Mitigation Commitments and Fair Effort Sharing in a New Comprehensive Climate Agreement Starting 2020

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1. Introduction

The international community is in the process of developing a new climate agreement, to be adopted at the Paris Conference in December 2015 and to be applied starting in 2020. Countries' mitigation contributions are one central element in the negotiations. By the end of October 2015, 128 Parties had submitted their "intended nationally determined contributions" (INDCs), reflecting 155 countries (including the European Union member states), and covering around 87% of global emissions in 2010 (excluding LULUCF) and 88% of global population.

Ever since the UN Framework Convention on Climate Change (UNFCCC) was agreed upon, the level of ambition as well as the fair balance between parties has been the linchpin of negotiations. The Ad Hoc Working Group on the Durban Platform (ADP) again revolves around these questions: Can negotiations ensure that aggregate action by parties suffices to achieve the jointly agreed goal to limit warming below 2°C – or even 1.5°C as called for by the most vulnerable countries, in light of current science? How can a fair and equitable distribution of effort be enshrined in the agreement? How to move forward action on mitigation and adaption, and reconcile this with the pursuit of countries' development aspirations and needs?

To keep global warming to below a 2°C increase above preindustrial levels, as is the accepted goal internationally, the urgency and timing of mitigation is critical. The last Assessment Report by the Intergovernmental Panel on Climate Change (IPCC) included a calculation of permissible levels of emissions which allow a reasonable chance of staying below 2°C. For a more than 2/3 probability of staying below 2°C, cumulative emissions since the period 1861-1880 would need to stay below 1000 GtC. This "carbon budget" is reduced to 800 GtC once non-CO_2 forcing is accounted for. By 2011, already over 530 GtC has been emitted. Thus, only a third of the carbon budget is still available. A steep decrease of emissions throughout the 21st century is required to achieve the above mentioned goals (IPCC, 2013).

So far, climate policy has not sufficiently responded to the challenge. For example, a second commitment period under the Kyoto Protocol was agreed upon in 2012, but only a minor number of industrialized countries committed to these binding 2020 targets - the EU, and some smaller countries (Doha Amendment, 2012). Later agreements under the Copenhagen Accord and the Cancún Agreements included a more comprehensive set of countries, but the aggregate pledges will not provide sufficient emission reductions to limit global warming to below 2˚C. The 2014 UNEP Gap report reiterated that the gap between pledges and pathways consistent with 2˚C is not being closed and remains at a high 14-17 $GtCO_2$-eq for 2030 only (UNEP, 2014).

While the process of INDC submissions showed that most countries are to some extent willing to contribute to climate change mitigation, it was not possible yet to include a top-down assessment of country contributions. The level of ambition of contributions as well as the establishment of an assessment and review process ("ratcheting of emission reductions") will remain to be in the center of negotiations at the Paris Conference.

Against this background, our report offers deliberations on what a "fair share" for emissions in 2025 and 2030 could be. It shows, for a selection of ten countries, how their respective INDCs perform if **related to different fair share approaches** and effort sharing models. These assessments also take into account **national mitigation potential and costs** and the wider context of socio-economic development of the countries. Finally, **current policies and politics** of each country are included in the assessments.

Our report falls into three parts:

- The ten country chapters, with a qualitative analysis of each INDC
- An Annex containing a detailed analysis and data for each country;
- Annexes laying out the elements of the methodology developed by the research team.

2. Scope and method of the analysis

Even if there is a general consensus that greenhouse gas (GHG) emissions need to be reduced, so far no agreement exists on how a "fair share" of emission reductions should be determined in line with common but differentiated responsibilities and capabilities. In the absence of an agreed methodology to compare and assess countries´ mitigation efforts, different approaches have been developed to compare countries' contributions to climate change mitigation, often including an assessment of the countries' targets against a fair share.

The two areas of difference between each of the approaches are (i) focus on certain dimensions of the effort sharing e.g. historic responsibility, equality, capability or equal costs, and (ii) assumptions and initial judgments on how to weigh and treat certain aspects – e.g. which indicators to use for a quantitative illustration of the dimensions or global emissions pathways required for specific temperature levels. Thus, the methodologies complement each other, offering answers from different angles – provided, the assumptions and judgments are transparent to the user. The result is a broad range of possible interpretations of what a fair share could be.

This report picks four possible approaches to set appropriate levels of mitigation ambition for each country and evaluates countries' proposed mitigation contributions on this basis. The selected approaches distribute a given global emission trajectory to countries using quantitative indicators such as emissions, income and/or population. These indicators represent certain equity principles and allow to determine countries' emission allocation (Vieweg, Sterk, Hare, Hagemann, & Fekete, 2014). The team used the Evolutions of Commitment (EVOC) Model for this analysis. The approaches chosen here cover a broad range of different positions regarding what is considered fair:

- Converging Per capita Emissions (CPE): Focus on equality, with converging per capita emissions for all countries.
- Greenhouse Gas Development Rights (GDRs): Focus on responsibility, capability and needs.
- Common but Differentiated Convergence (CDC): Focus on converging per capita emissions after reaching a threshold.
- Triptych: Focus on exploiting different sectoral potentials depending on country grouping, also considering differentiation via timing.

A more detailed description of the approaches is provided in Annex 2.

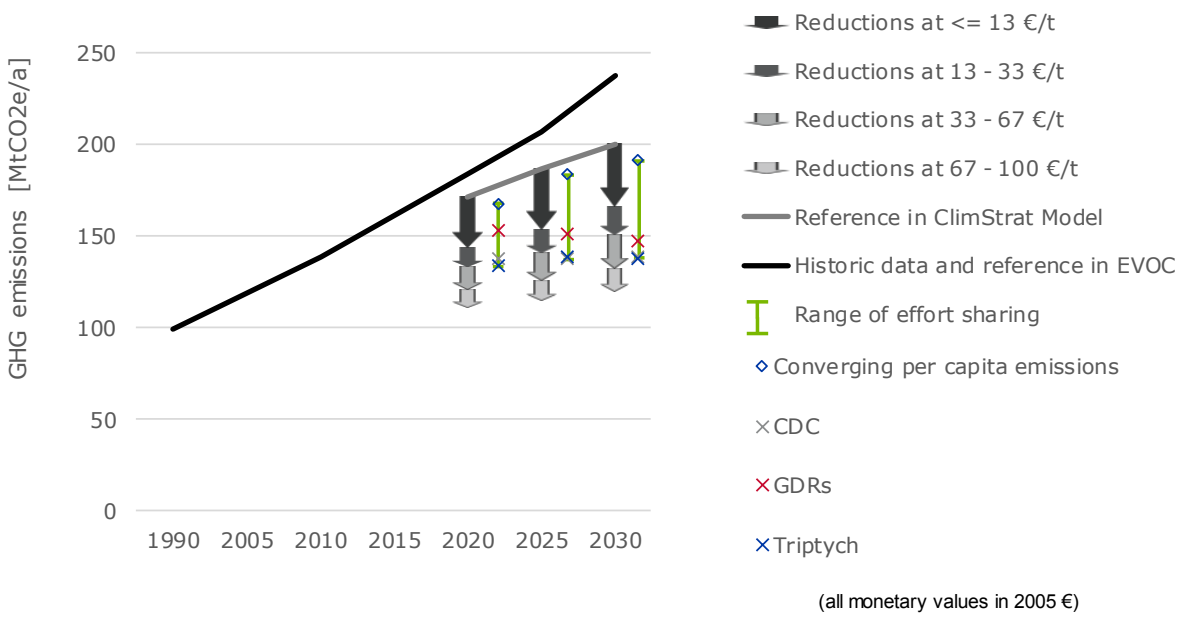
To complement the calculations of different effort sharing approaches, the report also analyses mitigation potential and costs for the selected countries. In particular, it provides domestic emission reduction potentials at different carbon prices. Additionally, for some countries the marginal mitigation costs associated with the results of the effort sharing calculations are presented. This provides further guidance on the potential of a country to reach the targets prescribed by the effort sharing approaches. The calculations are conducted using the Climate Strategies Tool (ClimStrat), developed by Fraunhofer ISI. A detailed description of the model is available in Annex 4.

The results of the calculations based on the effort sharing approaches shed light on the countries' responsibility and capability for greenhouse gas mitigation as well as their economic potential for emission reductions. In the current situation, most potentials should be used in order to get on a 2°C pathway as fast as possible. This means that even potentials in countries with low responsibility and capability need to be considered. The analysis shows, which countries could use support for tapping into more ambitious parts of their mitigation potential. It also reveals which countries have responsibility or capability that goes beyond their domestic mitigation potential – those countries could thus support others to make up for this difference.

The results of the effort sharing and mitigation cost calculations for each country are presented in a graphical format as illustrated below. The graph includes two modeled reference curves against which possible reductions are plotted: The black curve represents the reference scenario from the EVOC

model while the grey curve represents the ClimStrat reference. In addition, the figure shows which reduction levels could be achieved by the respective country at four levels of mitigation costs according to the ClimStrat model: Costs below 13€ per tonne CO_2-eq., costs between 13 and 33 €/t, costs between 33 and 67 €/t and costs between 67 and 100 €/t[1]. As noted above, these costs are calculated on the basis of purely domestic efforts. Finally, the figure displays emission targets that each country should take on according to the four effort sharing proposals considered in this study.

Figure 1: Exemplary Illustration of Effort Sharing and Potential Calculations



In addition to the quantitative results, the report illustrates socio-economic indicators and describes the current political system in the countries, with a focus on climate policy. This information helps to put the potential future contribution in the national context. The country chapters in the Annex 1 illustrate the results of this part of the analysis in detail.

On the basis of the effort sharing results and mitigation potential and costs, the INDCs of 10 countries are assessed in this report to determine whether or not the Party's contribution falls in line with the results of the effort sharing calculations.

The 10 example countries included in the INDC assessment are Brazil, China, the European Union (EU), India, Japan, Mexico, Morocco, Russia, South Africa, and the United States of America (USA). This list of countries was chosen to provide for a geographical balance and coverage of the main negotiation groups while also taking into account data availability and coverage of large emitters. The detailed analysis in the Annex additionally includes the Philippines, Saudi Arabia and Venezuela.

As the effort sharing calculations were done on the basis of emissions data excluding the LULUCF sector, also the assessment of the INDCs excludes the LULUCF sector in meeting the proposed targets. Since different countries have been using different methodologies to assess their LULUCF emissions for the sake of consistency data generated by the Climate Action Tracker (CAT) have been used. Thus, in some cases the numbers referring to the INDCs may deviate from the numbers provided in the INDCs themselves. For detailed information on the methodologies employed by the CAT to produce data on the LULUCF sector in the respective countries, please refer to the CAT website and to the respective country pages (http://climateactiontracker.org/)."

[1] All monetary values are in year 2005 €.

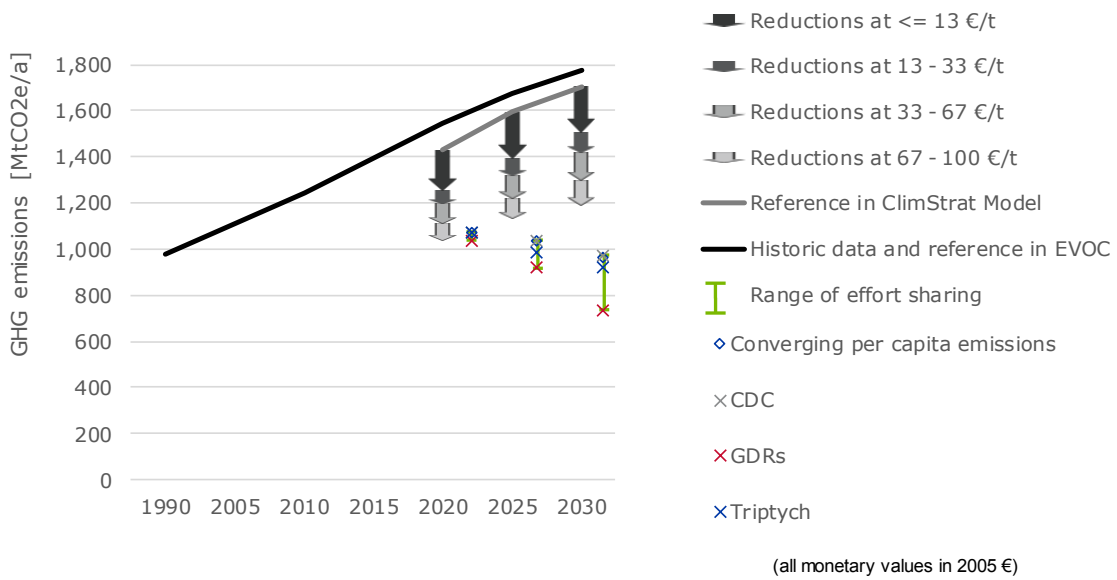
3. Brazil

Brazil submitted its INDC on 28 September 2015, pledging to reduce its emissions of net greenhouse gases by 37% below 2005 levels by 2025 including LULUCF (Government of Brazil, 2015). Excluding LULUCF, CAT estimates the INDC will result in GHG emissions increasing by about 36% above 2005 levels by 2025 In addition, it mentioned an "indicative contribution" to reduce emissions including LULUCF by 43% below 2005 levels by 2030 (CAT, 2015). One of the major instruments to achieve the emissions reduction in the non-LULUCF sector was an increase in the share of energy from renewables sources to 45%, from slightly over 41% currently.

When looking at these numbers for Brazil, it is crucial to keep in mind that LULUCF was not included in the analysis. LULUCF has, however, until recently been responsible for by far the largest share of Brazil's total emissions and plays a key role in its mitigation strategy. Therefore, these numbers can only shed light on a section of Brazil's effort sharing allocations and their corresponding costs.

Allocations for Brazil for 2020 are quite similar among the four effort sharing proposals considered in this study and vary the most for 2030. To reach the different targets, Brazil would have to reduce its emissions by 14% to 17% in 2020 compared to 2010 levels. For 2030, emissions would have to lie at between 22% and 41% below 2010 levels. This would equal between 1% and 26% below 1990 levels. The median of the proposals' targets lies at about 15% below 2010 levels in 2020, 19% below 2010 levels in 2025, and at 25% below 2010 levels (5% below 1990 levels) in 2030. The results of these effort sharing proposals for Brazil's emission target are depicted in Figure 2.

Figure 2: Results of Effort Sharing Calculations and Mitigation Costs for Brazil



According to the calculations in this study, Brazil could achieve the 2020 targets at marginal costs, which approximately equal the highest of the cost ranges depicted in Figure 2. The targets resulting from the effort sharing approaches for the years 2025 and 2030 could only be reached at marginal abatement costs well above 100 €/t CO_2-eq. For 2030, they would amount to about 130 €/t CO_2-eq. for reaching the CDC's target and to more than 400 €/t CO_2-eq. for the GDRs'.

The median of the four effort sharing proposals' targets could be achieved at marginal costs of nearly 90 €/t CO_2-eq. for 2020 and of about 200 €/t CO_2-eq. for 2030. The GDRs imply the most ambitious, the CDC the least ambitious out of the targets set by the four effort sharing proposals for Brazil.

As noted above, these calculations are based on the assumption of purely domestic efforts, so use of international emissions trading would tend to lower these costs.

Table 1: Comparison of INDC with Results for Effort Sharing Calculations for Brazil

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
INDC[2]	n.a.	1.169	n.a.	n.a.	104%	n.a.	n.a.	20%	n.a.
INDC[3] ("indicative contribution")	n.a.	n.a.	1.228	n.a.	n.a.	114%	n.a.	n.a.	27%
CPE	1.068	1.029	962	9%	5%	-2%	-14%	-17%	-23%
CDC	1.069	1.033	968	9%	5%	-1%	-14%	-17%	-22%
GDRs	1.031	915	730	5%	-7%	-26%	-17%	-26%	-41%
Triptych	1.068	1.029	962	9%	5%	-2%	-14%	-17%	-23%
Median	1.069	1.033	968	9%	5%	-1%	-14%	-17%	-22%

To lower emissions from non-LULUCF sectors, the Brazilian government is planning to increase its share of renewables in the energy sector to 45%, only slightly above the current level of 41%. Achievement of this target will be made difficult by the increasing demand resulting from increasing electrification and standard of life.

The plans to decarbonize Brazilian power sector remains in stark contrast with the recent policy developments. In November 2014 Brazilian government opened power auctions to coal- and gas-fired power plants. The goal of this strategy was to increase the flexibility of the power sector in case hydro power plants will not be able to provide enough electricity to satisfy the rapidly increasing demand. But the success of the gas-fired power plants in the auctions and the government's plans to increase power production from gas-fired power plants by 66% until 2023 compared to 2014 (Government of Brazil, 2014) may limit the options for deep decarbonisation required especially by the GDRs approach. At the same time there are numerous options to increase Brazil's energy security such as increasing energy efficiency or introducing incentives for demand management. More effective utilization of flexible renewables, especially biomass, as well as development of the power grid to take advantage of the complementarity of different sources of energy can also be used to reduce Brazil's CO_2 emissions in the future.

[2] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.

[3] See above.

4. China

On 30 June 2015, China submitted its INDC (Government of China, 2015). It contains the objectives to

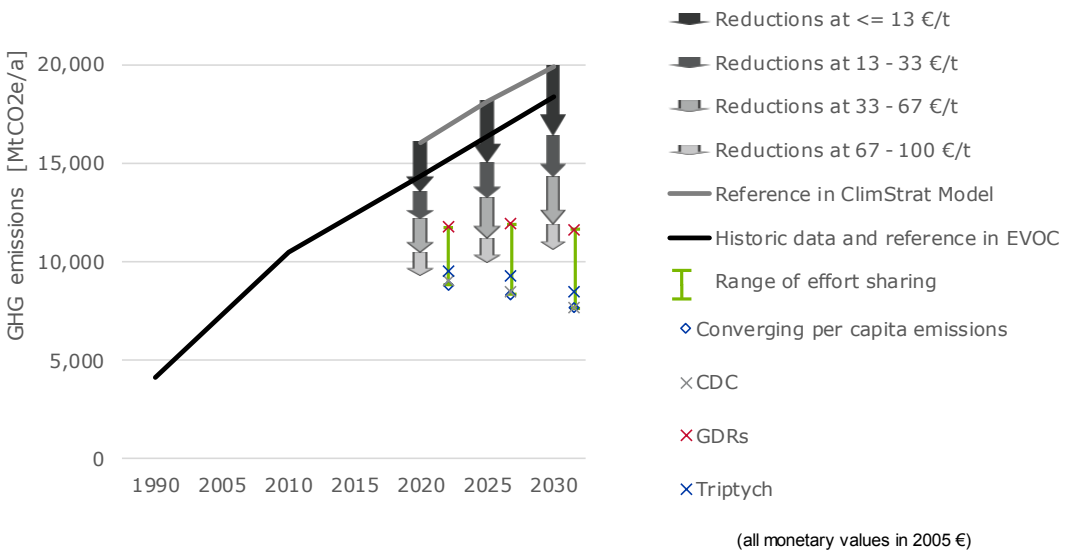
- Peak emissions by 2030, or earlier if possible.
- Decrease carbon intensity of its GDP by 60-65% compared to 2005 levels.
- Increase the share of non-fossil energy in primary energy to at least 20%.
- Increase forest stock volume by around 4.5 billion cubic meters, compared to 2005.

Further, the document contains a description of measures to be implemented to mitigate GHG emissions, amongst which are measures in areas, which had not yet been covered by concrete measures before (e.g. reductions of f-gases).

Absolute emission levels resulting from the targets are unclear, as the indicators included in the INDC do not define absolute levels. For example, the intensity target depends on economic growth, the outcome of the share of primary energy on the development of overall energy consumption and the split between fuels for the remaining 80% of primary energy. The Climate Action Tracker (CAT) estimates an absolute emissions level of between 13.6 and 16.9 GtCO2e/a in 2030 (CAT, 2015). The lower end reflects the target calculated based on the share of non-fossil energy. Emissions calculated based on the intensity targets represent the upper end of the range. As the fulfillment of the INDC means reaching all targets and not just one of them, the lower end of 13.6 GtCO2e/a should be used as basis for considering whether China is contributing its fair share.

Chinese GHG emission increased from under 4 GtCO2e in 1990 to over 10 GtCO2e in 2010, which makes China by far the largest emitting country. Under the highest BAU scenario in this study, this country would reach levels in the order of 20 GtCO2e in 2030 (Figure 3). Significant mitigation potential exists to counter this trend. According to the ClimStrat model, China could roughly stabilize its GHG emissions at current levels by 2030 at marginal reduction costs of about €100/t CO2-eq.

Figure 3: Results of Effort Sharing Calculations and Mitigation Costs for China



According to the selected effort sharing approaches, China would need to commit to a target between 8 and 12 GtCO2e in 2025, and between 8 and 11 GtCO2e/a in 2030. According to all approaches, Chinese emissions would need to peak at the latest by 2025 at only slightly above today's level. All approaches suggest strong deviation from the reference scenarios and a significant change of the current trend. The potential to achieve such emission levels is available, but measures include relatively high-cost categories.

The results reflect the fact that China has reached per capita emissions above the world average. This means that for approaches like Convergence of per Capita Emissions (CPE) and Common but Differentiated Convergence (CDC), China needs to start reducing per capita emissions immediately resulting in relatively ambitious targets. Under the Triptych approach, based on convergence of sectoral indicators, China should also start reducing emissions soon. The Greenhouse Development Rights approach allows for slight growth in emissions until 2025 as it factors in lower historical responsibility as well as lower economic capacity compared to industrialized countries and therefore represents the least ambitious target. China's actual INDC is thus weaker than even the least stringent effort sharing allocation considered in this study.

This analysis reveals that China has sufficient mitigation potential to stabilize, peak, and reduce emissions. The effort sharing analysis shows that under the least stringent approach this peak in emissions should occur by 2025 at a level of about 12 GtCO2-eq. Under approaches that are more stringent China would need to reduce emissions immediately and drastically. The results also indicate that China's mitigation potential is within the same order of magnitude as the reductions called for under effort sharing approaches, making it possible to achieve such emission levels domestically.

Table 2: Comparison of INDC with Results for Effort Sharing Calculations for China

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
INDC[4] (est. based on share of non-fossil)	n.a.	n.a.	13.600	n.a.	n.a.	299%	n.a.	n.a.	36%
INDC[5] (est. based on intensity target)	n.a.	n.a.	16.900	n.a.	n.a.	397%	n.a.	n.a.	69%
CPE	8,729	8,257	7,563	113%	102%	85%	-16%	-21%	-28%
CDC	8,962	8,387	7,596	119%	105%	86%	-14%	-20%	-27%
GDRs	11,702	11,841	11,555	186%	189%	182%	12%	13%	11%
Triptych	9,464	9,204	8,429	131%	125%	106%	-9%	-12%	-19%
Median	9,213	8,795	8,039	125%	115%	96%	-12%	-16%	-23%

China is currently working on the development of its 13th Five Year Plan (FYP) for the period from 2016-2020. Policies currently discussed with the highest emissions reduction potentials are limitations on the use of coal, and an absolute cap on emissions, enforced via a national emissions trading scheme to be introduced in 2017.

