDD+ credits entering a global

<sup>267</sup> In a world where in addition globalization, international trade and long consumption and production chains entail various forms of “leakages”, not necessarily captured by any official GHG accounting frameworks.

carbon market<sup>268</sup>, which seems, however, to be very unlikely before 2020. In this case transparent monitoring and reporting of LULUCF emissions and sinks of all countries is a logical first step when moving towards post 2020-agreement. In the first phase, the monitoring and reporting should focus on accurate monitoring of land use and land use changes, and it could be based on already existing approaches such as IPCC Good Practice Guidance for LULUCF. Also, international experiences of collaboration and capacity building efforts on GHG inventories and accounting frameworks have been rather positive and served to re-build lacking trust between Annex 1 and non-Annex 1 countries, a crucial component of any real progress under the UNFCCC negotiations.

**Table 33.** The potential of stricter accounting rules regarding LULUCF, AAU and double counting to reduce emissions by 2020 compared to 1990 levels.

	Emissions 2020 – Optimistic scenario	Emissions 2020 – Pessimistic scenario
<b>LULUCF</b>	0 MtCO <sub>2</sub> -eq	-800 MtCO <sub>2</sub> -eq
<b>AAU</b>	1 700 MtCO <sub>2</sub> -eq	500 MtCO <sub>2</sub> -eq
<b>Double counting</b>	1 300 MtCO <sub>2</sub> -eq	1 600 MtCO <sub>2</sub> -eq

The estimates of the impact possible of LULUCF accounting rules are based on the considerations presented in the UNEP Gap Report<sup>269</sup> and the UNEP Bridging the Emissions Gap report<sup>270</sup>.

The AAU estimate reflects the potential impact of the decisions made at the COP 18 in Doha in 2012. The major spread in the estimate result from the uncertainty related to i) the participation of countries to the Kyoto protocol second commitment period, ii) the willingness of countries to buy and use AAUs from the first commitment and iii) the development of the emissions (and thus the need for AAUs) in the participating countries. However, the strong decisions regarding the use and further accumulation of AAU surplus will serve as preliminary guidelines in the post 2020 climate regime and may thus have far-reaching influence. Yet some important topics such as the status of AAU units from the first commitment period during and after CP2 and the status of Kyoto surplus units after 2020 remained unclear.

The emission reduction potential estimates regarding the influence of double counting are very theoretical in nature as the real impact is very hard to assess and the current, rather thin literature on the topic, only considers double claiming (not double issuance or financial double counting). Despite these difficulties, double counting inflicts an increasing risk to the integrity of the climate regime as the number of new market mechanisms and cap and trade schemes increases. Issues related to double counting will be on the table in the climate negotiations at the COP 19 in Warsaw.

<sup>268</sup> The interlinkages between functioning carbon markets and pledges is analyzed e.g. in the recent study by the Nordic Council of Ministers (NOAK), which highlights that the accessibility of cost-effective policy tools such as international crediting is closely linked to many countries' willingness to commit to more ambitious targets. Seppänen et al, 2013. Demand in a Fragmented Global Carbon Market: Outlook and Policy Options. TemaNord 2013:525

<sup>269</sup> UNEP (2012 a)

<sup>270</sup> UNEP (2011), Bridging the Emissions Gap. United Nations Environment Programme (UNEP)

Thirdly, the ICIs do represent a major emission reduction potential, with several opportunities to narrow the gap already in the shorter-term pre-2020. Several of the ICI initiatives have already a proven track record and are scaling-up rapidly, while many still struggle to find sufficient policy support (e.g. the phasing out of fossil fuel subsidies). While the necessity for additional action is embraced by all UNFCCC parties, clarifying the relationship between UNFCCC and ICIs will require a “big bucket of common sense” to avoid methodological and political disputes hamper concrete progress both inside and outside of the negotiations. As pointed out in section 5, it is difficult to determine what sub-national or city-level initiatives can be considered ‘additional’ based on national level reporting, just as it can be difficult to capture the full scope of private sector emissions reductions in national communications. The challenges in designing effective methods of measurement and accounting are of particular concern in the context of carbon markets.