The mitigation measures in the INDC announce further strengthening of China's current climate policy framework. They will likely form a part of the 13th FYP. Particularly controlling the use of coal is high on the agenda given China's recognition of economic detriment of an emerging public health crisis caused by air pollution from coal combustion, and the potential economic gains from increased efficiency and renewable energy capacity. The activities build on previous policies that closed outdated and inefficient capacity, as well as on more recent policies that restrict the construction and operation of coal thermal power plants in certain areas. These actions go along with goals for the installation of renewables capacity and increasing efficiency.

[4] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.

[5] See above.

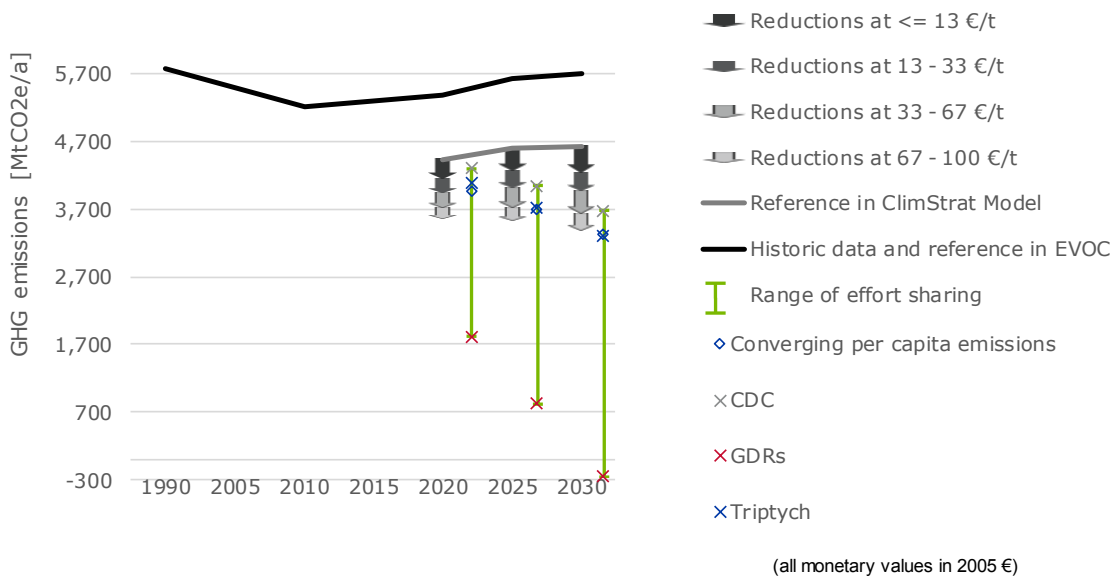
5. European Union

The EU has offered to reduce emissions by "at least 40% below 1990" levels by 2030 (European Union, 2015). The INDC stipulates that land use, land use change and forestry (LULUCF) are to be included into the EU's 2030 GHG mitigation framework but does not provide information on the accounting rules and potential magnitude of their impact on emissions levels in 2030.

GHG emissions in the European Union have been decreasing since the early 1990s. A large share of these emissions reduction happened in result of modernization of industry in Central and Eastern European countries, which joined the EU in 2004. Development of renewable sources of energy, especially in the Western European countries, allowed this trend to continue in the recent years. While emissions decreased by an average of 0.9% per year between 1990 and 2012, they are projected to decrease between 0.5% and 1.2% per year up to 2020, and between 0.1% and 1% per year until 2030. As a result, BAU emissions are estimated to be between 4,115 MtCO2e and 4,374 MtCO2e (a 22-27% reduction below 1990) in 2020 and between 3,681 MtCO2e and 4,317 MtCO2e (23-35% below 1990) in 2030 (CAT, 2015).

The effort sharing approaches considered in this study yield strongly varying results for the EU. The approaches that are based on globally converging per capita emissions starting from current levels (CPE and CDC) and on convergence of sectoral indicators irrespective of countries' development status (Triptych) range from 26-32% in 2025 and 37-43% in 2030. By contrast, the GDRs approach which focuses on historical responsibility and economic capability suggests -86% in 2025 and more than 100% in 2030. The median of the proposals considered in this study lies at 36% below 1990 levels in 2025, and 43% below 1990 levels in 2030. The EU's 2030 target therefore lies at the lower end of the range.

Figure 4: Results of Effort Sharing Calculations and Mitigation Costs for the EU



According to the calculations in this study, the EU could achieve the targets suggested by those effort sharing approaches that do not take into account historical responsibility and economic capability (CDC, CPE and Triptych) at relatively moderate costs. For 2025, a target as suggested by the median of the effort sharing results could be achieved by mobilizing reduction potential in the range of about 67 €/t, while for 2030 reduction potential in the area of about 100 €/t would need to be mobilized. By contrast, a target according to the GDRs proposal would incur costs well above 500 €/t if implemented purely domestically, and would in practice only be feasible through financing large volumes of emission reductions outside the EU.

With the inclusion of the words "at least" in front of the 40% target, the EU made it possible to ratchet-up its current target. However, EU climate policy is strongly stymied by its need to achieve consensus

among 28 member states with strongly varying national circumstances. While the Green Growth Group of climate-progressive EU countries sees the 40% as the floor of ambition, to be strengthened in case of a successful outcome of the Paris conference, the Eastern European member states organized in the informal Visegrád Group advocate for an even lower emission reduction target. These countries are concerned that ambitious climate policy would strongly increase the cost of energy and constitute a threat to their coal industry. For these countries, the 40% target is open to be adjusted in either direction in the light of the results of the Paris conference.

Table 3: Comparison of INDC with Results for Effort Sharing Calculations for the EU

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
INDC[6]	n.a.	n.a.	3376	n.a.	n.a.	-40%	n.a.	n.a.	-28%
CPE	3.953	3.679	3.323	-32%	-36%	-43%	-24%	-29%	-36%
CDC	4.290	4.028	3.664	-26%	-30%	-37%	-18%	-23%	-30%
GDRs	1.799	809	-273	-69%	-86%	-105%	-65%	-84%	-105%
Triptych	4.065	3.704	3.292	-30%	-36%	-43%	-22%	-29%	-37%
Median	4.009	3.692	3.307	-31%	-36%	-43%	-23%	-29%	-37%

The achievement of the emissions reduction goal will largely depend on the effectiveness of the EU ETS reform announced in July 2015 and on EU efforts on renewable energy and energy efficiency. Implementation of efficiency measures has historically been lacking and while the EU agreed a new efficiency target for 2030, it is non-binding, as is also the case for the EU's 2020 efficiency target. The EU also agreed a new renewables target for 2030, which is binding. However, in contrast to the 2020 renewables target, the 2030 target is not to be translated into individual targets for the member states, which raises the question how achievement of the target is to be assured. Governance of the renewable energy target is thus a crucial issue of the future EU-internal negotiations.

[6] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.

6. India

Due to its size and large population, India has high total GHG emissions, which are projected to grow dramatically under BAU. By contrast, India's GHG emissions per capita have so far been rather low (1.4 t CO2-eq./a in 1990). These are to increase substantially under business as usual, with per capita emission levels reaching 4.1 t CO2-eq./a in 2030. However, this would still be far below current per capita emission levels of industrialized countries.

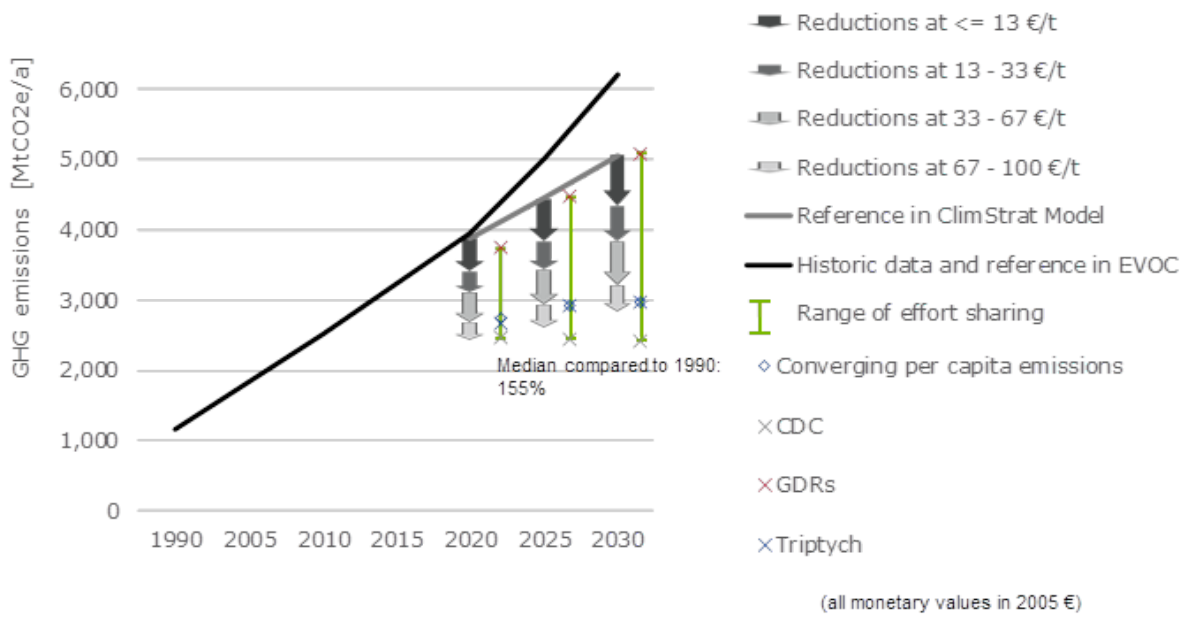
India's INDC includes the following quantitative elements (Government of India, 2015):

- Reducing emissions intensity by 33-35% below 2005 levels by 2030.
- Increasing the share of non-fossil based power generation capacity to 40% of installed electric power capacity by 2030.
- Creating an additional (cumulative) carbon sink of 2.5–3 Gt CO2-eq. through additional forest and tree cover by 2030.

The INDC is conditional on the conclusion of an ambitious global agreement including additional means of implementation. Need for technology transfer and low-cost international finance is highlighted especially for the renewables target.

The INDC does not specify the coverage and metrics of the emissions intensity target. Assuming annual GDP growth of 6.4% (IEA, 2014a), the emissions level resulting from this target would be 5.6–5.7 Gt CO2-eq. (excluding LULUCF) by 2030. The Climate Action Tracker considers that the renewable energy target is significantly more ambitious than the emission intensity target, leading to emissions at 4.9–5.0 Gt CO2-eq (CAT, 2015). As the fulfillment of the INDC means reaching all targets and not just one of them, the lower end of 4.9-5 GtCO2e/a should be used as basis for considering whether India is contributing its fair share.

Figure 5: Results of Effort Sharing Calculations and Mitigation Costs for India



Calculations made for this study yield strongly varying results for the different effort sharing proposals for India. The approaches that are based on globally converging per capita emissions starting from current levels (CPE and CDC) and on convergence of sectoral indicators irrespective of countries' development status (Triptych) range from 2.4 to 2.9 Gt CO_2-eq. in 2025 and 2.4-3 Gt CO_2-eq. in 2030. By contrast, the GDRs approach which focuses on historical responsibility and economic capability

suggests 4.5 Gt CO_2-eq. in 2030 and 5 Gt CO_2-eq. in 2030. The median of the proposals considered in this study lies at 2.9 Gt CO_2-eq. in 2025 and 3 Gt CO_2-eq. in 2030.

Therefore, due to the ambitious renewable energy target the INDC lies within the effort sharing range, though at the low end.

The low end of the effort sharing range is close to the reference scenario in the ClimStrat model, which assumes mobilizing the entire no-regret reduction potential. The median of the emission targets from the four effort sharing models that were analyzed could be reached with average abatement costs below 100 €/tCO_2-eq./a both in 2020 and in 2030. Since India represents a high share of the global low-cost emission reductions, international emission trading would most likely not reduce these costs as strongly as in other countries.

Table 4: Comparison of INDC with Results for Effort Sharing Calculations for India

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
INDC[7] (est. based on intensity target)	n.a.	n.a.	5718 to 5559	n.a.	n.a.	403% to 389%	n.a.	n.a.	125% to 119%
INDC[8] (est. based on non-fossil fuel capacity target)	n.a.	n.a.	4853 to 5054	n.a.	n.a.	327% to 345%	n.a.	n.a.	91% to 99%
CPE	2.722	2.891	2.954	135%	149%	155%	8%	15%	17%
CDC	2.440	2.428	2.409	111%	110%	108%	-3%	-4%	-5%
GDRs	3.724	4.448	5.067	221%	284%	337%	48%	76%	101%
Triptych	2.649	2.894	2.962	129%	150%	156%	5%	15%	17%
Median	2.686	2.893	2.958	132%	150%	155%	6%	15%	17%

India is a large GHG emitter in absolute terms but with low per capita emissions. Despite its powerful industry base and rapidly growing middle class, India has a high share of very poor inhabitants lacking basic infrastructure and access to the power grid. Thus, while India has often been classified in the same category as China, economically and with view to its GHG emission profile India is distinctively different.

Domestically, climate change is slowly changing from a non-issue to something that is at least verbally addressed. However, domestic climate policies and politics in India are influenced by the aim of enhancing development and reducing poverty, while being confronted with the consequences of climate change. Sometimes mitigation can be a co-benefit, e.g. development of renewables allows for faster electrification of distant areas and cleaner environment. In national climate action plans there are no clear emissions reduction targets, based on the reasoning that these plans are development strategies with climate as a co-benefit, not the primary goal. However, the new government that came into office in 2014 has put a strong focus on the potential of renewables to address energy poverty, resulting in the ambitious target for the development of non-fossil sources of energy noted above. India's new strategy to end energy poverty is thus yielding substantial emission reductions as a "co-benefit".

[7] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.

[8] See above.

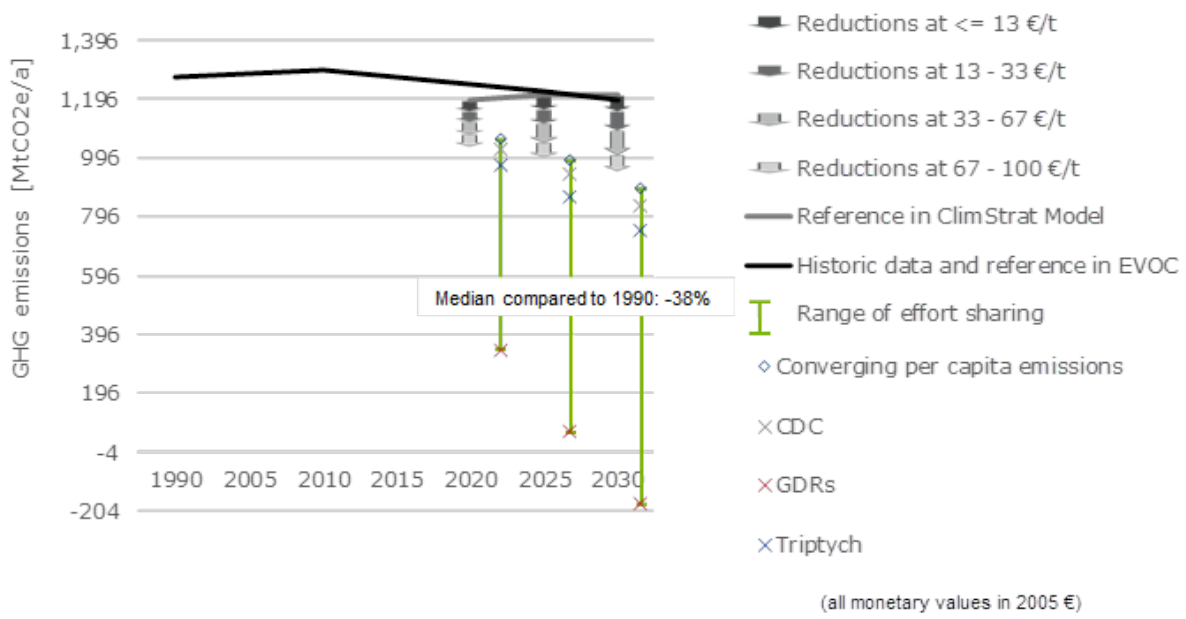
7. Japan

Japan's current pledge for 2020 is a reduction of 3.8% below 2005 levels, equivalent to 5.2% above 1990 levels. For the new agreement, Japan offered to reduce emissions by 26% below 2013 levels by 2030, which is equivalent to 25% below 2005 levels and to 18% below 1990 levels (Government of Japan, 2015). Excluding LULUCF, which Japan intends to take into account, yields a target of 23% below 2013 levels (15% below 1990) (CAT, 2015).

The calculations made for this study yield strongly varying results for the different effort sharing proposals for Japan. The approaches that are based on globally converging per capita emissions starting from current levels (CPE and CDC) and on convergence of sectoral indicators irrespective of countries' development status (Triptych) range from 17 to 24% below 1990 levels in 2020, 22 to 32% in 2025 and 30 to 41% in 2030. By contrast, the GDRs approach which focuses on historical responsibility and economic capability suggests 73% in 2020, 95% in 2025 and more than 100% in 2030. The median of the proposals considered in this study lies at 22% below 1990 levels in 2020, 29% below 1990 levels in 2025, and 38% below 1990 levels in 2030.

Despite the broad range, Japan's targets for 2020 and 2030 therefore fall far short of the results of all effort sharing proposals analyzed in this study.

Figure 6: Results of Effort Sharing Calculations and Mitigation Costs for Japan



Most of the targets suggested by the various effort sharing proposals could only be achieved at very high marginal costs above 100 €/t CO_2-eq. The marginal costs of achieving the median of the reduction target range from about 100 €/t CO_2-eq. for 2020 to about 200 €/t CO_2-eq. for 2030. While even the least ambitious of the effort sharing proposals regarding Japanese future emissions, the CPE, would entail marginal abatement costs of between about 80 €/t CO_2-eq. in 2020 and 150 €/t CO_2-eq. in 2030, reaching the GDRs' target, the strictest of the four proposals, would involve marginal abatement costs above 500 €/t CO_2-eq.

As noted above, these calculations are based on the assumption of purely domestic efforts. With the use of international emissions trading, these costs would tend to be lower.

Table 5: Comparison of INDC with Results for Effort Sharing Calculations for Japan

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
INDC[9]	n.a.	n.a.	1079	n.a.	n.a.	-13%	n.a.	n.a.	-14%
CPE	1.056	985	888	-17%	-22%	-30%	-19%	-24%	-32%
CDC	1.020	935	830	-20%	-26%	-35%	-21%	-28%	-36%
GDRs	340	62	-185	-73%	-95%	-115%	-74%	-95%	-114%
Triptych	970	861	745	-24%	-32%	-41%	-25%	-34%	-43%
Median	995	898	788	-22%	-29%	-38%	-23%	-31%	-39%

Japan's government led by the Democratic Party of Japan (DPJ) had originally set a much more ambitious target for 2020, a reduction of 25% below 1990 levels. This target was within the range of effort sharing proposals considered in this study. But in 2012 the DPJ was replaced by the Liberal Democratic Party (LDP), which has traditionally been less ambitious on climate policy. Increasing growth of Japan's economy, which underwent a long slump since the 1990s, has officially been the top priority of the new government. The new government justified its downgrading of the 2020 target with the impacts of the Fukushima nuclear accident, which put the future role of nuclear power into question. However, even a total replacement of the nuclear power projected for 2020 by coal would only cut Japan's Copenhagen pledge in half. If replaced by oil, gas or renewables, the impact of the nuclear shutdown on the downgrading of Japan's emission reduction target would be much lower (38% with oil, 23% with gas, 0% with renewables) (Jefferey et al., 2013).

[9] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.

8. Mexico

Mexico was the fourth country to deliver its INDC in March 2015 (Government of Mexico, 2015b). It includes commitments regarding GHGs as well as Short-Lived Climate Pollutants (SLCP) and has a mitigation and an adaptation component. Mexico commits to reduce 25% of its GHG and SLCP emissions below a business as usual scenario (BAU) until 2030 (including LULUCF). This commitment implies an unconditional reduction of GHGs by 22% and of Black Carbon by 51% compared to the BAU scenario, aiming to combine low-cost mitigation actions with co-benefits in terms of health and well-being for the Mexican population. Additionally, Mexico's INDC implies a net emissions peak starting from 2026 and the reduction of emissions intensity per unit of GDP by around 40% in 2030 compared to 2013.

Beyond its unconditional commitment, Mexico stipulates additional 15% of emission reductions that would increase the overall emissions reduction target to 40% reductions (36% GHG emission reductions and 70% reductions of Black Carbon emissions) below BAU projections by 2030. This increase is subject to "a global agreement addressing important topics including international carbon price, carbon border adjustments, technical cooperation, access to low-cost financial resources and technology transfer, all at a scale commensurate to the challenge of global climate change". In the long run, Mexico's General Law on Climate Change stipulates the aim to reduce its emissions by 50% from 2000 levels by 2050. The INDC proposal is consistent with this objective.

According to the BAU scenario underlying Mexico's INDC, its unconditional target for GHG emissions would imply an emissions level of 759 MtCO2eq in 2030, and the conditional target would imply a level of 623 MtCO2eq (including LULUCF). Excluding LULUCF on the basis of data provided by the government of Mexico in a different presentation of its INDC would imply an absolute target emissions level of 776 MtCO2e for its unconditional target (Government of Mexico, 2015a). However, official figures for the role of LULUCF in meeting Mexico's conditional target are not available. The effort-sharing calculations show that the range of allocations in different effort sharing approaches varies between approximately 550 MtCO2eq for most approaches and 350 MtCO2eq in the GDRs approach.

Overall, Mexico's unconditional target falls therefore short of the results of all effort sharing approach analysed in this study. Yet, it is difficult to assess Mexico's conditional target excluding LULUCF in the light of the results of the effort sharing approaches as the role of LULUCF in meeting the conditional target has not been specified by the government. Also, the scope of the LULUCF sector in the INDC is not precisely defined by Mexico. Comparing the LULUCF figures which the government provides for LULUCF in the BAU, the sector only seems to include afforestation, reforestation and deforestation activities. Additionally, the comparison of emissions to the baseline emission projections implies several uncertainties because there is no standard methodology according to which a BAU scenario is developed.