Based on our review and analysis referring to a roughly 10 GtCO<sub>2</sub>e total emission reduction potential through ICIs by 2020 could be justified at this moment. However, as in the case of the debate of climate finance and the “100 billion USD annually by 2020”-question, there is a need to ensure focused measures to step-wise and concretely remove barriers and harness the actual emission reduction potentials for ICIs in various sectors and initiatives. This should take place in a transparent and additional manner, and looking beyond “the 10 Gt” level (or in the case of climate finance, beyond USD 100 billion/annually) that actually will be required.

**Table 34.** Emission reduction potential through ICIs . While it is too early to provide well justified and separate optimistic and pessimistic scenarios for the emission reduction potential, we conclude with a rough overall estimate for 2020.

Emission reduction potential through ICIs by 2020	Likelihood to reach the pledge / additional emission reduction potential
~ 10 000 MtCO <sub>2</sub> -eq	The ICIs consist of a high number of various initiatives at different phases of maturity and up-scaling potentials ranging from some 10-100 MtCO <sub>2</sub> -eq to several GtCO <sub>2</sub> -eq by 2020.

Fourthly, and in conclusion, this study highlights the fact that international climate negotiations do not take place in a vacuum. In short, unless countries have a sufficient understanding of their GHG inventories, their emission reduction potentials (including costs/benefits and co-benefits/costs) and in particular the implications of taking/not taking mitigation for the country’s development aspirations more broadly, international negotiation progress is unlikely. For this reason progress on local and national level is crucial, and the importance of continued and long-term strengthening of climate mitigation enabling environments cannot be overestimated. One crucially important role the UNFCCC can play in catalysing national action is enhancing the accounting of countries emissions and transparency of their actions. Without countries doing their homework better the World Leaders’ Summit on Climate Change scheduled for September 2014, at the invitation of UN secretary general Ban Ki-moon, will not become a major milestone in raising pre-2020 ambition, as required, for any “likely” chance of being on track to stay below the 2 °C target.

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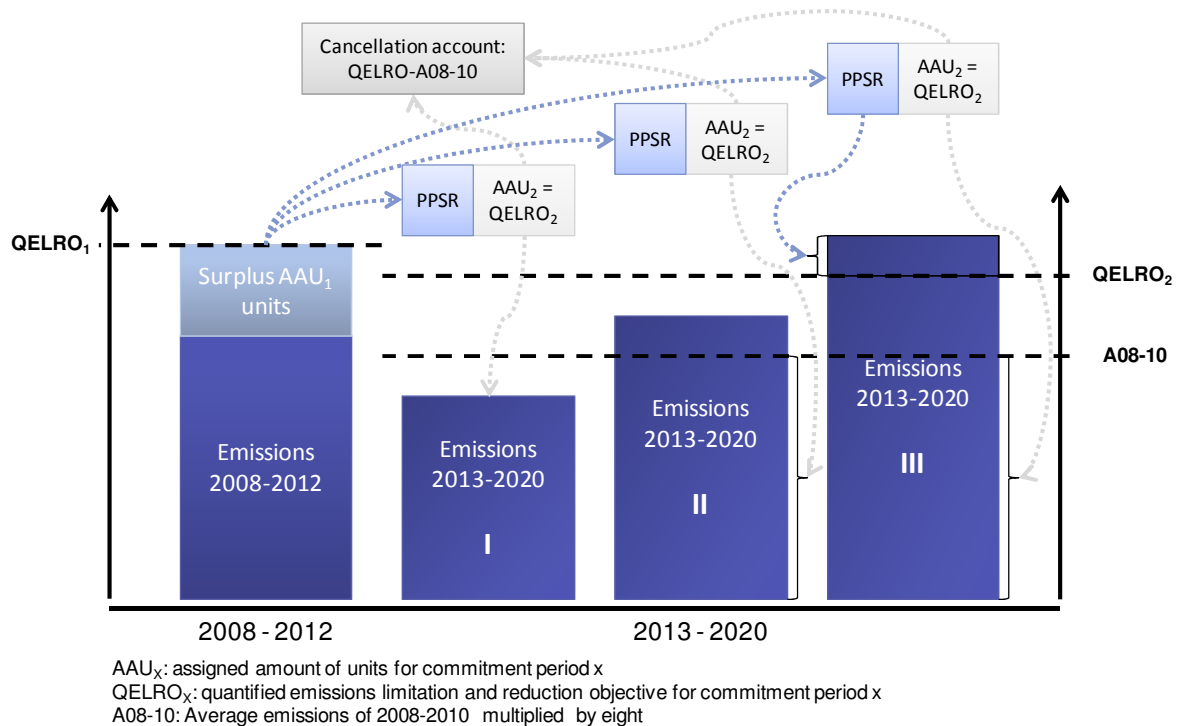
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# Annex I Doha decisions - impacts on AAUs