The inclusion of a specific target related to black carbon is remarkable for tackling the effect of SLCP and generating co-benefits for human health, however the effects on climate are highly uncertain and the climate benefits of black-carbon reduction partly overlap with the effects of measures aiming to reduce GHG emissions covered by the Kyoto Protocol.

To achieve the median emissions allocation levels would require reduction measures at costs up to 51€/t in 2020, up to 59€/t in 2025 and up to 78€/t in 2030, according to the analysis carried out for this project. Table 6 displays the figures for the range of the effort sharing results for the years 2020, 2025 and 2030.

Figure 7: Results of Effort Sharing Calculations and Mitigation Costs for Mexico

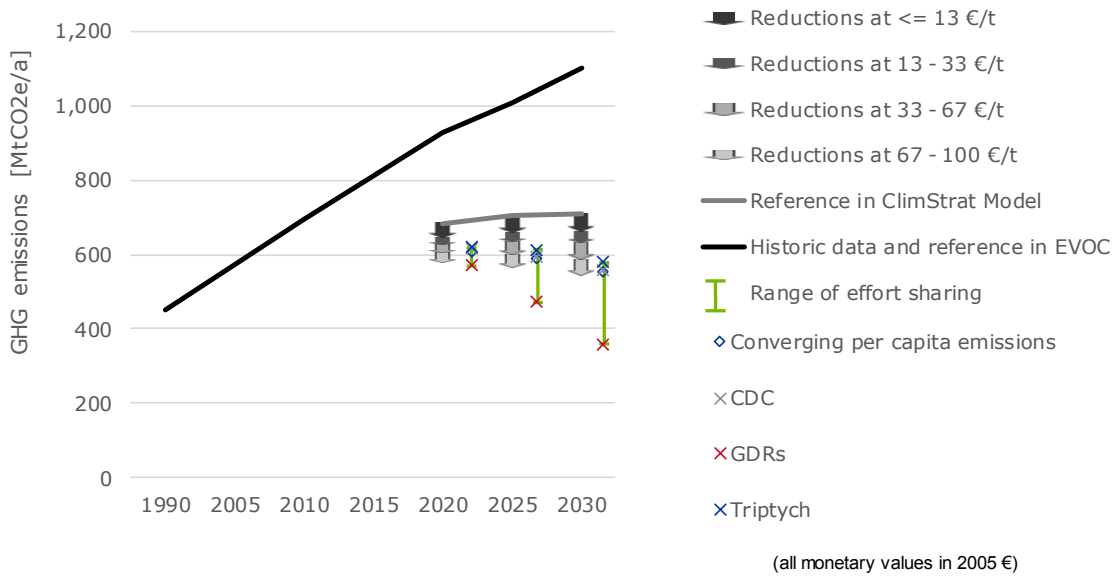


Table 6: Comparison of INDC with Results for Effort Sharing Calculations for Mexico

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
INDC[10] (unconditional)	n.a.	n.a.	841	n.a.	n.a.	83%	n.a.	n.a.	20%
INDC[11] (conditional)	n.a.	n.a.	673	n.a	n.a.	47%	n.a.	n.a.	-4%
CPE	604	584	549	34%	30%	22%	-13%	-16%	-21%
CDC	611	591	555	36%	31%	23%	-12%	-15%	-20%
GDRs	566	468	356	26%	4%	-21%	-19%	-33%	-49%
Triptych	615	609	575	37%	35%	28%	-12%	-12%	-17%
Median	607	588	552	35%	31%	23%	-13%	-15%	-21%

The National Strategy for Climate Change (ENCC) published in 2013 and the Special Programme for Climate Change (PECC) 2014-2018 contain lines of actions for Mexico's climate policy for the short, medium and long term. However, the indicative goals mentioned in these documents do not ensure changes in laws, for instance, with respect to the introduction of a carbon tax.

Beyond these general efforts to mitigate climate change, the Mexican government has particularly focused on the energy sector trying to reduce emissions through the promotion of renewables and energy efficiency, with mixed success. The net contribution of renewables to the national energy production decreased between 2003 and 2012, from 8% to 6.3%12 (Secretariat of Energy, 2013), largely because complementary policies have not sufficiently supported the energy transition.

Furthermore, one of the big hurdles to mitigation is rooted in the fact that Mexico's oil, gas and electricity industries are controlled by the government.13 The removal of energy subsidies is encountering strong opposition from centrist and left-wing parties as well as from the general public (Party of Democratic Revolution, 2013).

[10] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.

[11] See above.

[12] But while in 2003, electricity from renewable energy came almost entirely from hydroelectric and geothermal sources, in 2012, wind energy contributed 8% to the national electricity generation, biomass and biogas 2% and solar energy 0.02%.

[13] As a result, prices for the consumption of electricity, gas and gasoline are fixed by the federal government and, in the case of gasoline, diesel and electricity funds are given to the state-owned energy companies to cover production costs.

9. Morocco

Morocco submitted its INDC in June 2015 (Government of Morocco, 2015). According to it, this country aims to reduce GHG emissions including LULUCF in 2030 by 13% below BAU projections. This commitment would be increased to 32% GHG reductions below BAU by 2030 if international support was provided and a legally binding agreement was concluded. The absolute level of GHG emissions including LULUCF resulting from the unconditional INDC in 2030 is 148 MtCO2eq. The conditional target would lead to a reduction of emissions to a level of 117 MtCO2eq in 2030 (including LULUCF). Absolute emission reductions in the conditional scenario thus amount to 54 MtCO2eq. According to Morocco's INDC submission, 5% of this mitigation effort shall be made in the LULUCF sector (2.7 MtCO2eq). Thus, an absolute target emissions level of 119.7 MtCO2eq excluding emissions and removals from the LULUCF sector can be inferred from these figures. Information on the role of the LULUCF sector for meeting its unconditional target is not provided by Morocco.

In the submission of its INDC, Morocco includes a detailed list of actions, which it expects to be necessary to achieve the unconditional target. Many of these actions are already anchored in national legislation. To reach the conditional target, the INDC specifies 54 measures in different sectors that could lead to further reductions. To implement these actions, Morocco affirms that in total 45 billion USD would be necessary as investments between 2015 and 2030. It expects 35 billion USD to come from access to new sources, e.g. "new climate finance mechanisms, such as the Green Climate Fund". Morocco's INDC submission includes the possibility to use market mechanisms to achieve the proposed targets.

About 50% of its emission reductions envisaged by the conditional target shall be achieved in the energy sector. Additionally, its INDC contains detailed information on activities, mainly in the energy sector, to increase the share of renewable energy capacity to 42% and to stop its emissions growth by 2020.

Emission allocations according to the effort sharing approaches considered in this report range from 62 (Triptych), 69 (CDC), 80 (CPE) to 102 Mt CO2-eq. (GDRs), with a median of 74 Mt CO2-eq for 2030. In the reference scenario used for this analysis, emissions keep growing to about 142 Mt CO2-eq. in 2030, which is a lower level than the BAU scenario referenced in Morocco's INDC submission (171 MtCO2eq in 2030 under business as usual). For 2020, emission allocations range from about 60 to about 86 Mt CO2-eq., which would mean a near doubling of 1990 levels (45 Mt); and for 2025 from about 63 to about 94 Mt CO2-eq.

Morocco's proposed INDC therefore falls short of the results of all effort sharing proposals analysed in this study even though it is comprehensive in scope and sets an ambitious unconditional target. Nevertheless, the reduction of emissions compared to the baseline emission projections implies several uncertainties, as there is no established methodology for calculating BAU scenarios. Therefore, the results of the effort sharing approaches diverge from the absolute levels of GHG reductions implied in the calculations of the INDC itself.

Morocco has a high potential for emission reductions that have economic benefits. The country could reach the high range of allocations (102 Mt CO2-eq. as calculated from the GDR approach) purely with measures already in place or planned by mid-2013. According to ClimStrat calculations, making full use of these measures would actually lead to a slightly stronger emissions reduction than needed to reach the high range for every calculated year. Reaching emissions levels consistent with the median of approaches, on the other hand, would incur marginal abatement costs possibly slightly above 100 €/t CO2-eq.

Reaching levels consistent with the Triptych approach, would need significantly higher effort: average costs were calculated as about six times as high as those incurred by reaching the median for each year. Marginal abatement costs would reach almost 500 USD/t CO2-eq. in 2030. However, such high investments would also lead to a levelling-out of the emissions pathway at levels about 10 Mt CO2-eq. lower than the median path in every year, with emissions even slightly decreasing after 2025.

Figure 8: Results of Effort Sharing Calculations and Mitigation Costs for Morocco

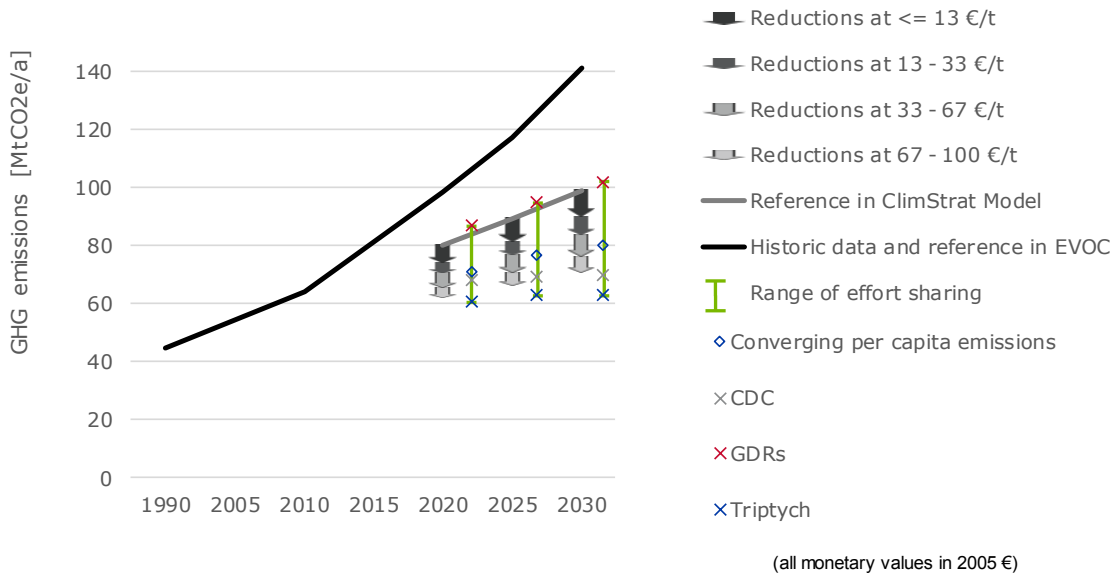


Table 7: Comparison of INDC with Results for Effort Sharing Calculations for Morocco

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
INDC[14] (unconditional)	114	131	149	284%	341%	402%	21%	38%	58%
INDC[15] (conditional)	104	104	117	249%	250%	295%	10%	10%	24%
CPE	71	76	80	58%	71%	78%	10%	19%	24%
CDC	68	69	69	51%	54%	56%	5%	7%	8%
GDRs	86	94	102	93%	111%	128%	34%	47%	58%
Triptych	60	63	62	35%	40%	40%	-6%	-3%	-3%
Median	69	73	74	55%	62%	67%	8%	13%	16%

Morocco represents a special case within the North African region: it is relatively poor and does not have access to extensive oil and gas reserves to fuel its energy demand, which has grown by about 7% annually in recent years. The country meets more than 95% of its energy needs through imported fossil fuels (mainly oil), and is therefore highly susceptible to global oil price variations (WWF, 2013).

Not least due to a relatively high import bill for fossil fuels, and the energy dependence on other countries it creates, Morocco is currently taking strong strides to expand its renewable energy base, which in 2011 was still very small. It has a strong interest to diversify its energy sources and make use of the country's high potential for solar and wind energy. Morocco's climate policy therefore mainly has focused on energy through targets to expand renewable energy and reduce energy consumption. Yet, constraints in access to centrally-governed funds, limited technical and legal capacity for the promotion and uptake of renewable energies, in times limited uptake of renewable energies by regional authorities (WWF, 2013). Furthermore, the continuing political dispute over the status of the West Sahara, which discourages development banks from providing funding (El Yaakoubi, 2014), pose challenges to the realisation of Morocco's renewable energy plans. Recognising this, the National Agency for the Development of Renewable Energies and Energy Efficiency (ADEREE) has established a number of capacity building programmes to overcome local capacity barriers (ibid.).

[14] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.
[15] See above.

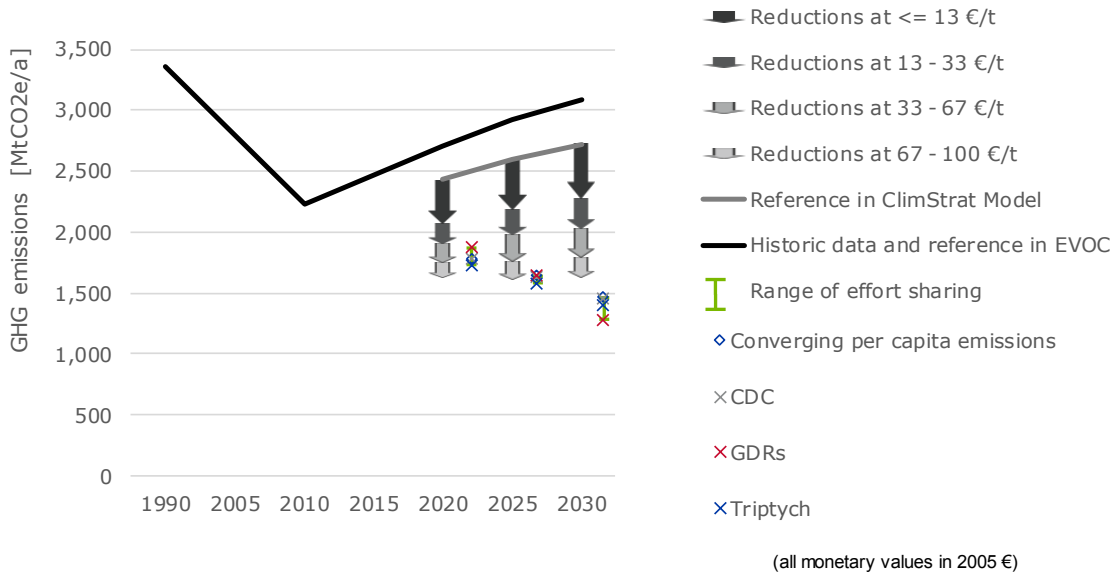
10. Russia

Russia submitted its INDC on 31 March 2015, pledging to reduce its emissions of net greenhouse gases by 25% to 30% below 1990 levels by 2030, which falls far short of the effort sharing proposals considered in this study, which suggest that Russia should have aimed for a reduction of 57% to 62% below 1990 (Russian Federation, 2015). The reductions required by effort sharing approaches go significantly below today's level and will be difficult to reach through domestic action only.

While emissions from LULUCF were not included in the effort sharing calculations of this report, it is important to note that credits from LULUCF would enable Russia to increase its industrial GHG emission levels significantly, thereby further watering down the initial target of a reduction of 25% to 30% below 1990 to a reduction of merely 6% to 11% below 1990.

Effort sharing calculations foresee substantial reductions for Russia in order to be on track to meet the 2°C target. For 2025, the range of effort-sharing allocations is minimal, all moving around 1,600 Mt CO_2-eq. Allocations for 2030 range from 1,271 with the GDRs approach to 1,455 Mt CO_2-eq. with the converging per capita emissions approach. The INDC pledges emission levels to be around 2,986-3,162 $MtCO_2e$ by 2030, highlighting the huge discrepancies between Russia's INDC and the results of the effort sharing calculations (CAT, 2015).

Figure 9: Results of Effort Sharing Calculations and Mitigation Costs for Russia



Russia's potential for emission reductions with economic benefits is quite high. According to ClimStrat calculations, the country could reduce as much as 362 Mt CO_2-eq in 2020 purely with cost-neutral measures. In 2025 and 2030, this number increases to 418 and 436 Mt CO_2-eq., respectively. Reaching emissions levels consistent with the median of effort sharing approaches would imply reduction measures at costs up to 67 €/t CO_2 in 2020. In 2025, reaching the level indicated by effort sharing approaches requires measures at costs up to 100 €/t. In 2030, Russia's fair share is as much as 400 Mt CO_2-eq. below the reduction level achieved when reduction measures at costs up to 100 €/t CO_2 are implemented.

Table 8: Comparison of INDC with Results for Effort Sharing Calculations for Russia

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
INDC[16]	n.a.	n.a.	3.162 to 2.986	n.a.	n.a.	-6% to -11%	n.a.	n.a.	42% to 34%
CPE	1.771	1.632	1.455	-47%	-51%	-57%	-21%	-27%	-35%
CDC	1.768	1.624	1.440	-47%	-52%	-57%	-21%	-27%	-35%
GDRs	1.867	1.633	1.271	-44%	-51%	-62%	-16%	-27%	-43%
Triptych	1.719	1.570	1.386	-49%	-53%	-59%	-23%	-30%	-38%
Median	1.769	1.618	1.414	-47%	-52%	-58%	-21%	-27%	-37%

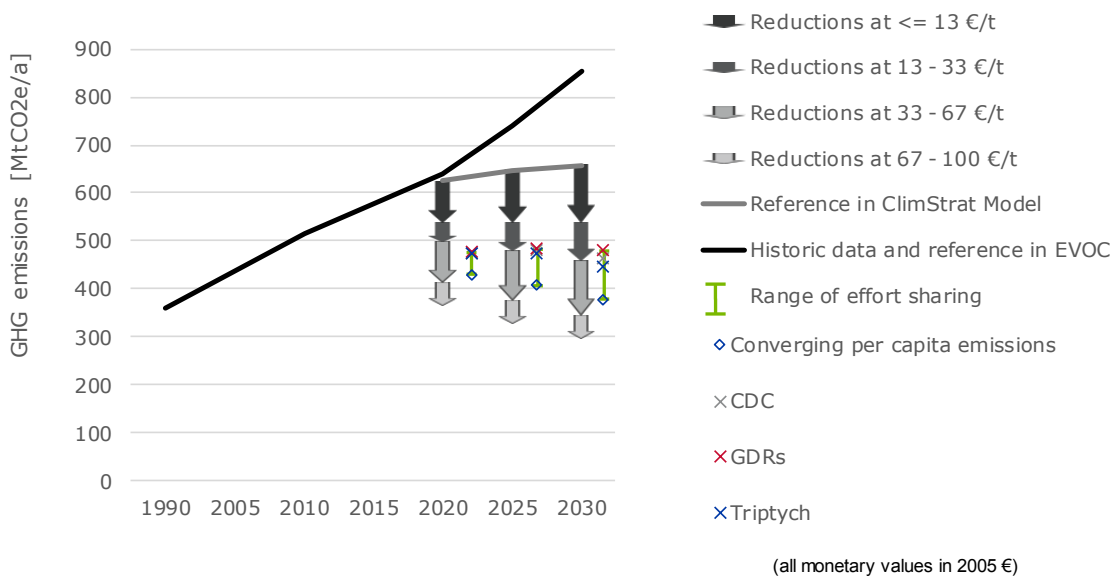
[16] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.

11. South Africa

South Africa has re-affirmed its existing policy in its INDC, pledging that emissions by 2025 and 2030 will be in a range between 398 and 614 Mt CO2-eq. South Africa's pledge includes LULUCF (Government of South Africa, 2015). Assuming LULUCF remains at the average level over 2000–2010 (-19 Mt CO2-eq.), the figures translate to an emissions level of between 417–633 Mt CO2-eq. excluding LULUCF.

Compared to other countries analyzed in this study the results of different effort sharing approaches do not differ significantly. For 2025, the range is about 405-480 Mt CO2-eq. whereas for 2030, it increases to 375-480 Mt CO2-eq. The median of the emission targets from the four effort sharing models we analyzed – 465 Mt CO2-eq. in 2025 and 443 Mt CO2-eq. in 2030 – could be reached with average abatement costs well below 100 €/tCO2-eq. up to 2030. Even considering the effort sharing model which requires most ambitious actions for South Africa (CPE), marginal abatement costs would be below 100 €/tCO2-eq.

Figure 10: Results of Effort Sharing Calculations and Mitigation Costs for South Africa



For 2025, the lower end of the range of South Africa's INDC excluding LULUCF (417 Mt CO2-eq.) is at the lower limit of the effort sharing range (405 Mt CO2-eq.). For 2030, it is also well within the range (375-480 Mt CO2-eq.). The upper limit of the pledge is significantly above all effort sharing allocations. The mid-point of South Africa's pledged range (525 Mt CO2-eq.) is also well above even the most lenient allocation.

Table 9: Comparison of INDC with Results for Effort Sharing Calculations for South Africa

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
INDC[17]	n.a.	398 to 614	398 to 614	n.a.	20% to 82%	20% to 82%	n.a.	-28% to 9%	-28% to 9%
CPE	426	405	376	18%	12%	4%	-17%	-21%	-27%
CDC	472	477	462	31%	32%	28%	-9%	-8%	-10%
GDRs	474	481	478	31%	34%	33%	-8%	-7%	-7%
Triptych	470	470	445	30%	30%	23%	-9%	-9%	-14%

[17] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.

Median	466	465	443	29%	29%	23%	-10%	-10%	-14%

South Africa's domestic policy shows a mixed picture: compared to its history and existing infrastructure as a coal country, its national climate change strategy with an emission peak between 2020 and 2025, plateau up to 2035 and decline up to 2050 can be considered a major paradigm shift. However, up to today implementation falls short of the country's ambition, partly due to strong industry opposition, but also due to shortfalls in vertical and horizontal policy integration.