To explain the combined impacts of Doha decisions, three different cases with respect to three different emission levels in CP2 are sketched in figure I-1.



**Figure I-1.** A sketch of the impact of Doha decisions on a country's decision which has QELRO higher than its average emissions were during 2008-2010.

In the figure the country has accumulated a significant AAU surplus during CP1. In the beginning of CP2, these surplus units are transferred to PPSR and the country receives AAUs according to its QELRO for CP2. However, the share of AAUs that exceed the country's average emissions during 2008-2010 is transferred directly to country's cancellation account. It is important to notice, that according to the new Kyoto rule, AAUs from CP1 can be used to compensate only the emissions which exceed party's initial assigned amount for CP2, including AAUs in the cancellation account. The three scenarios regarding emissions reflect the importance of this rule.

- Scenario I: The emissions in CP2 remain below country's average emissions during 2008-2010. Country can use its CP2 AAUs to comply with emission target and sell or bank the leftover. Country can sell its AAUs from CP1 or keep them in PPSR.
- Scenario II: The emissions in CP2 are between QELRO and country's average emissions during 2008-2010 multiplied by 8 (later A08-10). Country receives AAUs for CP2 according to its QELRO but the difference between QELRO and A08-10 is recorded to the cancellation account. Country cannot use AAUs from CP1 to match the emissions exceeding A08-10 and has to buy AAUs from other countries or other Kyoto units to meet the target.
- Scenario III: The emissions in CP2 are above country's QELRO. Country can use AAUs for CP2 to meet up with the target up to A08-10 and AAUs from CP1 to match the emissions

exceeding QELRO. The country has to buy an amount of emissions units from the market that equals the emissions between QELRO and A08-10.

## Annex 2: LULUCF – future potential & challenges

### REDD+ early actions in non-Annex 1 countries

Deforestation, forest degradation, and land-use change are a major source of carbon emissions in developing countries. The Intergovernmental Panel on Climate Change (IPCC) estimates that 1 600 MtCO<sub>2</sub>-eq is released annually due to land-use change, of which the major part is traced to tropical deforestation<sup>271</sup>. Forest conversion (deforestation) and forest degradation represent about 11% of current global carbon emissions<sup>272</sup>.

During the two years of negotiations starting in Bali in 2007, and leading up to Copenhagen COP15, the issue of “avoided deforestation” raised interest and gained momentum – and changed its name three times from RED to REDD, and finally to REDD+. The Copenhagen Accord recognised the crucial role of reducing emissions from deforestation and enhancing removal of greenhouse gases from the atmosphere by forests, and called for the immediate establishment of a REDD+ mechanism. The Cancun COP decided to adopt “policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries” (UNFCCC Decision 2/CP.13–11).

In order to ensure the additionality of emission reductions, the REDD+ mitigation mechanism must have a sufficiently credible system for measuring, reporting, and verifying (MRV) changes in forest carbon stocks, and countries must set up compliant MRV systems. An assessment of national forest monitoring capabilities in tropical countries<sup>273</sup> indicated that of the 99 countries assessed, less than 20 % have completed a national greenhouse gas inventory. Only three countries had capabilities that were considered to be very good for both forest area change monitoring and for forest inventories (estimation of carbon stocks). Only about half of the countries had good or very good capabilities in any one of these categories. According to the above assessment, the major shortcomings in the current monitoring capacities grouped according to IPCC reporting principles (IPCC 2003) were: (a) lack of consistency of estimations, (b) lack of transparency of information sources, (c) poor comparability of results due to lack of common methodologies, (d) lack of completeness due to lack of suitable data, and (e) limited information on sources of error and uncertainty levels.