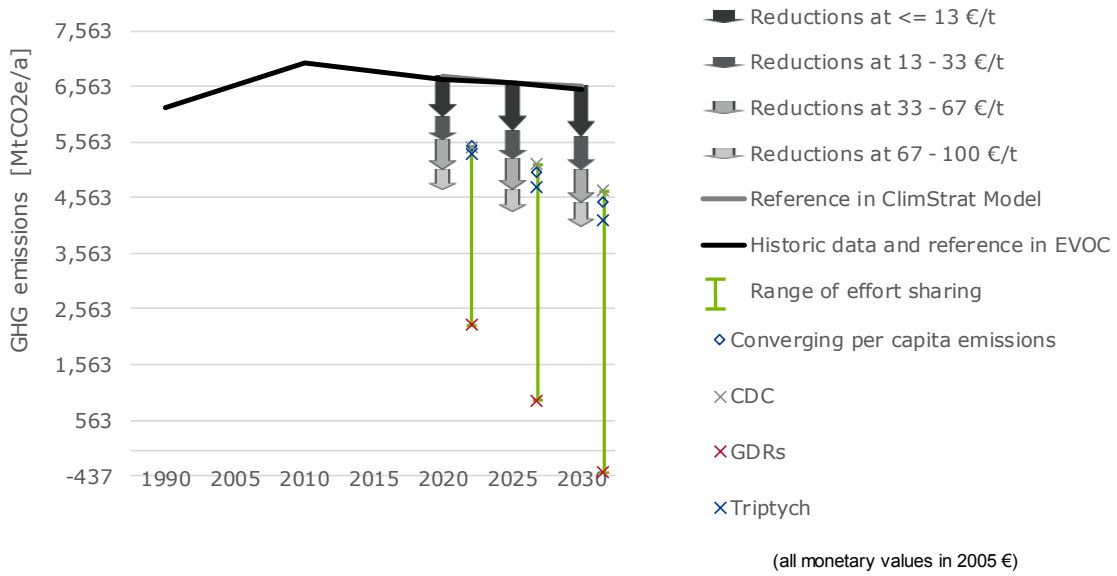
12. United States of America

According to its INDC (Government of the United States of America, 2015) the USA aims to reduce its emissions by 26-28% below 2005 levels by 2025, which translates to about 12-19% below 1990 levels (excl. LULUCF), which involves some uncertainty (CAT, 2015). This is at the very low end of the effort sharing proposals considered in this study.

The US emissions have been increasing constantly from 6,220 Mt CO2 in 1990 to 7,288 Mt CO2 in 2007. Afterwards the emissions started to decrease and approached a level only 4% above the 1990 emissions level in 2012. According to the USA INDC the average speed of emissions reduction will increase from slightly above 1% annually in the period 2005-2020 to between 2.3-2.8% in the subsequent five years.

The effort sharing exercise yields strongly varying results for the USA. The approaches that are based on globally converging per capita emissions starting from current levels (CPE and CDC) and on convergence of sectoral indicators irrespective of countries' development status (Triptych) range from 17-23% below 1990 levels in 2025 and 25-33% in 2030. By contrast, the GDRs approach which focuses on historical responsibility and economic capability suggests emissions reduction by 86% in 2025 and negative emissions in 2030.

Figure 11: Results of Effort Sharing Calculations and Mitigation Costs for the USA



Mitigation costs to achieve the high end of the range are around 50 €/t CO2-eq. in 2025. For 2030 costs would increase to around 100 €/t CO2-eq. By contrast, achieving the low end of the range would incur much higher costs. As noted above, these calculations are based on the assumption of purely domestic efforts, so the use of international emissions trading would tend to lower these costs. A target as suggested by the GDRs proposal would in practice only be feasible through financing large quantities of emission reductions outside the USA's borders.

Table 10: Comparison of INDC with Results for Effort Sharing Calculations for the USA

	Absolute Emissions			Level relative to 1990			Level relative to 2010		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
INDC[18]	n.a.	5462 to 5014	n.a.	-4%	-12% to -19%	n.a.	n.a.	-20% to -27%	n.a.
CPE	5.467	5.011	4.449	-12%	-19%	-28%	-22%	-28%	-36%
CDC	5.453	5.141	4.662	-12%	-17%	-25%	-22%	-26%	-33%
GDRs	2.253	894	-397	-64%	-86%	-106%	-68%	-87%	-106%
Triptych	5.326	4.746	4.132	-14%	-23%	-33%	-24%	-32%	-41%
Median	5.390	4.878	4.290	-13%	-21%	-31%	-23%	-30%	-39%

The ultimately unsuccessful Waxman-Markey climate bill of 2009, which the USA referred to in its Copenhagen pledge, envisaged stronger reductions than the INDC, namely 30% below 2005 levels by 2025 and 42% by 2030 (19% and 33% compared to 1990 levels). However, the figures envisaged in the Waxman-Markey bill were part of a comprehensive legislation that would have established a cap-and-trade system as well as other emission reduction policies. Currently, there is no prospect for such comprehensive climate legislation being adopted. Large parts of the Republican Party take radical positions on climate policy and a substantial number of the Democrats can also not be counted on to support stronger climate policy due to their states' heavy reliance on coal or manufacturing or their personal opinions.

Therefore, the administration will for the foreseeable future have to rely on executive action, which limits the level of emission reductions the USA can achieve. According to a study by the World Resources Institute, the most ambitious pathway achievable without additional Congressional action, the "Go-Getter scenario", would lead to a reduction of 26% below 2005 levels in 2025 (Bianco et al., 2013).

One may therefore conclude that the INDC is the best the current US administration can offer, but at the very low end of what could be considered an equitable contribution based on the effort sharing proposals considered in this study.

[18] INDC emission levels exclude emissions from LULUCF and are based on calculations of the Climate Action Tracker.

Annex 1 – Full country chapters

The information contained in this annex is as of October 2014.

1. Brazil

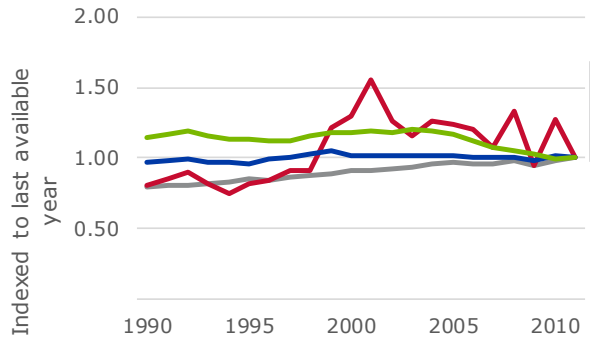
1.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	196.935	mln cap	2011
GDP	1.1E+12	US$ (2005)	2011
Air pollution index	41	ug/m3, mear	2012

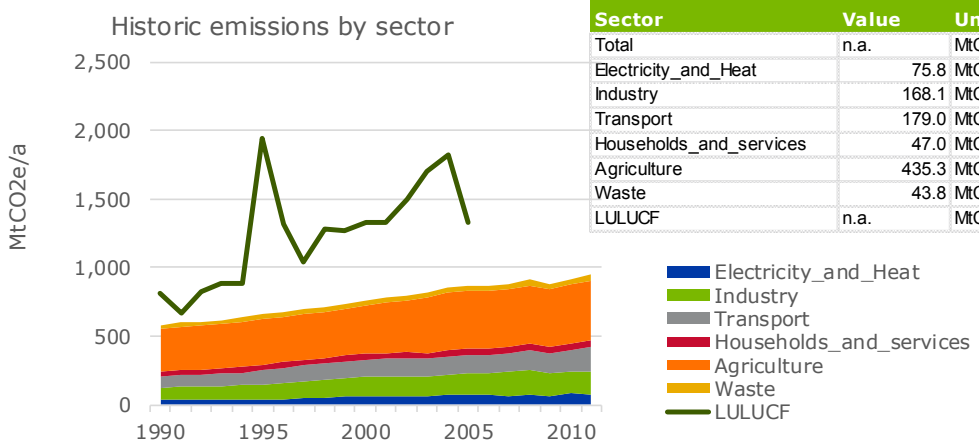
Indicator	Value	Unit	Year
Vulnerability	0.30	-	2011
HDI	0.74	-	2011
Electrification rate	99.3	%	2011

Past trends of decarbonisation indicators



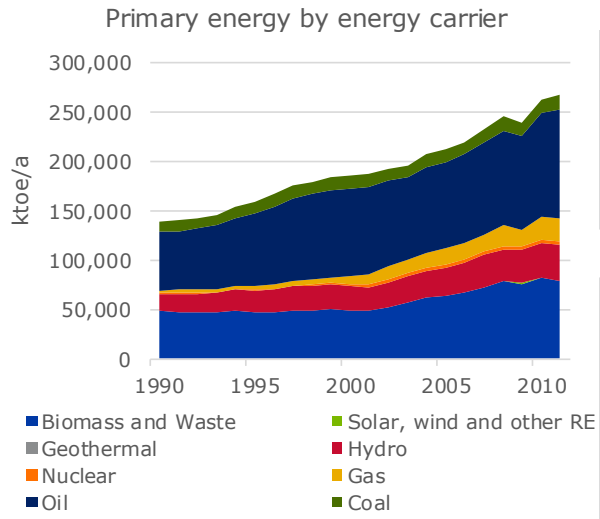
Indicator	Value	Unit	Year
Per capita emissions	4.82	tCO2e/ cap	2011
Emission intensity of electricity	67.8907	tCO2/kWh	2011
Emission intensity of economy	0.84	tCO2e/ USD	2011
Energy intensity of economy	0.24	ktoe/ million	2011

National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	75.8	MtCO2e/a	n.a.
Industry	168.1	MtCO2e/a	n.a.
Transport	179.0	MtCO2e/a	n.a.
Households_and_services	47.0	MtCO2e/a	n.a.
Agriculture	435.3	MtCO2e/a	n.a.
Waste	43.8	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Energy mix



Fuel	Value	Unit	Share in 2011
Biomass_waste	77912	ktoe	29%
Solar_wind_other	653	ktoe	0%
Geothermal	0	ktoe	0%
Hydro	36837	ktoe	14%
Nuclear	4081	ktoe	2%
Gas	22887	ktoe	9%
Oil	109027	ktoe	41%
Coal	15431	ktoe	6%

Indicator	Value	Unit	Year
Share of global emissions	3.2	%	2010
Domestic fossil fuel production	129,112	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	52	%	2011
Economic relevance of fossil fuel imports	1.6	% of GDP	2011
Fossil fuel subsidies	n.a.	Billion USD	n.a.
Fuel import dependence	8	% of imports	2011
Fuel import bill	44.09	Billion USD	2011

Brazil's contribution to climate change is low-medium. While Brazil has a share of 2.25% of global emissions and emitted a total of 2,192 Mt CO2e in 2005, its per capita emissions amount to 6 t CO2e and its accumulated emissions in the period 1990-2010 to 98 t CO2e per capita. These figures, however, are strongly determined by the country's huge emissions from agriculture, forestry and other land uses (AFOLU) which constitute about half of Brazil's total GHG emissions while the electricity sector accounted for only 6% of national emissions in 2005 (Empresa de Pesquisa Energética (EPE), 2007). This is largely owed to the huge endowment of renewable energy sources leading to an electricity emission factor of just 0.61 t CO2e per MWh (December 2013; (Kuriyama, 2014)). However, emissions in Brazil's electricity sector are expected to rise by almost 7% per year between 2005 and 2030 (Empresa de Pesquisa Energética (EPE), 2007).

Brazil's Human Development Index of 0.73 shows its relatively high social and economic development status. Also, the country with the fifth largest population in the world (195 million inhabitants) has a relatively high per capita income of about US$ 5,600. However, the national income is distributed extremely unequally: With a Gini coefficient of 51.9, Brazil is among the countries in the world with the highest income inequality. Nevertheless, all in all, these numbers reflect Brazil's relatively high capacity to tackle complex problems such as climate change.

1.2 Mitigation Potential and Effort Sharing Allocations

Since land use, land use change and forestry (LULUCF) is a sector that is very different from the other sectors and has different accounting rules under the UNFCCC, LULUCF was not included in the analysis. Due to the high relevance of LULUCF emissions in Brazil, this is a strongly limiting factor.

Allocations for Brazil for 2020 are quite similar among the four effort sharing proposals considered in this study and vary the most for 2030. To reach the different targets, Brazil would have to reduce its emissions by 14% to 17% in 2020 compared to 2010 levels. For 2030, emissions would have to lie at between 22% and 41% below 2010 levels. This would equal between 1% and 26% below 1990 levels. The median of the proposals' targets lies at about 15% below 2010 levels in 2020, 19% below 2010 levels in 2025, and at 25% below 2010 levels (5% below 1990 levels) in 2030. The results of these effort sharing proposals for Brazil's emission target are depicted in Figure 6.

Figure 12: Results of Effort Sharing Calculations and Mitigation Costs for Brazil

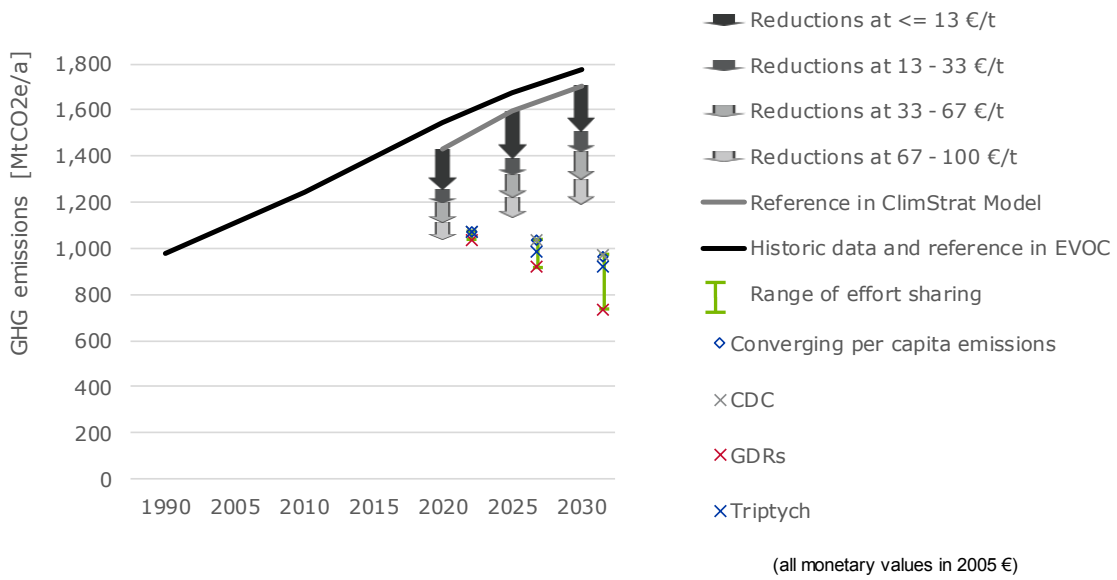


Table 11 displays the figures for the range of the effort sharing results, the range of the marginal abatement costs of achieving the respective effort sharing targets, the marginal cost of achieving the median reduction target, the range of the average costs of achieving the effort sharing targets and the average cost of achieving the median reduction target, each for the years 2020, 2025 and 2030.

Table 11: Results of Effort Sharing Calculations for Brazil

Effort Sharing Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	1.068	1.029	962	9%	5%	-2%	-14%	-17%	-23%
CDC	1.069	1.033	968	9%	5%	-1%	-14%	-17%	-22%
GDRs	1.031	915	730	5%	-7%	-26%	-17%	-26%	-41%
Triptych	1.068	1.029	962	9%	5%	-2%	-14%	-17%	-23%
Median	1.069	1.033	968	9%	5%	-1%	-14%	-17%	-22%

According to the calculations in this study, Brazil could achieve the 2020 targets at marginal costs which approximately equal the highest of the cost ranges depicted in Figure 6. The targets for the years 2025 and 2030 could only be reached at marginal abatement costs well above 100 €/t CO_2-eq. For 2030, they would amount to between about **130** €/t CO_2-eq. for reaching the CDC's target **and to more than 400** €/t CO_2-eq. for the GDRs'.

The median of the four effort sharing proposals' targets could be achieved at marginal costs of nearly 90 €/t CO_2-eq. for 2020 and of about 200 €/t CO_2-eq. for 2030. The GDRs imply the most ambitious, the CDC the least ambitious out of the targets set by the four effort sharing proposals for Brazil.

When looking at these numbers for Brazil, it is crucial to keep in mind that LULUCF was not included in the analysis. LULUCF has, however, until recently been responsible for by far the largest share of Brazil's total emissions and plays a key role in its mitigation strategy. Therefore, these numbers can only shed light on a section of Brazil's effort sharing allocations and their corresponding costs.

As noted above, these calculations are based on the assumption of purely domestic efforts, so use of international emissions trading would tend to lower these costs.

1.3 Political System

The Federative Republic of Brazil (República Federativa do Brasil) consists of the Federal District and 26 states, is divided into 5,565 municipalities (municípios) and is governed under the Federal Constitution of 1988. The President of the Republic is elected for four years in direct general elections and is both chief of state and head of government. He or she appoints the cabinet, comprised of senior advisers and other government officials, who are in charge of formulating, implementing, and evaluating, a particular policy portfolio. The National Congress (Congresso Nacional) consists of two representative houses and constitutes the legislative power in Brazil. While the Chamber of Deputies (Câmara dos Deputados) represents the population, the Federal Senate (Senado Federal) represents the states. Deputies are elected for a period of four years by proportional representation, Senators for eight years by majority voting (3 Senators from each state and federal district). However, not all seats of the Senate are up for election at every election. While in 2014, elections regarded one third of all seats, the other two thirds are up for election four years later.

As no party has a majority in either the Senate or the Chamber of Deputies, majorities in the National Congress depend on coalitions which tend to change depending on the issue concerned. As of 29 October 2014, there are Senators from 16 different parties and Deputies from 19 parties in the National Congress. The largest party in the Senate is the Brazilian Democratic Movement Party (Partido do Movimento Democrático Brasileiro, PMDB) which holds 19 out of the 81 seats in the Senate (23%) (Brazil: Senado Federal, 2014). With 88 out of 513 seats (17%), the Worker's Party (Partido dos Trabalhadores, PT) of re-elected President Dilma Rousseff is the most important party in the Chamber of Deputies.

On October 5 2014, elections were held for Presidency, Governors, the National Congress as well as States and Federal District Parliaments. Inaugurations are envisaged for the beginning of 2015. While Rousseff was re-elected, her mandate is considerably weaker than in her first term in office. While in

2010, she had won the runoff election with 56.01% of all votes cast, in 2014 she just received 51.6% of the vote. Also, Rousseff's Worker's Party lost seats in both representative houses. In Brazil's 2015 Congress, the Worker's Party will hold only 70 of all seats in the Chamber of Deputies (13,7%), followed by the Brazilian Democratic Movement Party with 66 of the seats (12.9%). The Brazilian Democratic Movement Party will remain the strongest party in the Senate with 18 seats (22.2%), with the Worker's Party runner up with 12 seats (14.8%) (Brazil: Câmara dos Deputados, 2014; Brazil: Senado Federal, 2014; Glickhouse, 2014).

The legislative process in Brazil may be started by either one of the representative houses, the President, the Supreme Court, the Higher Courts, the Attorney General and citizens. (Nachmany et al., 2014; Townshend et al., 2013). All draft legislation proposed by one of the representative houses has to be approved (when indicated, after revision) by the other representative house and may be sanctioned or vetoed by the President (Hanna Fekete, Mersmann, & Vieweg, 2013). This obliges the President to be involved in legislation around climate change and provides the topic some relevancy at higher political levels. The legislative process in Brazil includes comprehensive stakeholder consultation and is open to input from scientists and experts. This facilitates largely stringent and thorough climate legislation (Hanna Fekete et al., 2013; Townshend et al., 2013).

Climate politics and policies are an essential element of the Brazilian political system and are embedded profoundly in different government bodies, in particular in the Ministry of Science, Technology and Innovation (Ministério da Ciência, Tecnologia e Inovação, MCTI), the Ministry of the Environment (Ministério do Meio Ambiente, MMA) and the Ministry of External Relations (Ministério das Relações Exteriores, MRE) (Brazil, 2010; Hanna Fekete et al., 2013; Government of Brazil: Interministerial Committee on Climate Change, 2007; Governo Federal: Comitê Interministerial sobre Mudança do Clima, 2008).

1.4 Historical and Current Domestic Climate Policy and Politics

Brazil has come a long way regarding politics as well as policies on climate change mitigation and adaptation in the last couple of years. Today, it has the legislative and administrative architecture as well as a consistent set of strategies and plans to fight climate change effectively. It has developed and implemented a large number of policies and measures to reduce its greenhouse gas emissions – particularly regarding deforestation, its largest source of emissions – and supports several funds, credit lines and other financial sources supporting mitigation and adaptation projects, studies and similar undertakings. Science and research institutions in Brazil have the know-how as well as the capacity to develop mitigation options and MRV emissions (Hanna Fekete et al., 2013).

Nevertheless, while the Brazilian government is committed to combating climate change, forces opposing strong action regarding deforestation have persisted over the years and up to now, Brazil's mitigation plans still compete with other plans such as Brazil's growth strategy as well as its current plans to invest heavily in, inter alia, roads, electricity transmission, mining and industrial farming in the Amazon in the years to come (Held, Roger, & Nag, 2013). Further pressure is put on land and forests with Brazil's continuing strong emphasis on biofuels and hydropower. These developments could prove to be detrimental to Brazil's efforts to reduce deforestation and jeopardize the success the government has had with its deforestation policy in cutting its emissions from land use, land use change and forestry (LULUCF) since 2004.

While mitigation was just a co-benefit of programmes of the 1970s and 1980s such as the National Fuel Alcohol Program (Programa Nacional do Álcool, PRÓÁLCOOL 1975) and the National Electrical Energy Conservation Program (Programa Nacional de Conservação de Energia Elétrica, PROCEL, 1985), later programmes such as the Programme of Incentives for Alternative Electricity Sources (Programa de Incentivo a Fontes Alternativas de Energia Elétrica, PROINFA, 2002) and the Biodiesel Program (2004) were explicitly launched with the objective of reducing GHG emissions (La Rovere & Santos Pereira, 2014).

Investment decisions made in the last century have led to an unusually high share of hydropower in Brazil's energy supply mix and boosted the production and use of biofuels. In February 2014, hydropower accounted for about 68% of all electric energy production in Brazil; only 28,7% of all power produced resulted from thermoelectric power plants (ANEEL (Agência Nacional de Energia Elétrica), 2014). In 2005, the electricity sector accounted for only 6% of national emissions (Empresa de Pesquisa Energética (EPE), 2007). Thus, while most emerging economies tend to focus on the energy sector to reduce their emissions, Brazil was open to focus on its huge emissions from agriculture, forestry and other land uses (AFOLU) (Held et al., 2013).

Early legislation limiting deforestation, such as the Forest Code of 1965, on the one hand, was hard to enforce, especially in the outback of the country. On the other hand, many states that profited highly from Amazonian industries were very influential and most of them generally opposed policies aiming at the reduction of deforestation in the National Congress. This left the government unable to control deforestation effectively, even with relatively strong forestry legislation in place. Only since the late 1990s, concerns regarding climate change from national as well as international environmental groups, scientists, politicians and businesses started to be heard in Brazil and the government started heading for a new approach to climate change in President Fernando Henrique Cardoso's (1995-1998, 1999-2002) second term in office (Held et al., 2013).

With increasing interest to influence climate negotiations under the UNFCCC as well as impulses from the international level, Brazil started to develop the basis of the current climate legislation architecture. Furthermore, after major deforestation crises with huge deforestation rates – particularly in 1995 and 2002-2004 – and several violent conflicts over land, the government decided to expand legislation regarding deforestation as well as its enforcement. For this purpose, the Forest Code was reformed and complemented by other legislation and measures on this topic such as the National Forest Program (2000), the National Conservation Area System (2000), the Public Forest Management Law (2006) and the Real Time Deforestation Detection System. These instruments facilitated more effective action in the fight against deforestation. Besides enhanced forestry legislation and higher numbers of protected areas, enforcement of forestry laws and regulations was improved (Held et al., 2013; Viola, 2013).

In the wake of these measures and lower prices for agricultural and forest products, deforestation rates decreased gradually in all states after the last deforestation crisis in 2004. Reduced deforestation in the Amazonian forest and the Cerrado Savannah was responsible for a major share in the decrease of Brazilian GHG emissions in the following years. From 2005 to 2009, carbon emissions in Brazil dropped by 25%. Nevertheless, economic growth rates stayed at 3,5% annually in this five-year period. This boosted confidence in the ability of the government to fight deforestation effectively without hurting the Brazilian economy (Climate Policy Initiative, 2013; Climate Policy Watcher, n.d.-a; Viola, 2013).

Moreover, after the turn of the new millennium, natural disasters as well as new information and reports on the risks resulting for Brazil from climate change as well as the options available to confront the situation – first and foremost Brazil's Initial National Communication to the UNFCCC (2004) and the IPCC's fourth assessment report of 2007 – led to a better understanding of climate change and increased awareness on the issue both in government bodies and the public (Climate Policy Watcher, n.d.-a). Growing public concern intensified the pressure from civil society particularly in the run-up to COP 15 in Copenhagen to act on climate change domestically and to take a strong, progressive position in international climate negotiations. Such a position was supported by many businesses, too, who hoped, inter alia, for international investment in environmental services in Amazonia. Also, former environmental activists like Marina Silva and Carlos Minc became part of the government and strongly influenced Brazil's stance and actions on climate change and deforestation against opposing forces in the Ministry of Science, Technology and Innovation and other ministries as well as in the National Congress (Held et al., 2013). This development intensified when Marina Silva made the transition to a low-carbon economy part of her presidential campaign as candidate for the Green Party in 2010. The

attention that climate change received due to Silva's candidacy also influenced then-President Luiz Inácio Lula da Silva's (2003-2006, 2007-2010) actions regarding national as well as international climate policy in the run-up to Copenhagen. After the death of the Socialist Party's presidential candidate Eduardo Campos in April 2014, Marina Silva replaced him as candidate in Brazil's presidential election in October 2014, bringing the issue of global climate change once more into the centre of attention. (Stigson, Buhr, & Roth, 2013a; Viola, 2013). However, Dilma Vana Rousseff ultimately prevailed in the elections and will continue her presidency in a second term in office.

Against this backdrop, back in 2007, President Luiz Inácio Lula da Silva ordered the preparation of the National Policy on Climate Change (Política Nacional sobre Mudança do Clima, PNMC) in his second term in office. In the light of broad public support for climate action, it was approved in both chambers of the National Congress after strong lobbying by the trans-party environmental bloc (Viola, 2013). With the PNMC, the state aimed at structuring and coordinating government actions related to climate change (Governo Federal: Comitê Interministerial sobre Mudança do Clima, 2008). In the PNMC, as one of the first major developing countries, Brazil set itself a voluntary emission reduction target of between 36.1% and 38.9% until 2020 compared to a BAU scenario with 2005 as baseline. To reach this, as well as subordinate climate change-related targets, the PNMC employs a set of instruments such as the National Plan on Climate Change (Plano Nacional sobre Mudança do Clima, 2008), Sector Plans of Mitigation and Adaptation to Climate Change, the National Fund on Climate Change (Fundo Nacional sobre Mudança do Clima, FNMC) and the Brazilian Emissions Reductions Market (Mercado Brasileiro de Redução de Emissões, MBRE) (Presidência da República: Casa Civil: Subchefia para Assuntos Jurídicos, 2009).

The National Plan on Climate Change is a particularly important pillar of Brazil's set of climate change instruments. In it, Brazil describes climate change to be a "strategic issue for both the present and the future of national development" (Government of Brazil: Interministerial Committee on Climate Change, 2007) and depicts the main actions to be implemented in Brazil regarding climate change mitigation and adaptation. The Plan defined and compiled targets as well as actions concerning energy efficiency, renewable energy, biofuels, deforestation and forest coverage, vulnerabilities of populations and adaptation (Governo Federal: Comitê Interministerial sobre Mudança do Clima, 2008). The most far-reaching and progressive change in Brazilian policies was the inclusion of the targets regarding the reduction in deforestation rates and the net loss of forest coverage in the country's climate strategy, as well as the extent of these targets (Held et al., 2013).

In 2009, Brazil submitted its voluntary emission reduction target under the Copenhagen Accord and turned the PNMC into a legally binding law (Held et al., 2013). Moreover, in 2010 at COP 16 in Cancún, Brazil was the first developing country to announce an absolute emissions limit: By 2020, total national emissions should not exceed 2 Gt CO2-e (Townshend et al., 2013).

Especially in states benefiting from the exploitation of the Amazon, the forces explicitly opposing strong action on deforestation, such as the so-called "ruralists" who advocate the interests of rural agriculture, have persisted over the years. To combine economic growth with environmental and social sustainability, payments for ecosystem services have been introduced in Brazil with the Green Allowance (Bolsa Verde) in 2011 (Townshend et al., 2013). In 2012, a new Forest Code (Código Florestal) on land-use in Forests and other Protected Area replaced the Forest Law of 1965. In the run-up to this law, strong and heated discussions between advocates and opponents of stringent legislation on deforestation flared up in all areas of civil society and the government. In the end, concessions were made to the ruralists and the new Forest Code was approved after several alterations to the law had been made (Townshend et al., 2013). Overall, the new Forest Code is more lenient than the old one and has relaxed previous standards. Amnesty from fines and other penalties was given to landowners for violations of the Forest Code that had started before 2008 and the area to be reforested was reduced from 500,000 km^2 to 210,000 km^2. Furthermore, the new law allows additional deforestation which is estimated to reach 400,000 km^2 (Covre & Clemente, 2014; Soares-Filho et al., 2014). The discussion on the new Forest Code not only put substantial pressure on President Dilma Vana Rousseff

but also had repercussions on other legislative processes. They especially delayed the development of other legislation concerning forests such as the REDD+ law project (Townshend et al., 2013). In the elections of October 5 2014, ruralists have gained seats both in the Senate and the Chamber of Deputies. While they currently hold 37.2% of the 513 seats in the Chamber of Deputies (191), they will have the majority next year with a total of 51.3% of all seats (263). This shift in power is likely to become blow for the fight against deforestation in Brazil (Macedo, 2014).

This is not the only development threatening the achievements made in the fight against climate change in Brazil. The country's continuing strong emphasis on biofuels and hydropower as well as its plans to invest heavily in infrastructure in the Amazon in the coming years put additional pressure on land and forests and may result in further deforestation.

Furthermore, while the share of hydropower in electric energy production is still very high today and amounted to 68% of all electric energy production in February 2014, it has been decreasing significantly over the last couple of years. In 2005, hydropower still accounted for about 90% of total electricity production. Total electricity consumption, in contrast, is expected to almost triple until 2030. Brazil's National Energy Plan 2030 (Plano Nacional de Energia 2030 (PNE 2030)) envisages the vast majority of the expansion of the electricity demand to come from nuclear energy as well as coal and natural gas while, by 2030, hydropower is projected to have a share of only little more than 70% in national electricity production (Empresa de Pesquisa Energética (EPE), 2007). The use of other renewable energy sources such as electric energy from biomass (sugarcane), wind power and municipal waste are expected to increase, but reaching only a total of 4% of Brazil's electricity supply in 2030 (Empresa de Pesquisa Energética (EPE), 2007). In total, this development is expected to lead to a significant increase of the electricity sector's emissions. While electricity generation accounted for only 6% of Brazil's total emissions in 2005, it is expected to reach a share of 10% in 2030 and emissions are expected to grow by almost 7% per year between 2005 and 2030 (Empresa de Pesquisa Energética (EPE), 2007). In addition, Brazil currently develops new oil fields, especially those in the provinces of the Pre-salt in the Brazilian continental shelf which has oil-bearing rock under a thick layer of salt (Cunningham, 2014). Therefore, even if it manages to get its emissions from LULUCF under control, increased emissions in other sectors still could prevent Brazil from achieving its voluntary emissions reduction target.

1.5 Historical and Current International Climate Policy Positions

From the beginning of international climate negotiations, Brazil has taken a rather conservative non-commitment position. It argued that a country's responsibility to reduce GHG emissions in the atmosphere depended upon its share in accumulative historical emissions and that basing any effort sharing decision on a country's yearly emissions would underestimate developed countries' contributions to climate change. Therefore, accumulative rather than yearly emissions should be the basis for decision-making on effort sharing.

The Brazilian Proposal of 1997 stressed this point anew (UNFCCC, 1997). Brazil rejected binding as well as voluntary emission reduction commitments all throughout the 1990s. Furthermore, it announced that it would not limit GHG emissions until the middle of the 21st century and called for strong action from developed countries to reduce emissions instead. With the largest share of emissions in Brazil stemming from agriculture, forestry and other land uses (AFOLU), the government knew that serious attempts to cut the country's emissions would have to focus on this sector and feared negative political as well as economic consequences from commitments under the UNFCCC. Moreover, such commitments were criticized by many decision-makers for undermining Brazil's national sovereignty. In general, the focus was set on the short-term benefits of using natural resources instead of on long-term interests concerning deforestation (Climate Policy Watcher, n.d.-a; Held et al., 2013; Viola, 2013).

While it objected own mitigation commitments, Brazil was pushing for climate action on international level in other areas. Thus, it developed the original concept of a Clean Development Fund (CDF) in

1997 which opened the doors for the creation of the Clean Development Mechanism (CDM). As the country hoped to benefit from then CDM's introduction, it strongly supported the ratification of the Kyoto Protocol in 1997 with binding emission reduction targets for developed countries. Brazilian advocacy even increased once the United States of America (USA), who had been the other major supporter of the CDM, pulled out in 2001. Also, Brazil was among the states that fostered the forming of coalitions that are responsible for the Marrakech Accords as well as later agreements (Held et al., 2013; Matsuo, 2003).

Events both at the international and the national level as described above reinforced each other and influenced Brazil to gradually change its position in international climate negotiations beginning in the mid-2000s. Thus, several forces who had previously opposed a more progressive Brazilian stance in international climate negotiations were confronted with developments which made climate actions profitable for them. For landowners and agriculturalists, for instance, discussions of the inclusion of Reduced Emissions from Deforestation and Forest Degradation (REDD) into the CDM or any other market mechanism as well as other options for payments related to avoided deforestation opened up the chance of additional income for safeguarding their forests from deforestation. Also, the bioethanol industry regarded strong global mitigation commitments to be profitable as such commitments fuelled international demand for Brazilian ethanol. These developments led to a substantial reduction of opposition from parts of these group of actors and even encouraged strong support for REDD+ and own mitigation commitments, respectively (Kasa, 2013; Stigson et al., 2013a; Viola, 2013).

Further impetus for Brazil's new approach to climate change arose when emissions reductions from deforestation became a major issue of climate negotiations under the UNFCCC from 2005 onwards. The Environment Ministry's policies had started to successfully curb emissions from deforestation in Brazil. With its expertise on deforestation, the Environment Ministry's influence on Brazil's position in international climate negotiations, which previously had been dominated by the Ministry of External Relations and the Ministry of Science, Technology and Innovation, increased substantially. This development was reinforced by the decision at COP 13 in Bali to encourage voluntary domestic action by developing countries. The Environment Ministry's influence was crucial for Brazil's changing position. International climate policy in Brazil gained a stronger environmental basis and discussions on emissions from deforestation in the international climate negotiations were no longer seen as just a threat for the country (Kasa, 2013).

Another development fuelling the change in Brazil's repositioning occurred in 2009. That year, the House of Representatives in the USA passed the Waxman-Markey Act that implied additional taxes on imports from countries without emissions mitigation commitments. Though the act later was rejected in the Senate, it substantially increased the Brazilian export industry's interest in the topic in the run-up to Copenhagen and encouraged this important group of actors in Brazilian society to take up own initiatives supporting climate action (Kasa, 2013).

While Brazil had already started to change its position in international climate negotiations in the mid-2000s – which presented itself, for instance, at COP 12 in Nairobi when Brazil proposed a global fund to fight deforestation – it only turned into a progressive force in the negotiations in 2009.

In 2008, Brazil's chief negotiator Everton Vargas from the Ministry of External Relations still argued publicly for historical emissions to become the basis of international emissions mitigation commitments and rejected own emission reduction commitments (Vargas, 2008). In the following year, however, Brazil's position changed dramatically. Increasing coverage of the topic and pressure from the national as well as the international society in the run-up to COP 15 in Copenhagen on top of the developments described above opened a window of opportunity. Former environmental activist Carlos Minc, who now was the Minister of the Environment in Lula's government, campaigned for a new, more ambitious Brazilian position in international climate negotiations and suggested capping Brazil's greenhouse gas emissions at 2005 levels. Though this suggestion did not prevail, in November 2009, against strong opposition from the Ministry of External Relations and the Ministry of Science, Technology and Innovation, Minc and Rousseff – who then was chief of staff – jointly announced a volun-

tary commitment to reduce emissions for Brazil. Brazil was one of the first major developing countries to take this step. It set itself the target to reduce its emissions by 36.1 to 38.9% in 2020 compared to a projected BAU scenario with the year 2005 as a baseline (Colitt, 2009; Viola, 2013).

In the BAU scenario, Brazilian emissions reach a total of 2.7 Gt CO_2e in 2020. The voluntary emission reduction target implies a reduction to 1.8 Gt CO_2e, about the same amount of emissions as Brazil had in 2009 (Viola, 2013). The target implies emission reductions of about 1.21 Gt CO_2e to 1.26 Gt CO_2e per year, most of which are to result from a considerable decline in deforestation (Hanna Fekete et al., 2013).

After the adoption of the emission reduction target, different groups of actors inside the government struggled to define Brazil's position in the upcoming climate negotiations. While the conservatives emphasised the importance of the BASIC alliance, more progressive forces voiced their view that Brazil should position itself with countries that have ambitious goals themselves. In the end, Brazil continued its alliance with the other BASIC countries at COP 15. However, it did not only enter climate negotiations in Copenhagen with its own voluntary emission reduction target. It also offered contributions to a fund for climate action in developing countries. Before Copenhagen, Brazil had insisted on Annex I countries to be responsible for financial resources financing emission reductions in the global South (Kasa, 2013; Viola, 2013).

In 2010, Brazil submitted a list of 11 individual NAMAs to the Copenhagen Accord, complemented by the declaration that these actions were expected to lead to the emission reductions of 36.1 to 38.9 % in 2020 compared to projected emissions. The NAMAs defined the amount of expected emission reductions in 2020 regarding Amazon deforestation, Cerrado deforestation, grazing land, integrated crop-livestock system, no-till farming, biological N_2 fixation, energy efficiency, biofuels, hydroelectric power plants, alternative energy sources and iron & steel. In the same year, Brazil's emission reduction target became legally binding when the PNMC was turned into national law. Finally, at the end of the same year at COP 16 in Cancún, Brazil published the final figures of its voluntary emission reduction target and was the first developing country to announce an absolute emissions limit: It stipulated that its total national emissions were not to exceed 2 Gt CO2-e by 2020. Approximately half of the emission reductions is expected to result from reduced deforestation while the rest is to be achieved in sectors like agriculture or steel (Government of Brazil, 2010; Held et al., 2013; Herold, Cames, Siemons, Emele, & Cook, 2013; La Rovere, Olimpio Pereira Jr., Schmidt Dubeux, & Wills, 2014; Townshend et al., 2013; Winkler, 2014).

At COPs 16 to 18 in Cancún, Durban and Doha in the years 2010 to 2012, Brazil in general continued focusing on its traditional alliance with the other BASIC countries: China, India and South Africa. These countries are highly dependent on fossil fuels – in stark contrast to Brazil. The BASIC alliance's main aim remained the same as before: the continuation of emission reduction commitments for Annex I countries under the Kyoto Protocol post-2012 on the one hand and targets for non-Annex I countries no sooner than 2020. Nevertheless, Brazil strongly advocated commitments from non-Annex I countries from 2020 onwards inside the BASIC alliance and indicated in its statement to the conference in Durban that it would be willing to be legally bound if other large economies were, too (Wolfgang Sterk, Arens, Mersmann, Wang-Helmreich, & Wehnert, 2011; Viola, 2013).

All in all, Brazil remained the most progressive of the BASIC countries during COPs 16 to 18, followed by South Africa, China and India, in that order (Viola, 2013). Both in Durban and Doha, Brazil was very proactive and engaged strongly in the negotiations in open as well as in closed meetings. Thus, it supported the 2° target in Cancún and attempted to convince Japan, Canada and Russia to take part in the Kyoto Protocol's second commitment period. In Durban, it tried to conciliate the positions of the European Union and the other BASIC countries and attempted to encourage China, India and the USA to be more flexible in the negotiations. In Doha, Brazil focused on the aim to guarantee continuity of the Kyoto Protocol (Wolfgang Sterk, Arens, Mersmann, et al., 2011; Viola, 2013).

At COP 19 in Warsaw, Brazil once more stressed that countries' emission reduction contributions should be determined on the basis of their historical contribution to global temperature increase in a new version of its old Brazilian Proposal. This proposal got strong support from many quarters. Along the same lines, Brazil demands a shift from using Global Warming Potentials to Global Temperature Potentials when comparing the effect of different greenhouse gases. Furthermore, Brazil suggested to enable countries to count pre-2020 mitigation actions as well as credits stemming from the Kyoto mechanisms towards the commitments of the post-2020 agreement (Herold et al., 2013; Wolfgang Sterk et al., 2013; Wolfgang Sterk, Arens, Kreibich, Mersmann, & Wehnert, 2012). Regarding the work of the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP), Brazil again stressed the importance of equity and common but differentiated responsibilities and respective capabilities and reiterated its view that developed countries should take the lead (Government of Brazil, 2012, 2013a, 2013b; UNFCCC (United Nations Framework Convention on Climate Change), 2012).

1.6 Conclusions

The results of the analysis of four effort sharing proposals – CPE, CDC, GDRs and Triptych – are broadly similar for Brazil, except for 2030, and imply that Brazil would have to reduce its emissions to about 15% below 2010 levels in 2020, to about 19% below 2010 levels in 2025 and to about 41% below 2010 levels in 2030 (median of the four effort sharing allocations). The median of the marginal abatement costs for reaching the targets is relatively high and amounts to 87 €/t CO_2e for 2020, 145 €/t CO_2e for 2025 and 200 €/t CO_2e for 2030 while average costs lie at 19 €/t CO_2e €/t for 2020, 49 €/t CO_2e for 2025 and 62 €/t CO_2e for 2030 (median).

When looking at these numbers, it is crucial to keep in mind that LULUCF was not included in the analysis of the different effort sharing proposals. LULUCF has, however, until recently been responsible for the biggest share of Brazil's total emissions and plays a key role in its mitigation strategy. Therefore, these numbers can only shed light on a section of Brazil's effort sharing allocations and their corresponding costs. Furthermore, the calculations assume that emission reductions would only be achieved domestically and without international emissions trading.

Considering Brazil's political system, its historical and current domestic climate policy and politics as well as its positions in international climate negotiations, it becomes clear that Brazil is one of the more progressive forces in this area today. Brazil brings to the table a sophisticated climate legislation architecture, a consistent system of strategies and plans as well as a voluntary emission reduction pledge and established coordinating entities regarding climate change issues. A large number of policies and measures has been developed and implemented, especially regarding the reduction of deforestation. Climate politics and policies are an essential element of the Brazilian political system and are embedded profoundly in different government bodies.

Due to its unusual emission profile with an extremely low electricity generation emission factor, Brazil was open to concentrate on its emissions from LULUCF, which is responsible for the largest share of its total emissions. Though there had been efforts to reduce deforestation before, Brazil only achieved a substantial reduction in deforestation rates after 2004. While there have been groups of actors opposing strong action on climate change and especially on deforestation right from the beginning of Brazil's efforts to reduce its emissions, support for climate action has grown considerably in the public and as well as, gradually, in the economy and on all levels of governance since the late 1990s and is nowadays quite strong.

Internationally, Brazil has turned into a progressive force in international climate negotiations since the mid-2000s. As one of the first major developing countries, Brazil set itself a voluntary emission reduction target. Regarding effort sharing, it reiterated its demand that countries' emission reduction contributions should be determined on the basis of their historical contribution to global temperature increase at COP 19 in Warsaw.

Nevertheless, locking horns over legislation on deforestation has lately resulted in blood, sweat and tears in both the National Congress and the government. Even though deforestation is still a major

problem in Brazil and increased from 2012 to 2013 after many years of declining, the new Forest Code is more lenient than the old one and has relaxed previous standards. With former environmental activist Marina Silva running for President again in this autumn's general elections, the issue of global climate change was once more put at the core of the political agenda. However, Dilma Rousseff prevailed in these elections and ruralist parties have gained seats both in the Senate and the Chamber of Deputies. Ruralists now account for more than half of the Deputies in the National Congress. This constellation means no good news regarding Brazil's fight against deforestation.

Despite great differences in domestic policy and ambition, the BASIC countries have announced to maintain their alliance in the upcoming climate negotiations at COP 20 in Lima. Viola (Viola, 2013) suggests, though, that Brazil might soon turn to alliances with more advanced forces in international climate negotiations such as the EU and South Korea. However, this time has not arrived yet (Mohan, 2014; Viola, 2013).