Countries with weak capacities and limited data will need more time to reach full REDD+ readiness than countries with stronger capacity and better data. Grassi et al. (2008) proposed a useful concept - conservativeness - that provides flexibility in dealing with uncertain or incomplete data in the

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<sup>271</sup> Denman et al. (2007),. In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignorand, M. & Miller, H.L. (eds.). Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the IPCC Fourth Assessment. Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, USA. p. 541–584

<sup>272</sup> UNEP (2012 a)

<sup>273</sup> Herold, M. (2009), An assessment of national forest monitoring capabilities in tropical non-Annex I countries: Recommendations for capacity building GOFC-GOLD Land Cover Project Office 62 p.

REDD+ process. In the REDD+ context, conservativeness means that, when completeness or accuracy of estimates cannot be achieved, the reduction in emissions or increases in carbon stocks should not be overestimated and the risk of overestimation should be minimised. As an MRV system is implemented and improves, the need for conservative estimates may be replaced by the use of ‘best estimates’ if independent assessments show they are correct<sup>274</sup>. This approach allows flexible monitoring requirements since the quality of the estimates is rewarded, and it rewards the quality of the estimates – it starts with conservativeness, precision and accuracy will likely follow<sup>275</sup>.

Early actions in REDD+ pilot or demonstration activities could lead to substantial additional reduction of emission if they are targeted to (a) areas with high carbon densities (carbon content per unit area), (b) areas currently under high risk of conversion, and (c) in countries with already strong capacity and good data for precise and accurate monitoring. Some examples of these potential is are presented in Box.1

**Box 1.** *Examples of major emission reduction potentials in REDD+.*

For example, the annual emissions from peatland fires in Indonesia are estimated to be at le level of 200–500 MtCO<sub>2</sub>-eq. (van den Werf et al. 2008). The two-year moratorium, released by the government of Indonesia in 2011 aims at “the postponement of issuance of new licences and improving governance of primary natural forest and peatland”. This moratorium was extended with two more years in 2013. The additional (to existing protected areas) area under the moratorium is at most 22.5 million hectares (Mha), which consists of 7.2 Mha of primary forests, 11.2 Mha of peatlands and 4.1 Mha that fall into neither of these categories (Murdiyarso et al. 2012). The annual CO<sub>2</sub> emissions from the conversion of peatlands into oil palm plantations could be as high as 60 MgCO<sub>2</sub> ha<sup>-1</sup> year<sup>-1</sup> (Murdiyarso et al. 2010, Hergoualc’h and Verchot 2011). Peatlands will continue to emit greenhouse gases even after conversion activities have stopped. If the moratorium is able to protect at least a part of Indonesia’s peatlands, substantial carbon benefits would be obtained (see also section 2.3)

Recent findings indicate that each hectare of mangroves stores several times the amount of carbon found in upland tropical forests, containing on average 1,023 Mg C ha<sup>-1</sup> (Donato et al. 2011). Organic-rich soils ranged from 0.5 m to more than 3 m in depth and accounted for 49–98 % of carbon storage in these systems. Donato et al. (2011) estimate that mangrove deforestation generates emissions of 0.02–0.12 Pg C per year—as much as around 10% of emissions from deforestation globally, despite accounting for just 0.7 % of tropical forest area. Due to the fact that mangroves are key ecosystems for climate change adaptation (e.g. sea level rise), immediate actions in their protection would yield considerable carbon benefits.

## Future potential of other LULUCF activities

### *Agriculture – forgotten potential*

<sup>274</sup> Herold, M., Skutsch, M.M. (2009), Measurement, reporting and verification for REDD+. Objectives, capacities and institutions. In: Angelsen, A., Brockhaus, M., Kanninen, M., Sills, E., Sunderlin, W.D., Wertz-Kanounnikoff, S. (Eds.), Realising REDD+: National strategy and policy options. CIFOR, Bogor, Indonesia, pp. 86-100.

<sup>275</sup> Grassi et al. (2008), Applying the conservativeness principle to REDD to deal with the uncertainties of the estimates. Environmental Research Letters 3, 1-12.