2. China

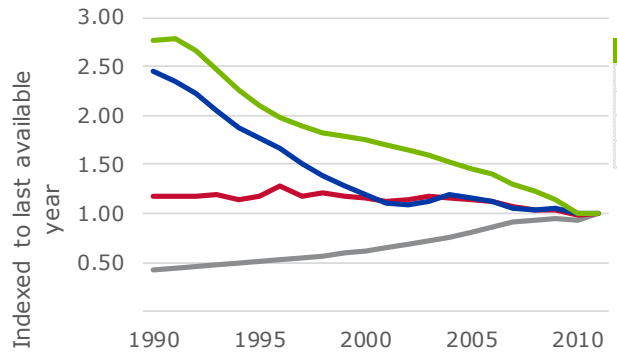
2.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	1344.130	mln cap	2011
GDP	4.2E+12	US$ (2005)	2011
Air pollution index	90	ug/m3, mear	2010

Indicator	Value	Unit	Year
Vulnerability	0.30	-	2011
HDI	0.71	-	2011
Electrification rate	99.8	%	2011

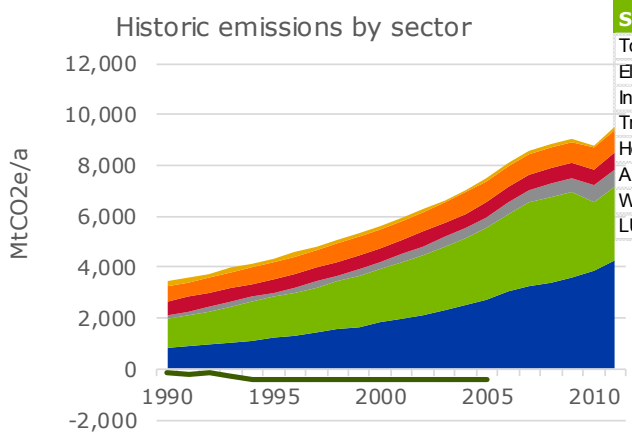
Past trends of decarbonisation indicators



Indicator	Value	Unit	Year
Per capita emissions	7.08	tCO2e/ cap	2011
Emission intensity of electricity	764.4536	tCO2/kWh	2011
Emission intensity of economy	2.27	tCO2e/ USD	2011
Energy intensity of economy	0.65	ktoe/ million	2011

Per_capita_emissions
Electricity_intensity
Energy_intensity
Emission_intensity

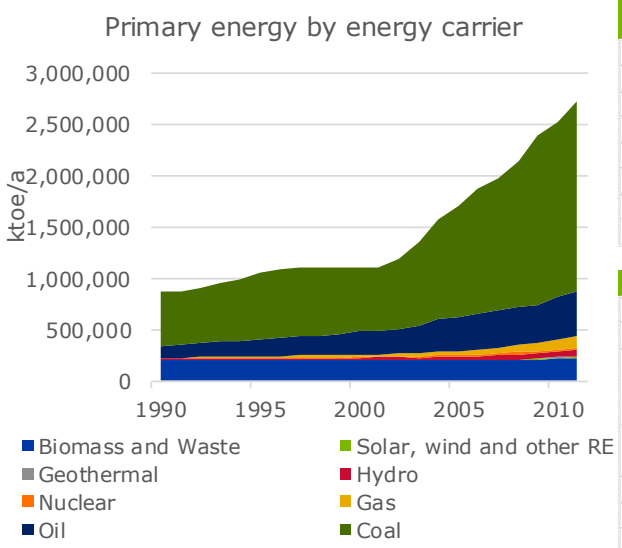
National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	4280.9	MtCO2e/a	n.a.
Industry	2909.5	MtCO2e/a	n.a.
Transport	676.4	MtCO2e/a	n.a.
Households_and_services	670.6	MtCO2e/a	n.a.
Agriculture	862.7	MtCO2e/a	n.a.
Waste	120.1	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Electricity_and_Heat
Industry
Transport
Households_and_services
Agriculture
Waste
LULUCF

Energy mix



Fuel	Value	Unit	Share in 2011
Biomass_w aste	216423	ktoe	8%
Solar_w ind_other	17134	ktoe	1%
Geothermal	4001	ktoe	0%
Hydro	60109	ktoe	2%
Nuclear	22503	ktoe	1%
Gas	107746	ktoe	4%
Oil	442245	ktoe	16%
Coal	1858662	ktoe	68%

Indicator	Value	Unit	Year
Share of global emissions	22.3	%	2010
Domestic fossil fuel production	2,112,335	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	87	%	2011
Economic relevance of fossil fuel imports	2.2	% of GDP	2011
Fossil fuel subsidies	31.04	Billion USD	2011
Fuel import dependence	11	% of imports	2011
Fuel import bill	292.74	Billion USD	2011

2.2 Mitigation Potential and Effort Sharing Allocations

Chinese GHG emission increased from under 4 $GtCO_2$ in 1990 to over 10 $GtCO_2e$ in 2010, which makes China by far the largest emitting country. With increasing trends they would reach in the order of 20 $GtCO_2e$ in 2030 (Fig.1).

Significant mitigation potential exists against this trend. China could roughly stabilize its GHG emissions at current levels by 2030 at marginal reduction costs of about €100/t CO_2-eq.

The effort sharing approaches considered in the calculations indicate that China would need to commit to a target between 8 and 12 $GtCO_2e/a$, or between a 21% decrease and 12%, increase in 2025, and between 8 and 11 $GtCO_2e/a$, or between a 38% decrease and 7% increase in 2030 compared to 2010 emission levels. According to all approaches Chinese emissions would need to peak the latest by 2025 at only slightly above today's level. All approaches suggest strong deviation from the reference scenarios and a significant change of the current trend. The potential to achieve such emission levels is available, but measures include relatively high-cost categories.

The results reflect that China has reached per capita emissions above the world average. This means that for approaches like Convergence of per Capita Emissions (CPE) and Common but Differentiated Convergence (CDC), China needs to start reducing per capita emissions immediately resulting in relatively strong targets. Under the Triptych approach, based on convergence of sectoral indicators, China's emissions should also be reduced soon. The Greenhouse Development Rights approach allows for slight growth in emissions until 2025 as it factors in a lower historical responsibility as well as lower economic capacity compared to industrialised countries and therefore represents the least ambitious target.

Figure 13: Results of effort sharing and potential calculations for China

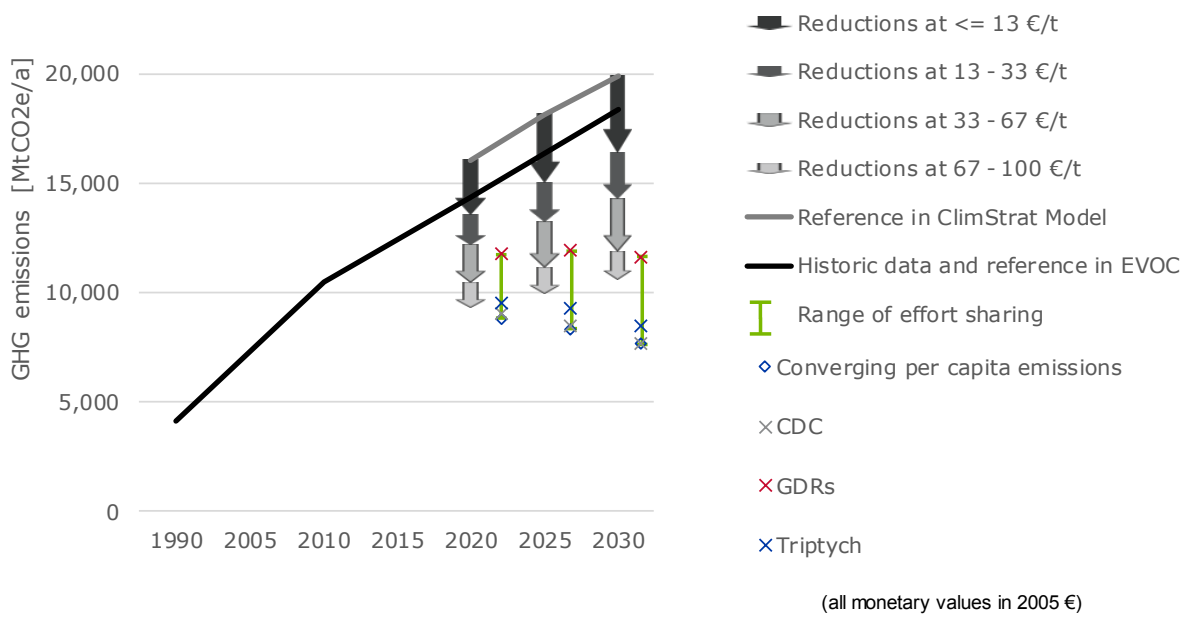


Table 12: Results of Effort Sharing Calculations for China

Effort Sharing Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	8,729	8,257	7,563	113%	102%	85%	-16%	-21%	-28%
CDC	8,962	8,387	7,596	119%	105%	86%	-14%	-20%	-27%
GDRs	11,702	11,841	11,555	186%	189%	182%	12%	13%	11%
Triptych	9,464	9,204	8,429	131%	125%	106%	-9%	-12%	-19%
Median	9,213	8,795	8,039	125%	115%	96%	-12%	-16%	-23%

2.3 Political System

Box: List of institutions related to climate change issues

State Council
Ministry of Foreign Affairs
National Development and Reform Commission
Ministry of Science and technology
Ministry of Industry and Information Technology
Ministry of Finance
Ministry of Land and Resource
Ministry of Environment Protection
Ministry of Housing and Urban-Rural Development
Ministry of Transport
Ministry of Water Resources
Ministry of Agriculture
Ministry of Commerce
Ministry of Health
Civil Aviation Administration
State Oceanic Administration
National Bureau of Statistics
State Forest Administration
China Academy of Science
China Meteorological Administration
National Energy Bureau
(China Economic Information Network 2006)

In China, climate change and energy policy has been elevated to a high level of importance, leading to domestic and international climate policy decisions occurring at high institutional levels. However, climate policy making remains a fragmented process, with multiple governmental institutions and agencies contributing to policy development and implementation. In addition, other stakeholders, such as state-owned enterprises (SOEs), and academics and experts are increasingly exerting an influence on climate and energy policy in China.

Chinese politics are dominated by a single political party, the Chinese Communist Party (CCP) (minor parties exist but are authorized by the CCP). The National Party Congress, consisting of around 2000 delegates convenes every five years to set the national policy direction, elect CCP's Central Committee (a group of slightly over 200), which will then elect the members of the Party's Political Bureau (Politburo) (however, most observers state that decisions are agreed to in advance). The CCP Central Committee executes the function of Party Congress between its sessions, with the Politburo as a much smaller leadership group of around 25 people. An even smaller, elite group of seven to nine members, known as the Politburo Standing Committee, is selected from the Politburo to serve for a five year term, with each member directing a policy portfolio of China. The General Secretary and the Standing Committee meet weekly to make policy decisions by consensus. The Central Committee and the Politburo acts as the legislature and is recognized as the chief decision-making body (such as through Party Congress Report and other political documents), with the General Secretary acting as executive (Dumbaugh & Martin, 2009).

Alongside the Politburo and its Standing Committee is the state government, or the State Council, which acts as the administrative and governing apparatus in China. The National People's Congress officially elects the President, who acts as the executive of the state government, as well as the Premier (nominated by the President) and cabinet-level officials (nominated by the Premier). However, analysts say this is essentially a "rubber stamp" approval process of decisions already made by senior officials (Dumbaugh & Martin, 2009).

All Politburo members will at the same time shoulder key functions in Party or government such as in The State Council, National People's Congress (NPC), Chinese People's Political Consultative Confer-

ence (CPPCC), Central Military Commission, key Ministry as well as several key sub-national governments. Other CCP Central Committee members will also serve as cabinet member of the Stage Council, other Provincial chief, the Supreme Court and Supreme Procuratorate, as well as other Party committees, NPC & CPPCC and military functions. Hence, such arrangement also ensures implementation of the strategic direction set by the Party.

The highest administrative body is the State Council, which is comprised of around 50 members, including the Premier and Vice Premiers, high-ranking ministers from each ministry, as well as other officials, and acts as a kind of cabinet. Because of the large size of the State Council, daily administration is directed by the State Council's Standing Committee. The State Council and ministries that act under it must take often broad policy statements or directions from the Politburo and turn them into effective policy and governance actions.

The National Development and Reform Commission (NDRC) is responsible for "centralized administration" in China and is the primary institution in charge of climate change governance as one of its areas of responsibility (PRC 2013). It is a high-level body which also drafts the country's Five Year Plans – documents that guide the economic and social development of the country. It assigns carbon and energy intensity targets for each province, develops national-level climate strategy, and supervises national-level programmes (such as the Top 10,000 Program which assigns energy saving targets to industrial companies).

The NDRC also houses the Department of Climate Change, which is the chief body representing China at international climate negotiations. The Ministry of Foreign Affairs (MOFA) also takes part in international climate policy decisions, but evidence suggests the authority of the NDRC supersedes the MOFA (Marks, 2010).

The National Leading Group on Addressing Climate Change (NLGCC) and National Leading Group on Energy Saving and Pollution are high-level and cross-ministry groups which discuss and establish China's strategy and guidelines, as well as to organize and coordinate implementation of China's efforts on mitigation and energy efficiency and conservation policies and actions, while NDRC is hosting their administrative office. NLGCC also plays key role for China's strategies and positions for international climate change negotiations. The NLGCC is headed by the Chinese Premier – an indication of the importance of climate change and energy policy (Information Office of the State Council, 2008). Membership in the Leading Group comes from a broad range of ministries (See Box), but its specific composition has been readjusted a number of times over the past seven years. The leading group advises the State Council during deliberation and drafting of national level climate policy.

At the subnational level, province governors head province-level leading groups. These groups are largely responsible for implementing policy decisions handed down from the various ministries coordinated by the National Leading Groups (Held, Nag, & Roger, 2011). Although provincial targets are decided by the central government, provincial governments (which hold the same administrative rank as ministries) have in the past lobbied the central government to alter provincial energy- and emissions-intensity targets. Provincial governors are also able to decide on the particular policy instruments or programs used to achieve targets, although those decisions can be overwritten by the NDRC (Williams, 2014). So, despite a strong central government with a centralized administration and policy making apparatus, local governments have significant autonomy.

In addition to government officials, experts from state-sanctioned research institutions are also influential in the policy making process. The National Climate Change Expert Committee is a formal, state-endorsed body comprised of academics and other experts from think-tanks and research institutions, who report directly to the NRDC and State Council. NDRC Department of Climate Change also established its advisory group National Center for Climate Change Strategy and International Cooperation (NCSC). Other experts outside of such formal groups also interact with government officials in advising national policy and targets. The role of these experts, although influential, is strictly advisory.

SOEs are some of the largest emitters in China, with the energy sector largely comprised of SOEs. Although no longer officially bureaucrats, the heads of some SOEs are very high ranking members of the Communist Party (such as in CCP Central Committee), and have equal rank to provincial governors and some ministers. They are able to lobby officials and influence policy, most often in favour of the status quo. For example, SOEs controlling the energy grid have impeded the penetration of wind energy into the grid over concerns and difficulties of adding intermittent energy sources (Williams, 2014). However, the goals of the government and SOEs often align, for example in improving efficiency and increasing access to international markets (Williams, 2014).

2.4 Historical and Current Domestic Climate Policy and Politics

China began building the institutional capacity to develop climate change policy in 1992 with the creation of the National Climate Change Coordination Group (NCCCG). This group was chaired by the State Meteorological Agency - a low ranking government body – signalling that meteorological aspects (namely climate science) was under more concern then and climate change was relatively low in terms of policy priorities in the country. In 1998, however, the NCCCG was moved into the high ranking National Planning Commission (which was later restructured as NDRC), indicating the swift change of climate change being considered as a development issue and its rising importance in China's domestic and international policy.

Climate-related policies began in the late 1990s and early 2000s, and were largely oriented towards economic and security concerns, such as energy efficiency and energy security, while increasingly with more concerns on public health and air pollution, but were not explicitly aimed at mitigating climate change. While China achieved a 5% annual reduction in energy use per unit of GDP from 1980 until 2002, a reversal of that trend initiated a more concerted approach to energy efficiency and conservation beginning in the early 2000s (Price et al., 2011). Notable large scale programs that signalled a mainstreaming of energy efficiency policy are the Medium and Long-Term Plan on Energy Conservation (MLPEC) (launched in 2004 and covering the 2005-2010 and 2010-2020 period), and the 11th Five Year Plan (FYP).

Economic growth and political stability concerns frame domestic climate policy in China. Over the past five years, China's political elite have identified a number of separate but often interrelated issues that have caused climate change and energy to ascend the policy agenda. These include environmental and public health concerns about air and groundwater pollution and economic concerns about the vulnerability of energy infrastructure and agriculture to climate change impacts.

China has also been attempting to modernize its economy, with increased energy efficiency being a primary strategy. Additionally, China has identified strategic emerging industries that will contribute to continued economic growth but are less emissions intensive than current heavy industry (such as biotechnology, advanced composites, and renewables).

The country's single-party system doesn't leave room for the emergence of a green political party or faction. However, some observers contend that having a single party that recognizes environmental and climate issues can be more effective in pursuing policy than multiple parties supporting and opposing climate policy to varying degrees. These observers point to the rapid implementation of policies (such as renewables deployment) as supporting this idea. It should be noted that among the CCP Central Committee of over 200 members, only two specifically represent environmental and climate interests, namely the Minister of the Ministry of Environmental Protection and the NDRC Vice Minister, who also has competing interests to represent.

Government control of media limits the society's access to information on issues of pollution and climate change. However, social media, despite also being censored by the government, has been aiding in the growth of the Chinese environmental movement, with several high-profile protests against polluting factories. Partially as a result of such protests senior officials have made statements and taken action to address some of these environmental concerns. It is unclear whether this environmentalism has or will include climate change, or if it will alter China's policy response to climate change (The Wall

Street Journal, 2014). Additionally, foreign and, increasingly, Chinese environmental NGOs and civil society, have emerged as a viable voice in Chinese climate policy decision making, and are invited to submit comments on policy and planning documents (Schröder, 2008).

2.4.1 11th and 12th Five Year Plan

China formulates short- and medium-term policy, infrastructure, and economic objectives through five year plans. Some long-term objectives are also established in FYPs, with a series of policies and strategies in subsequent FYPs being implemented in service of those long-term objectives. For example, policy goals in the 11th and 12th FYPs are intended to set China on a path to achieve the goal of a 40-45% emissions intensity reduction by 2020, which was formally announced prior to the 2009 UNFCCC conference in Copenhagen,

The 11th FYP was the first FYP to put forward binding national energy intensity commitments, calling for a reduction in energy intensity by 20% in 2010 compared to 2005 levels. In 2006 the State Council approved a scheme that disaggregated the national energy-savings target into province-based binding targets. The final targets, which were further disaggregated into county- and city-targets, were a result of negotiations between provincial governments and the central government (Yuan, Kang, Yu, & Hu, 2011).

In 2007, China released the National Climate Change Program (NCCP), the first explicit elaboration of nation-wide climate change goals and activities. These goals were still developed with "economic development as the core objective, and placing emphasis on energy conservation, optimization of the energy mix" (Information Office of the State Council, 2008). In addition to general sustainable development and energy, and efficiency targets, the Program also put forward general policy goals. For example, policies in support of the service industry and "high-tech industry" (such as information technology, bioengineering, aeronautics, new energy, and new materials) are mentioned in the NCCP.

Other climate change mitigation policy areas included in the guiding document were afforestation, research and development, renewable energy and energy mix goals, and waste reduction and recycling. Despite its name, however, the NCCP was more of a progress report on already implemented policies than a guiding policy document and it only covers the period towards 2010. NCCP was lately updated by China's National Plan to Address Climate Change (2014-2020).

While the 2007 NCCP outlined some general climate and energy policy goals, the government announced its first quantified national emission reduction targets in 2011, calling for 17% reduction in emissions intensity in 2015 compared to the 2010 level.

The 12th Five-Year-Plan, drafted by the NDRC, detailed the overall requirements for GHG emissions controls during the five year plan period (2011-2015) and adopted a target of 11.4% percent primary energy supply from clean energy alongside the emissions target, as well as a new energy intensity target of a 16% reduction by 2015 compared to 2010 levels, in addition to the 17% emissions intensity target (The National Development and Reform Commission, 2011).

2.4.2 Energy Efficiency and Conservation

China's appliance efficiency standards date back to 1989, with the promulgation of the first minimum energy performance standards. These standards, developed by the China National Institute of Standards (CNIS), now apply to most residential and commercial appliances, heating and lighting, and cooling equipment. A voluntary labelling program was established in 1999 (covering 40 products), with a mandatory labelling program beginning in 2005 covering just four products: air conditioners, household refrigerators, clothes washers, and unitary air conditioners. However, enforcement and monitoring has been insufficient according to many observers, and the central government has made efforts to increase monitoring and compliance-testing efforts.

China's political apparatus has shown itself to be responsive and quick to implement policies that address the country's changing energy landscape. For example, the first major energy efficiency and conservation program, the MLPEC, was formulated in response to a rapid increase in primary energy con-

sumption in 2003 and 2004. The centrepieces of the plan were the Top Ten Priorities and Ten Key Projects. The Priorities and Projects were explicitly aimed at energy efficiency and conservation, not GHG emissions abatement, but established some of the policy approaches that would be used in later climate-specific policies. Priorities under the MLPEC included: Strengthening existing and creating new financial incentives for energy-efficiency, and establishing a National Energy Conservation Centre, among others (Yuan et al., 2011).

The energy efficiency and conservation elements of the 11th FYP were largely a restatement and enhancement of programs and policies put forward in the MLPEC. In addition to national-level programs and policies, provincial governments put forward numerous local initiatives and plans in order to reach their targets. Notable programs under the 11th FYP include the Top-1000 Energy-Consuming Enterprises Program (Top 1000 Program). This program, launched by the NDRC and the National Bureau of Statistics, identified the 1000 highest energy consuming enterprises (from the nine industrial sectors that consume 180,000 tons of standard coal equivalent or higher annually) for energy efficiency and conservation improvements. (Price et al., 2011). Although implemented by the central government, local governments oversaw much of the activities and monitoring involved in the program. Provincial governments expanded the program to cover smaller local businesses in the "Double-Hundred" program.

The Top 1,000 Program became the Top 10,000 Program under the 12th FYP. It was expanded to cover around 15,000 industrial enterprises, accounting for over 60% of China's total energy consumption, with an absolute energy-savings target of 250 million tons of coal equivalent (Mtce). The Top 10,000 Program also expanded its mandate to include large transportation enterprises and buildings that consume more than 5,000 tce per year (Institute for Industrial Productivity, 2011).

At the end of China's 11th FYP in 2011 it had achieved a 19.1% energy intensity reduction, falling 0.9% short of its target, but nonetheless 1510 $MtCO_2$ emission reduced and 300 billion Renminbi in energy savings (as well as additional infrastructure savings) (Yuan et al., 2011).

2.4.3 Renewables

In addition to the emphasis placed on conservation and efficiency, China has also developed renewable energy policy as part of their mitigation strategy. The NDRC issued the Medium and Long Term Development Plan for Renewable Energy (MDLPRE) in 2007, establishing targets for the deployment of renewables through 2020. Under this plan, renewables were to make up 10% of primary energy production in 2010, and 15% in 2020. A number of measures were adopted to promote and support deployment of renewables, primarily in the form of financial incentives and tax breaks, as well as access to special funds (Information Office of the State Council, 2008).

The 12th FYP announced a less ambitious share of renewable energy planned for 2015 than previously anticipated: increasing non-fossil energy to 11.4% of total energy use by 2015 and 15% by 2020. However renewable electricity capacity targets in 2011 that were more ambitious than those announced in the MDLPRE from 2007. The targets published in 2011 include an increase of RE capacity to a total of roughly 700 GW in 2020.

The revised targets are intended to set China on a path to achieve 420 GW of hydro, 200 GW of wind, 50 GW of solar by 2020 (Davidson, 2014). In addition to increasing installed capacity, China has also emphasized grid infrastructure and connectivity improvements to ensure the increased intermittent energy sources are utilized.

2.4.4 Emissions Trading

The 12th FYP also included the announcement of a carbon emissions trading system. The NDRC published the "Notice on Carbon Emissions Trading Pilot" in late 2011, signalling that the cities of Beijing, Tianjin, Shanghai, Chongqing and Shenzhen, as well as the provinces of Guangdong and Hubei, would roll out ETS pilots (Mao, Zhou, Ma, Gao, & Chiquet, 2014). Each pilot covers 130 to 830 emitters across a number of high-emissions intensity sectors (cement, power, manufacturing, etc.) in the pilot prov-

ince or city. Although the ETS activities are currently only taking place in a few regions, NDRC established a plan to roll out a nation-wide ETS in 2016 (Chen & Reklev, 2014b).China has also developed its own carbon credit standard, the China Certified Emissions Reduction (CCER), which is largely based on the Clean Development Mechanism (Sopher & Mansell, 2013).

2.4.5 Pollution Control

In September of 2013 the Chinese State Council released the Action Plan for Air Pollution Reduction and Control (APAPR). The Plan was largely a response to growing domestic and international pressure over what was seen as an emerging public health crisis: rapid deployment of coal thermal power plants, vehicles, and other industries, has led to an increase in particulate matter (PM) concentration across the country, causing respiratory illness, with some days seeing PM10 levels reaching 40 times those recommended by the World Health Organization (Wong, 2013). Specifically, officials called for a 10% reduction in inhalable particulate matter by 2017 against a 2012 baseline, with more stringent targets for densely populated and economically significant areas (Beijing and the Pearl River Delta, for example). Ten main policy measures were outlined in the APAPR, including the enhancement of smog control measures at sources of pollution and reducing the number of "old vehicles." Many of the policies (such as controlling production capacity in high-emitting industries) overlap with those included in the 12th FYP and MLPEC, indicating that the policy responses to pollution, energy, and climate challenges come from a shared policy playbook.

2.4.6 Vehicle Emission Standards

Vehicle emissions standards were first introduced in 2000, based on the European system but with delayed implementation (for example, while the Euro 5 standard for light-duty vehicles was implemented in 2008/2009, the equivalent China 5 standard won't be implemented nation-wide until 2018). The standards regulate hydrocarbon (HC), carbon monoxide (CO), nitrogen oxide (NOx), and PM and do not cover CO_2 like the European standards they mimic (TransportPolicy.net, 2014). The standards are developed and promulgated by the Ministry of Environmental Production and the Standardization Administration of China. Although standards are issued at a national level, certain cities and provinces are able to adopt more stringent standards. Although not directly aimed at CO_2 emissions, the emission standards have resulted in the removal of many old, inefficient vehicles from the road, increasing fleet-wide efficiency.

China instituted fuel economy standards for light-duty passenger vehicles in 2004 after a two year consultation and policy-development process. (Oliver, Gallagher, Tian, & Zhang, 2009). Unlike fuel economy standards in the US that calls for manufacturers to achieve fleetwide emission reductions, the Chinese standard calls for each individual car model to achieve determined fuel economy standards. Phase 1 began in 2005, phase 2 in 2008, and phase 3 in 2012, and are set to reach 6.9 liters per 100 km by 2015 (Oliver et al., 2009).

2.4.7 Challenges

While China has taken a proactive approach in developing institutional capacity and policy to address climate change (both explicitly and indirectly), some current policies reduce the effectiveness of climate change efforts. For example, electricity prices are regulated in China by the Department of Price Supervision under the NDRC. Utilities cannot pass on additional compliance costs to consumers, limiting the incentive for demand-side efficiency improvements. China has used subsidies to encourage deployment of renewables, but also maintains fossil fuel subsidies, hindering energy efficiency efforts and GHG mitigation efforts. There has been some subsidy reform, mostly through a shift to more targeted subsidies for industries and households, but fossil fuel subsidies remain an element of China's energy security and foreign policy. In fact, China has recently announced it will subsidize shale gas production (World Economic Forum, 2013).

2.5 Historical and Current International Climate Policy Positions

When the UNFCCC was adopted in 1992 as the international body for negotiating global action on climate change, China was the third largest total emitter but was still a poor, developing country, with low per capita GDP, a low ranking on the Human Development Index (HDI), and low per capita emissions. It was therefore classified as non-Annex I country and quickly allied itself with other developing countries, primarily the G77 (originally a group of 77 developing countries that has since expanded to cover 133 developing countries). China's early negotiating positions were characterized by a commitment to the principle of common but differentiated responsibilities (CBDR). The importance of the principle has been underlined by China to argue against binding emission commitments for itself and other non-Annex I countries, and for technology transfer and financing of mitigation efforts by Annex I countries.

China overtook the U.S.A. in 2006 as the world's largest emitter and its per capita GDP grew, moving it into middle-income territory. Increasing international pressure at successive negotiating sessions, as well as the domestic political changes described in the previous section, has led to a slight shift in China's international negotiations stance. While still maintaining the CBDR principle, rejecting binding commitments for non-Annex I countries, and calling for the majority of action to be undertaken by Annex I countries, China appears increasingly willing to engage significant mitigation activities under an international framework.

2.5.1 Alliances and Negotiating Blocs

Despite being a large group of countries representing a great degree of political, geopolitical, geographic, and economic diversity, with different interests, China and the G77 have represented a unified voting bloc, and present joint submissions to the UNFCCC, with China often presenting itself as a leader of this bloc.

China is also represented in the Like Minded Developing Countries Group (LMDC), a diverse group which overlaps with the G77 and includes Saudi Arabia, Venezuela, India, Mali, and others. China is also a member of the BASIC group, along with Brazil, India, and South Africa. However, although there is a great deal of coordination of negotiating positions among the BASIC group, they do not put forward submissions to the UNFCCC, while G77 + China and LMDC do.

China joined with the other BASIC countries to form a powerful bloc of the largest developing economies just prior to the Copenhagen negotiations. The group formed an alliance in order to jointly promote the principles of CBDR and emphasize the primary responsibility of developed countries, and to maintain the UNFCCC as the sole forum for negotiating a climate change agreement. Negotiations between the BASIC countries and the EU and US resulted in the Copenhagen Accord, in which the BASIC countries and other developing country parties put forward voluntary reduction commitments. However, the BASIC group maintained that the pledges were a political agreement, and not a binding commitment (Minas, 2013).

The BASIC group continues to meet and vote as a bloc, and despite widely differing interests, maintain the alliance in service of countering the influence of the US and EU. They voted together on the issue of international consultations and analysis (ICA) at the 2010 conference in Cancún, allowing for monitoring and review of developing country commitments, but maintaining that ICA should be 'non-intrusive, non-punitive and respectful of national sovereignty' (UNFCCC, 2011b). The BASIC countries have recently stated that they are pushing for a resolution on adaptation, finance, and technology transfer, during broader discussions on mitigation at the 2015 negotiations, while other parties support only negotiating the mitigation elements of a 2015 agreement (Sethi, 2014b).

2.5.2 Recent Negotiating Positions

China supported the creation of the ad hoc working group on long-term cooperative action (AWG-LCA) at negotiations in Bali in 2007, signalling long-term support for the UNFCCC process. The text of the AWG-LCA specifically mentions "Nationally appropriate mitigation actions by developing country Par-

ties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner" (IISD, 2007). Although China continued to resist binding emission reductions in international negotiations, support for the AWG-LCA indicated a shift to support of the long-term role of the UNFCCC and that China and other developing countries should begin contributing to quantifiable emission reductions, albeit with significant support from Annex I parties.

In 2007 the NDRC issued the National Climate Change Program, outlining current domestic efforts and stating that they were "ready to strengthen international cooperation with all countries." However, they continued to stress the principle of "common but differentiated responsibilities and respective capabilities," (CBDR) and appealed "to the developed countries to sincerely fulfil their commitments under the Convention to provide financial assistance and transfer technology to developing countries so as to enhance their capacity to address climate change" (The National Development and Reform Commission, 2007).

China, in taking a hard-line stance against binding reduction commitments for developing countries, had declined to put forward even voluntary commitments. However, this changed in 2009, as Premier Wen Jiabao announced China's first GHG emission reduction target prior to the UNFCCC negotiations in Copenhagen in 2009. However, the Premier stressed that the target was "a voluntary action China has taken in the light of its national circumstances. ... We have not attached any condition to the target, nor have we linked it to the target of any other country" (People's Daily Online, 2009).

2.5.3 The Durban Platform

China has remained committed to maintaining a clear separation in responsibilities and commitments between Annex I and non-Annex I countries despite increasing amounts of domestic activity addressing climate change and a voluntary pledge under the Copenhagen Accord.

In their submission to the Ad Hoc Working Group on Durban Platform for Enhanced Action in 2012, China stressed that "The outcome of Durban Platform process shall be 'applicable to all parties' in the same manner as the Convention and its Kyoto Protocol, which shall by no means suggest or imply uniformity of responsibilities and obligations for all parties in terms of nature, content and magnitude," and essentially threatened to shut down negotiations if parties attempted to weaken the CBDR principle, saying "any attempts to modify the Annexes of the Convention or to re-categorize developed and developing countries would delay progress in the Durban Platform process with nothing to come in the end" (China, 2012). China (as well as the previously mentioned blocs it is a member of) has been strongly supportive of a second commitment period of the Kyoto Protocol, given that this position supports the continued differentiation in responsibilities and commitments between Annex I and non-Annex I parties.

All countries have agreed to submit "Intended Nationally Determined Contributions" (INDCs) for the 2015 agreement. These documents will communicate planned emission reduction efforts (UNFCCC, 2013a). It is unclear exactly what will be included in China's INDC, however, some clues have begun to emerge. Xie Zhenhua, deputy chief of the NDRC, stated that China may include a target year for peak emissions in its nationally determined contribution, to be submitted in the first half of 2015 (Revkin, 2014). Prior to the UNFCCC meetings in Bonn, June 2014, the high level advisor He Jiankun mentioned the year 2030 as a potential peaking year and a level of 11 Gt[19] (Chen & Reklev, 2014a). Besides, Xie also mentioned during the UN Climate Summit in September 2014 that China will try to submit its INDC by the first quarter of 2015, which is the timeline required by Warsaw Decision for those Parties ready to do so.

[19] Given current emission levels, we assume this number refers to energy-related CO_2 emissions only

2.5.4 CDM and Finance

China initially lobbied in the UNFCCC against an international emission trading scheme and the clean development mechanism (CDM), which allowed developed countries to meet part of their reduction obligations through development of low carbon projects in developing countries. However, China ratified the Kyoto Protocol in 2002, and has since been the largest beneficiary of CDM project finance and technology transfer, and has developed a great deal of institutional capacity and expertise in developing and executing CDM-type projects. This experience and acceptance of the CDM has informed China's design and acceptance of utilizing a domestic carbon offset and emission trading program.

China went from arguing against carbon markets to embracing the CDM, largely because it offered an opportunity to acquire concrete benefits. However, Chinese negotiators do not support international market mechanisms under the UNFCCC to support mitigation. Instead, China maintains that finance for mitigation, particularly in developing countries, should come from official development assistance and public funds, stating in a 2013 submission on Long-term Finance "The major sources of long-term finance shall be public sources, mainly from direct budget contribution of developed country Parties and additional to the existing ODA...Private sources and carbon market revenue could play a supplementary role" (China, 2013).

2.5.5 Actions Outside of the UNFCCC

In addition to its climate mitigation efforts through the UNFCCC, China is a member of other international climate fora and bilateral partnerships. In 2006 the Asia-Pacific Partnership on Clean Development and Climate (APP), consisting of China, the US, Canada, Australia, South Korea, Japan, and India, was formed to generate public-private partnerships to speed up deployment of efficient, low-carbon technologies in a group of select industries, but disbanded in 2011.

In 2009, China and the US signed the "Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and the Environment" to strengthen and coordinate efforts, primarily focused on the development and deployment of low-carbon technologies, but also to discuss and coordinate on domestic and international climate policy (US Bureau of Public Affairs, 2009). The US and China have continued to pursue bilateral efforts, particularly in technology development and F-gas mitigation. The integration of climate change into US- China Strategic and Economic Dialogue strengthened such efforts.

2.6 Conclusions

A continuation of current trends would lead to the near doubling of China's emissions over the next two decades. This untenable scenario would lead to an overshoot of the UNFCCC's 2° C target. However, analysis reveals that China has sufficient mitigation potential to stabilize, peak, and reduce emissions. Effort sharing analysis shows that under the least stringent approach this peak in emissions should occur by 2025 at a level of about 12 $GtCO_2$-eq. Under more stringent approaches China would need to drastically reduce emissions immediately.

Analysis indicates that, despite China's insistence on financial support of mitigation activities, its mitigation potential is within the same order of magnitude as the reductions called for under effort sharing approaches.

The 2015 negotiations occur in the same year that the 12th FYP will end and the new 13th FYP will begin. Policy makers and international negotiators will take stock of mitigation achievements thus far, and propose revised and new mitigation targets. Among these is the possibility of setting a "peak," either in total emissions, emissions from a particular sector, or from primary energy use. Such a target could provide the possibility of an overshoot of "fair share" targets by a peak year of 2025, but sufficient reductions to fall within a fair range by 2030.

Such a policy, particularly a "peak coal" policy, makes sense given China's recognition of economic detriment of an emerging public health crisis caused by air pollution from coal combustion, and the potential economic gains from increased efficiency and renewable energy capacity. Previous policies that

closed outdated and inefficient capacity, as well as more recent policies restricting the construction and operation of coal thermal power plants in certain areas, along with goals for the installation of renewables capacity and increasing efficiency, all support a "peak coal" target.

3. Ethiopia

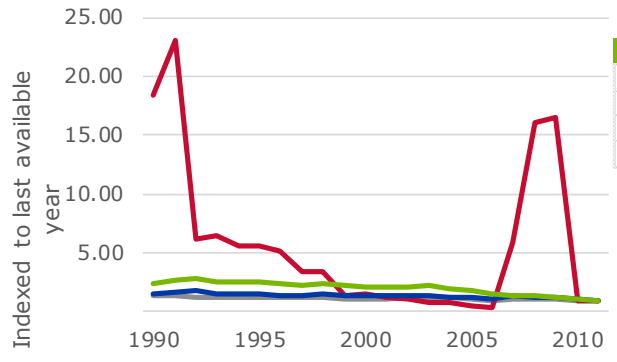
3.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	89.393	mln cap	2011
GDP	2.3E+10	US$ (2005)	2011
Air pollution index	n.a.	ug/m3, mear	n.a.

Indicator	Value	Unit	Year
Vulnerability	0.55	-	2011
HDI	0.42	-	2011
Electrification rate	23.3	%	2011

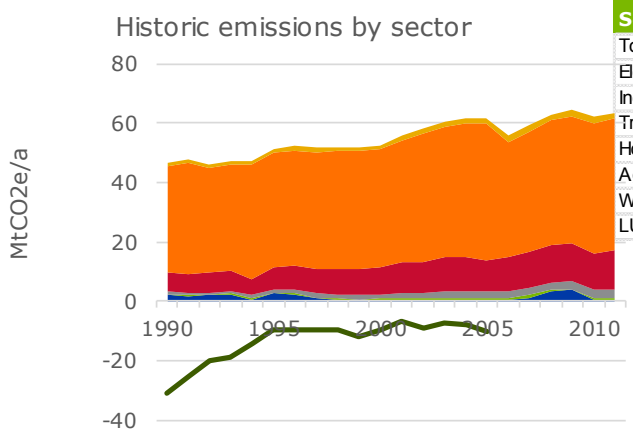
Past trends of decarbonisation indicators



Indicator	Value	Unit	Year
Per capita emissions	0.71	tCO2e/ cap	2011
Emission intensity of electricity	7.3821	tCO2/kWh	2011
Emission intensity of economy	2.80	tCO2e/ USD	2011
Energy intensity of economy	1.50	ktoe/ million	2011

Per_capita_emissions
Electricity_intensity
Energy_intensity
Emission_intensity

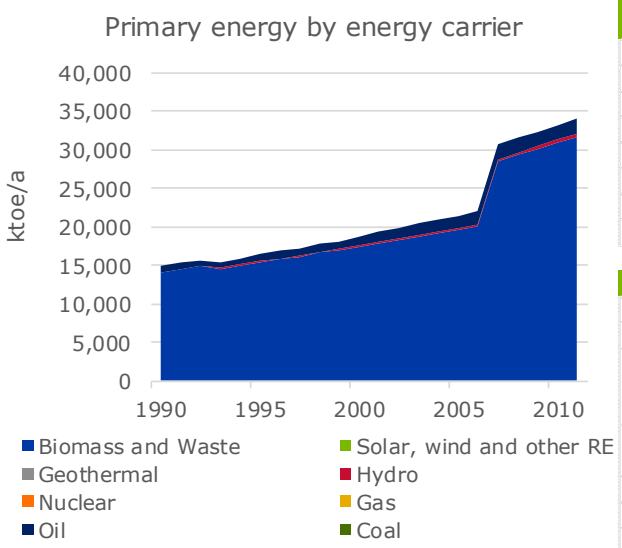
National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	0.4	MtCO2e/a	n.a.
Industry	0.5	MtCO2e/a	n.a.
Transport	3.0	MtCO2e/a	n.a.
Households_and_services	13.0	MtCO2e/a	n.a.
Agriculture	44.5	MtCO2e/a	n.a.
Waste	2.1	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Electricity_and_Heat
Industry
Transport
Households_and_services
Agriculture
Waste
LULUCF

Energy mix



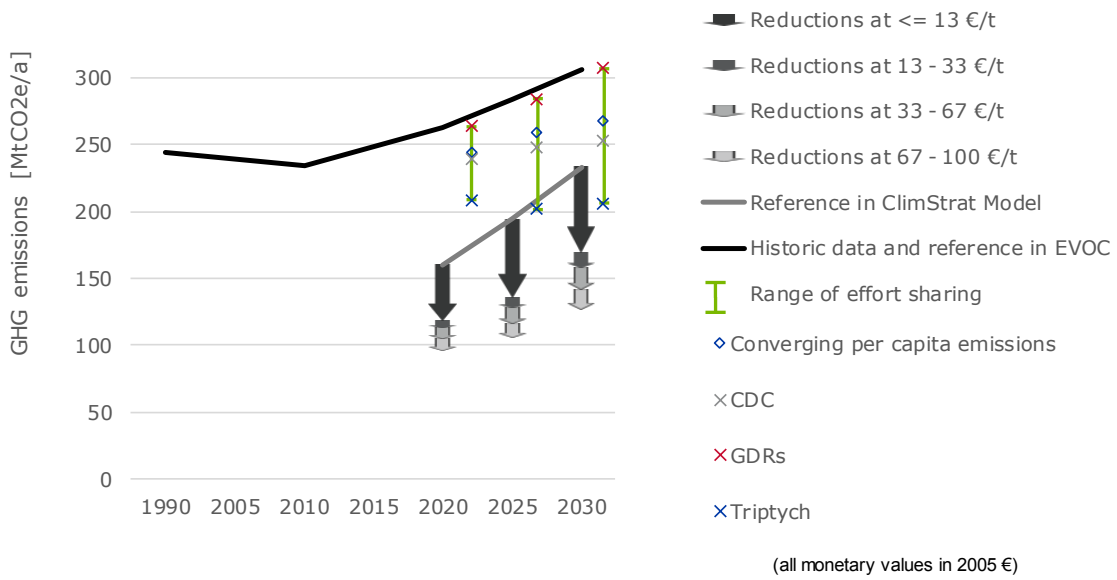
Fuel	Value	Unit	Share in 2011
Biomass_w aste	31658	ktoe	93%
Solar_w ind_other	0	ktoe	0%
Geothermal	16	ktoe	0%
Hydro	439	ktoe	1%
Nuclear	0	ktoe	0%
Gas	0	ktoe	0%
Oil	1950	ktoe	6%
Coal	0	ktoe	0%

Indicator	Value	Unit	Year
Share of global emissions	0.2	%	2010
Domestic fossil fuel production	0	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	0	%	2011
Economic relevance of fossil fuel imports	1.5	% of GDP	2011
Fossil fuel subsidies	n.a.	Billion USD	n.a.
Fuel import dependence	6	% of imports	2011
Fuel import bill	1.58	Billion USD	2011

3.2 Mitigation Potential and Effort Sharing Allocations

As a least developed country, Ethiopia has only little responsibility to reduce emissions according to most effort sharing approaches. The mitigation potentials go beyond what Ethiopia would need to do themselves, pointing to the need for international support for mitigation activities.

Figure 14: Results of Effort Sharing Calculations and Mitigation Costs for Ethiopia



The effort sharing calculations for Ethiopia display a quite wide range of options, where emissions vary between remaining at the EVOC BAU in the period 2020 to 2030 with the GDR approach or would need to be reduced by 21% below the EVOC BAU in 2020 with the Triptych approach, and as much as 33% in 2030. The median value for all the effort sharing approaches foresees a 4% reduction of GHG emissions by 2025 and 7% by 2030 compared to 1990-levels.

The calculations for mitigation potential based on marginal abatement costs reveal that the emission reductions at negative costs would lead to an emissions level below the median effort sharing value. Emissions reduction measures up to 13 €/t CO2e would reduce emissions by around 30% below the ClimStrat reference scenario in the period 2020 to 2030.

According to the EVOC model effort sharing calculations, Ethiopia has a BAU which starts at historical levels of about 240 MtCO2e in 2010, increasing steadily to more than 300 Mt CO2e in 2030. Note that for Ethiopia, EVOC considers additional data from Savannah burning from EDGAR, a category that is missing in the national inventory. These are emissions from short cycle biomass combustion, which are generally not considered in inventories. The ClimStrat Reference is thus significantly lower.