In 2005, agriculture contributed an estimated 11% of total global GHG emissions<sup>276</sup>. This figure does not include the contributions of food production to emissions in other sectors such as energy or transport. In addition, agriculture is a driver of deforestation and other land use changes that contribute an estimated 11 % of total global GHG emissions<sup>277</sup>. Despite its central role in sustainable development and its contribution to GHG emissions, agriculture has received little explicit attention in the UNFCCC process, when compared to its share of global LULUCF emissions and its emission reduction potential.

Under a BAU scenario (i.e. technological improvement is slow and livestock production and fertilized cropland expand into natural ecosystems), agricultural emissions are projected to increase between 57–70 % by 2050. The primary measures of agricultural emissions reductions are in livestock and land management for cropland/grazing and avoiding land-use changes such as deforestation. Agricultural abatement measures could reduce emissions up to 55 % (3 600 MtCO<sub>2</sub>-eq per year) from a baseline of 8 600 MtCO<sub>2</sub>-eq per year by 2050<sup>278</sup>.

After COP15 in Copenhagen in 2009, non-Annex 1 Parties were invited to submit NAMAs to the UNFCCC. By April 2010, 35 non-Annex 1 Parties had responded, submitting commitments or statements of intention to implement mitigation actions or achieve specified mitigation targets. An analysis made by FAO (2010) identified that 15 out of the 35 submissions stated intentions to implement mitigation actions in the agriculture sector. Additional NAMA submissions were made after COP16 in Cancun and COP17 in Durban. To date, 55 countries have submitted NAMAs to the UNFCCC. At least 21 of these submissions refer to mitigation actions in the agriculture sector<sup>279</sup>.

#### *Mitigation benefits of ecosystem-based adaptation*

The UNFCCC Adaptation Fund and Climate Resilience Fund managed by the World Bank have funded adaptation projects that include potentially important mitigation benefits as part of ecosystem-based adaptation schemes. These include actions such as mangrove management and conservation, forest management and conservation, and sustainable agriculture. However, the mitigation benefits of these and other adaptation activities have so far not been estimated, nor have the potential adaptation and mitigation synergies systematically been promoted and harnessed.<sup>280</sup>

#### *Large potential – low pledges*

UNEP Emission Gap Report estimates that the emission reduction potential of the LULUCF sector (agriculture and forestry) varies between 2 200 and 8 500 MtCO<sub>2</sub>-eq/year by 2020. So far, the pledges made by non-Annex 1 countries to reduce their LULUCF emissions range from 500–700 MtCO<sub>2</sub>-eq/year (unconditional pledge scenarios) to 700 – 1 000 MtCO<sub>2</sub>-eq/year (low pledge scenarios), and to 700–1 500 GtCO<sub>2eq</sub>/year (high pledge scenarios).

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<sup>276</sup> UNEP (2012 a)

<sup>277</sup> Ibid.

<sup>278</sup> Wilkes et al. (2013), National integrated mitigation planning in agriculture: A review paper. Food and Agriculture Organization of the United Nations (FAO). 53 p.

<sup>279</sup> Ibid.

<sup>280</sup> Illman, J. et al. (2013), Scoping study on financing adaptation-mitigation synergy activities. Nordic Working Papers 2013:902.

## Annex 3: List of people consulted

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Soledad Aguilar	Facultad Latinoamericana de Ciencias Sociales (FLACSO) Buenos Aires
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Taryn Fransen	World Resources Institute <sup>281</sup>
Shafqat Kakakhel	Former Pakistan Ambassador and Ex-UN Asst. Secretary General
Anja Kollmuss	Independent consultant
Anna Korppoo	Fridtjof Nansens Institutt
Srinivas Krishnawamy	Vasudha Foundation, India
Alden Meyer	Union of Concerned Scientists, US
Koos Neefjes	UNDP, Vietnam
Rodolfo Godínez Rosales	Ministry for Foreign Affairs, Mexico
Natascha Trennepohl	eclareon GmbH, Germany

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<sup>281</sup> Working on 2013 UNEP Gap report, section looking into “Do Policies Match Pledges.”



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