Table 13: Results of Effort Sharing Calculations for Ethiopia

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	243	259	267	0%	6%	10%	3%	10%	14%
CDC	239	248	252	-2%	2%	3%	2%	5%	7%
GDRs	263	283	306	8%	16%	26%	12%	21%	30%
Triptych	208	201	205	-15%	-17%	-16%	-12%	-14%	-13%
Median	241	253	260	-1%	4%	7%	3%	8%	11%

3.3. Political System

Ethiopia is a federal parliamentary democracy located at the Horn of Africa. The 1994 Constitution of Ethiopia introduced a federal structure, consisting of two layers of government: The Federal level and Regional States.

The Constitution defines the powers of the federal government and regional states and each are required to respect the powers of the other (The Federal Democratic Republic of Ethiopia, 1994). The Federal Government has an enumerated set of functions and powers. These are listed in Article 52 of the Constitution. These include: establishment and implementation of national standards and basic policy criteria for public health, education, science and technology, as well as for the protection and preservation of cultural and historical legacies; enactment of laws for the utilization and conservation of land and other natural resources, historical sites, and objects; formulation and implementation of foreign policy; negotiation and ratification of international agreements; determination and administration of the utilization of the waters or rivers and lakes linking two or more states or crossing national boundaries; and regulation of inter-state and foreign commerce.

Although it appears from Article 52 that the powers and functions of the Federal Government are exhaustively listed, there is a mechanism for the transfer of some powers from the states to the Federal Government when the House of Federation decides so on the basis that it is required for the creation of an economic community. In addition, some powers of the Federal Government can be delegated to the states. The state governments have residual power; anything that is not given to the Federal Government alone or the Federal and Regional Governments concurrently is left to Regional Governments.

The Federal Government is a parliamentary form of government: the political layer of the executive is part of the legislature (Article 45). The Prime Minister who heads the executive branch and many of the members of the cabinet are members of the legislature. They are also individually and collectively responsible to the legislature. There is a separation of the offices of the head of state and the head of government. The President is the head of state and has mainly formal functions (Articles 69-71).

The primary legislative organ of the Federal Government is the House of Peoples' Representatives. However, the executive branch of the federal government may promulgate secondary legislation. The House of Federation is the second legislative organ with the mandate to interpret the constitution and resolve inter-state disputes, among others.

The Federal Government is formed by the political party that has the greatest number of seats in the House of Peoples' Representatives (Article 56). The highest executive powers of the Federal Government are vested in the Prime Minister and the Council of Ministers that are collectively responsible to the House of Peoples' Representatives (Article 72). In addition to exercising executive powers on matters falling under federal jurisdiction, the Council of Ministers may be authorized by the House of Peoples' Representatives to enact secondary legislation (Article 77). Supreme federal judicial authority is vested in the Federal Supreme Court (Article 78).

The federal government has the power to enact environmental laws whose implementation will be left to the states. The states may, however, enact environmental standards which are more stringent than the federal legislation (The Federal Democratic Republic of Ethopia, 2002).

Environmental policies and laws are not subject to specific majority requirements. Like any other law, they are passed by the legislature on the basis of simple majority. At the time of writing (October 2014), the ruling party "Ethiopian Peoples' Revolutionary Democratic Front" occupies all seats except one in the House of Peoples' Representatives. Hence, passing a law at present does not require passing any significant hurdle.

3.4 Historical and Current Domestic Climate Policy and Politics

Being a (signatory) Party to the UNFCCC and the Kyoto Protocol, Ethiopia has pursued adaptation and mitigation policies and strategies. Though most initiatives come from the UNFCCC, the government has integrated them into the national development plans. Numerous existing policies and laws directly or indirectly address climate change, such as the Environmental Policy of Ethiopia, Plan for Accelerated and Sustained Development to End Poverty (PASDEP), Agriculture and Rural Development Policy and Strategy, National Policy on Disaster Prevention and Preparedness, Water Resources Management Policy, Health Sector Development Policy and Program, National Policy on Biodiversity Conservation

and Research, Science and Technology Policy, Population Policy and National Agricultural Research Policy and Strategy (The Federal Democratic Republic of Ethiopia, 2007).

As a member of the Least Developed Country group (LDC) Ethiopia prepared its National Adaptation Programme of Action (NAPA) in 2007 by identifying priority areas that needed urgent and immediate adaptation actions. The preparation of the NAPA was initiated and coordinated by the National Meteorological Agency, which was the focal point of the UNFCCC at that time. The NAPA had initially identified 37 potential adaptation options and finally selected 20 high-ranking priority projects (NMA, 2007). This was the first time that the country identified specific adaptation options and in the process has involved different stakeholders and regions. However, even though Ethiopia's NAPA was submitted to the UNFCCC in 2007, only one project has accessed funding for implementation. The Least Developed Countries Fund (LDCF[20]) has supported the preparation of NAPAs in 51 countries but funded only 138 NAPA projects[21]. This is mainly due to lack of funding in the LDCF.

Following up on the preparation of the NAPA, a new process was introduced to update the existing adaptation plans in 2010. This was due to the fact that the adaptation options listed in the NAPA were project based and there was a need to make them sectoral and regional specific. The Environmental Protection Authority (which is now upgraded to the Ministry of Environment and Forestry) in collaboration with sector ministers and regions initially prepared adaptation plans for the sectors of Water and Energy, Mines, Urban Works, Health, Wild Life Conservation Authority and later also included Agriculture. Ethiopia's Programme of Adaptation on Climate Change (EPACCC) consists of 20 sub-sector adaptation areas. The Adaptation Plan of the country has since been evolving further.

With regards to mitigation Ethiopia submitted to the UNFCCC its potential Nationally Appropriate Mitigation Actions (NAMA) in January 2010 to be implemented until 2020. The NAMAs were prepared with the understanding that there will be financial and technological support. Seventy-five mitigation actions were identified under the seven sector areas that are listed below. (The Federal Democratic Republic of Ethiopia, 2010b)

The potential NAMA areas were:

- Electricity generation from Renewable Energy for the Grid System: (Hydro-power; Hydro-power projects under study; Wind projects; Geothermal projects),
- Bio-fuel development for Road Transport and for household use;
- Electricity generation from Renewable Energy for Off-grid use and direct use of renewable energy,
- Transport (Railway projects to run with Electricity generated from Renewable Energy),
- Forestry/forests,
- Agriculture and,
- Waste management.

3.4.1 Renewable energy

Ethiopia's NAMA includes electricity generation from renewable energy sources for grid and off-grid systems including hydropower, wind and geothermal. Ethiopia has huge potential for hydropower. In addition to the ten hydropower projects under way and the eleven under study listed in the NAMA, the country has introduced a large hydro-power project, the Grand Renaissance Dam, which is currently being constructed and expected to generate 6,000 MW, which would make it the largest in Africa. Ethi-

[20] LDCF was established in 2001 to support specific adaptation needs of LDCs by supporting the LDC Work Programme including preparation and implementation of National Adaptation Programme of Actions (NAPAs)

[21] LDCF website. http://www.thegef.org/gef/LDCF

opia also expects to export power to neighboring countries. In 2011, the share of electricity production from renewables was 84% and there are plans to further expand this share (REN 21, 2013).

3.4.2 Development Plans

Since the current governing Party, the Ethiopian Peoples' Revolutionary Democratic Front (EPRDF), came to power in 1991, Ethiopia had various development plans. The main objective of these development plans was eradicating poverty. These plans were the Sustainable Development and Poverty Reduction Programme (SDPRP- 2002/2003-2004/2005) and the Plan for Accelerated and Sustained Development to End Poverty (PASDEP- 2005/2006-2009-2010). Based on the lessons learnt from the previous PASDEP processes, the Growth and Transformational Plan (GTP) for the years 2010-2015 was designed. The GTP's objective is "to sustain broadly founded, fast and equitable economic growth so as to eradicate poverty in due course" (The Federal Democratic Republic of Ethiopia, 2010a).

The GTP for the period 2010-2015 has the aim to make Ethiopia become a middle-income country by 2025. This development plan was introduced in 2009 and its implementation started in 2010.

The Growth and Transformational Plan comprises plans for the economic sector (agriculture, industry, trade, mining, infrastructure development), social sector (education and training, health), capacity building and good governance (capacity building, information and communication technology development, justice sector, democracy and good governance, media) and cross cutting sectors (gender and children's affairs, youth and sports development; HIV/AIDS prevention and control; social welfare; labor affairs; population and development; culture and tourism, science and technology development; environment and climate change). Since the GTP is a development plan, its climate change components are not as elaborated as other sectors (The Federal Democratic Republic of Ethiopia, 2010a).

The main objective for the environmental and climate change initiatives in the GTP is to "formulate and effectively implement policies, strategies, laws and standards which will foster social and green economy development so as to enhance the welfare of citizens and environmental sustainability". Moreover, building a green and climate resilient economy was among the strategic directions that were to be followed by the GTP (The Federal Democratic Republic of Ethiopia, 2010a).

3.4.3 Climate Strategy

In line with the objectives set out in the GTP, Ethiopia started the process of developing a Green Economy Strategy under the leadership of the Prime Minister, the Environmental Protection Authority, the Ethiopian Development Research Institute (EDRI) and six sector ministers. This process was led by an inter-ministerial steering group and engaged a team of more than 50 experts from more than 20 government institutions who worked in seven sector teams. This strategy was initiated to protect the country from the adverse effects of climate change and build a green economy that will help realize its ambition of reaching middle-income status by 2025 (The Federal Democratic Republic of Ethopia, 2011).

The strategy "Climate Resilient Green Economy" (CRGE) was launched nationally in September 2011 and internationally a few months later at the Durban Climate Summit in December 2011. Thus, this initiative makes Ethiopia one of the few LDCs to develop a Green Economy Strategy (IIED, 2013).

The CRGE initiative had three complimentary objectives and these are:

- Fostering economic development and growth;
- Ensuring abatement and avoidance of future emissions, i.e., transition to a green economy;
- Improving resilience to climate change. (The Federal Democratic Republic of Ethopia, 2011).

The CRGE followed a sectoral approach and identified and prioritized more than 60 initiatives across 7 sectors. The cost estimated to build a middle income green economy is around USD 150 billion over the next 20 years, i.e. until 2030 (The Federal Democratic Republic of Ethopia, 2011).

Among the plans in the CRGE, four areas with high mitigation potential were selected for fast-track implementation:

- Exploiting the vast hydropower potential;
- Large-scale promotion of advanced rural cooking technologies;
- Efficiency improvements to the livestock value chain; and
- Reducing Emissions from Deforestation and Forest Degradation (REDD).

The CRGE that was launched in 2011 only contains the Green Economy part. Subsequently other sectors were asked to advance and update their adaptation plans of the EPACC to design the Climate Resilient component of the Strategy. In line with this, two Ministries have so far prepared their adaptation plans; 1. Climate Resilience Strategy for Agriculture (Ministry of Agriculture) and 2. Climate Resilience Strategy for Water, Irrigation and Energy (Ministry of Water and Energy). These adaptation plans contain different scenarios including estimated costs for adaptation.

If the country continues to pursue a conventional development path the GHG emissions would almost triple from 150 Mt CO2e in 2011 to 400 Mt CO2e in 2030, according to the Climate Resilient Green Economy Strategy. Moreover, the financial framework for the implementation of the strategy has been designed with the establishment of a Climate Resilient Green Economy Facility that is responsible for the mobilization and allocation of funds as well as the financial management (The Federal Democratic Republic of Ethopia, 2011).

The Green Economy Strategy of Ethiopia is a high-level commitment in which the inter-ministerial committee (Ministers or State Ministers) conducts oversight and reports to the Prime Minister's office. In addition, there is a plan to establish a Measuring, Reporting and Verification (MRV) system that will be compatible with the international MRV requirements (The Federal Democratic Republic of Ethopia, 2011).

3.4.4 Implementing the Strategy

A CRGE Facility has been established to be the national vehicle to help mobilize, combine and sequence finance to support the institutional building and implementation of the CRGE strategy. Finance is to be mobilized from domestic, international, public and private sources. The facility is also established to benefit from the different forms of finance currently and potentially available and help mobilize and allocate funds in line with the prioritized needs as defined in the Green Economy Strategy. While the Ministry of Finance and Economic Development (MoFED) coordinates the development and implementation of the Facility's activities, the United Nations Development Programme (UNDP) is serving as the trustee of the Facility to ensure international fiduciary standards until the Ministry of Finance and Economic Development eventually take over the responsibility to fully and independently run the Facility (The Federal Democratic Republic of Ethiopia, 2013).

With regards to the overall implementation of the CRGE initiative, the Ministry of Environment and Forestry (formerly the Environmental Protection Authority until 2013) supervises and regulates implementation of the technical components. National regional states and federal level institutions are responsible for implementing the main parts of this initiative (FDRE, 2013). In order to facilitate this, CRGE units were established within different departments to implement the strategy. The CRGE Facility has approved some fast track projects that are in the process of being implemented. Other stakeholders such as Civil Society Organizations (CSOs) and the private sector cannot access funding directly from the CRGE Facility unless they have partnered with Implementing Entities (either of the six Minister organizations, the nine regional states or two city administrations).

In the past five years, civil society organizations have increased their impact when it comes to raising awareness on climate change among the public and contributed to include climate change issues into existing development and environmental projects and programmes. However, the engagement of the

private sector in adaptation and mitigation has been minimal. Yet some industries such as cement plants are undertaking initiatives to reduce GHG emissions and switch from coal to biomass.

3.4.5 Other Initiatives

Another positive initiative is the enforcement of the subsidy reform by the Council of Ministers, which started in September 2008. Its overall aim is to promote the use of renewable energy sources in the transport sector and to replace conventional fuel with bio-ethanol and biodiesel as substitutes (Sintayehu, 2014). The main objective of this action was to have an alternative transport system and develop effective policies and to focus on more priority development activities and needs such as food, health and infrastructure while at the same time following a greener path. This also makes Ethiopia one of the few developing nations that have reformed its policy on fossil fuel subsidies. Ethiopia is also a member of the 'Friends of Fossil Fuel Subsidy Reform', a group of non-G20 countries that support the reform of inefficient fossil fuel subsidies. Current members besides Ethiopia include Costa Rica, Denmark, Finland, New Zealand, Norway, Sweden and Switzerland (http://www.mfat.govt.nz/fffsr/).

When it comes to land use issues, the country's current development plan (GTP) is very ambitious to achieve vast investments in agricultural and industrial sectors. This could have some negative effects on the environment and sustainable development. For instance, some investments have been promoted at the expense of protected forests and green areas (The Federal Democratic Republic of Ethiopia, 2012).

3.4.6 Putting the pieces together

The Climate Resilient and Low Emission development strategy (CRGE) was designed to combine environmental responsibility and economic welfare. Instead of introducing completely new political measures and reforms, it integrates the existing adaptation and mitigation initiatives and plans (NAPA, EPACC and NAMA). The country has the ambitious Growth and Transformational Plan with a projected GDP growth of 11-15% per year from 2010-2015 at its forefront while pursuing the Green Economy Strategy. Over time, it is anticipated that the CRGE initiative will go beyond the GTP to become fully integrated and aligned with it.

The preparation of the second phase of the GTP is under way. The newly established National Planning Commission (in 2012) working with all sectors is responsible for the preparation of the GTP II. The Planning Commission is currently working on updating the existing documents based on the performance during the first phase. It is critical that GTP II integrates the climate resilient and green economy strategy in its vision and strategy. By doing so, it can be ensured that the economy and social sectors will be low in emissions and resilient to climate change. Integrating the CRGE and the GTP will help the country move towards the middle-income classification as planned in the GTP. Strategy, resources and efforts will neither be duplicated nor dispersed making monitoring and verification efficient.

3.5 Historical and Current International Climate Policy Positions

Ethiopia has been active on climate protection by collaborating with national, regional and international initiatives to combat climate change. Some of these efforts have been mentioned in the previous section. In the multilateral climate negotiations of the UNFCCC, Ethiopia has played a very important role especially when it comes to representing Africa in the negotiations.

The African Union Assembly of Heads of State and Government adopted a decision to speak with one voice at the global climate negotiations. Consequently, it established a Committee of African Heads of State and Governments on Climate Change (CAHOSOCC) in 2009. The Ethiopian Prime Minister served as the spokesperson of the CAHOSOCC for four years from COP15 in Copenhagen in December 2009 until the end of 2012 when the Ethiopian leadership was transferred to the Republic of Tanzania.

The African Group's main diplomatic goals at the climate negotiations are: to keep the distinction between mitigation commitments of Annex I and non-Annex I countries, support for adaptation measures, finance contributions from Annex I countries to meet the US$ 100 billion per year by 2020 -

and the new climate treaty should be ambitious enough to hold the global temperature increase below 2C (African Group, 2013, 2014a, 2014b).

Beyond the multilateral negotiations, Ethiopia has played a leading role by participating in voluntary mitigation actions (see previous section).

3.5.1 Position on Equity

Ethiopia made a submission on equity to the UNFCCC in February 2013 with the aim to enhance the level of ambition within the negotiations of work stream I of the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP)[22]. This specific submission states how countries should take collective responsibility with the aim to increase global ambitions. The Ethiopian submission proposes a methodology for splitting financial support required for mitigation and adaptation to climate change and for splitting the mitigation emissions burden based on the principles of equity. It proposes a revision of Annexes I and Annex II every 5 years based on the following criteria:

3.5.1.1 Revision of Annex I of the Convention

The revision of Annex I Parties shall be based on the per capita emission of each Party which is in excess of its fair share. This fair share is determined by the global cumulative emissions budget consistent with 1.5°C (to be determined by SBSTA) divided by the global population in 2020. Every Party's cumulative per capita emissions is determined by the Party's cumulative historic emissions from 1751 (or from when the Party has become a sovereign nation) up to 2020, divided by its population in 2020. Emissions emitted in one country while it was still a colony shall be attributed to the colonizer. Any Party that has cumulative per capita emissions above the cumulative global per capita is considered to have run out of its fair-share of emissions and shall be inscribed in Annex I of the Convention and is obligated to mitigate.

3.5.1.2 Revision of Annex II of the Convention

The revision of Annex II Parties shall be based on Parties' GDP and GDP per capita. Following their ranking, all Parties ranked above both the median GDP and GDP per capita shall be inscribed in Annex II of the Convention. All remaining Parties are exempt from legal obligations that are assigned to Annex II Parties by the UNFCCC.

3.5.1.3 Allocation of obligations to provide financial contributions

All Parties that fall into the Annex II category shall collectively provide financial contributions to the non-Annex II Parties to enable those countries to take actions needed in both mitigating and adapting to climate change, in technology development transfer, and in capacity building. How much a Party needs to provide in financial support to non-Annex II parties is directly proportional to the amount by which this Party's GDP is above the world's median GDP.

3.5.1.4 Allocation of obligations to mitigate climate change

The goal in emissions reductions shall be revised and determined by SBI and/or SBSTA on a 5-year basis using the latest scientific knowledge. The required emissions reductions for the subsequent 5 years may be broken down among Annex I Parties in two possible ways:

- Capacity: emissions reductions attributed to a Party will be directly proportional to the amount by which this Party's GDP is above World's median GDP.
- Historic responsibility: emissions reductions attributed to a Party will be proportional to the amount by which this Party's historical emissions has surpassed global average cumulative emissions.

[22] http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp_ethiopia_workstream1_18022013.pdf

The submission also indicates that Parties will need preparation if Annexes are to be revised. Furthermore, it recommends Parties should be given a grace period of two years.

3.5.2 Intended National Determined Contributions (INDCs)

According to the Convention, mitigation action by developing countries (non-Annex I) is encouraged but not mandatory. Nevertheless, Ethiopia as a country has developed a Climate Resilient Green Economy Strategy in 2011 to move to a carbon neutral development pathway. Though this plan is to be implemented until 2025 it is expected that it will continue beyond 2025. However, since the Durban conference (December 2011) discussions have started shifting and all Parties with respect to their responsibilities and capabilities are asked to contribute and participate not only in adaptation but also in mitigation actions. At the time of writing (October 2014), Ethiopia is carrying out the preparatory work to define its nationally determined contributions. Ethiopia's Intended Nationally Determined Contribution (INDC) could potentially be the efforts contained in the low carbon development strategy on the basis of available technical and financial support.

3.6 Conclusions

As a least-developed country with the aim of becoming a middle-income country by 2025, economic development and ending poverty is a main priority for Ethiopia. Economic growth is therefore essential to the country. If the country continues to pursue a conventional development path, it is anticipated that GHG emissions would almost triple from 150 Mt CO2e in 2011 to 400 Mt CO2e in 2030. As a consequence, the Government has actively elaborated an alternative development plan, described in the Climate Resilient Green Economy Strategy. According to this plan, Ethiopia should move to a carbon neutral development pathway. Though this plan is to be implemented until 2025 it is expected that it will continue beyond 2025. In order to implement an alternative low-carbon strategy and build a middle-income green economy, around USD 150 billion will be needed from 2011-2030.

Ethiopia's capability to undertake these actions, therefore, highly depends on whether technical and financial support will be made available. If successfully implemented, it would mean that Ethiopia is doing far more than actually required according to different effort-sharing approaches.

In the international negotiations, Ethiopia is an active player that has had an important role especially when it comes to representing the African group in the negotiations. It also submitted an alternative proposal on equity in 2013. Given that this proposal has not achieved considerable support from other parties – also not from the African Group – it is however unlikely that Ethiopia will pursue this position further in the upcoming negotiations.

According to the analysis carried out for this project, Ethiopia has substantial potential to reduce emissions at negative costs. Further, the potential goes significantly beyond what Ethiopia would be responsible for themselves according to effort sharing approaches.

4. European Union

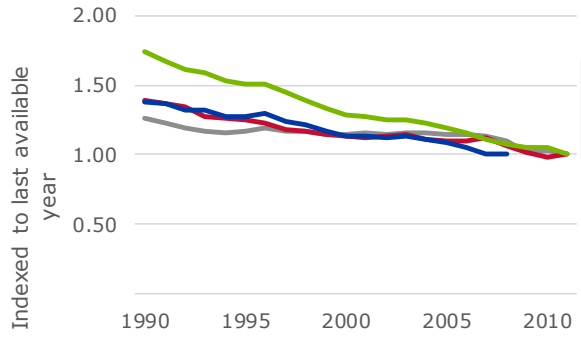
4.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	507.773	mln cap	2011
GDP	1.5E+13	US$ (2005)	2011
Air pollution index	26	ug/m3, mear	2011

Indicator	Value	Unit	Year
Vulnerability	0.22	-	2011
HDI	0.86	-	2011
Electrification rate	100	%	2000

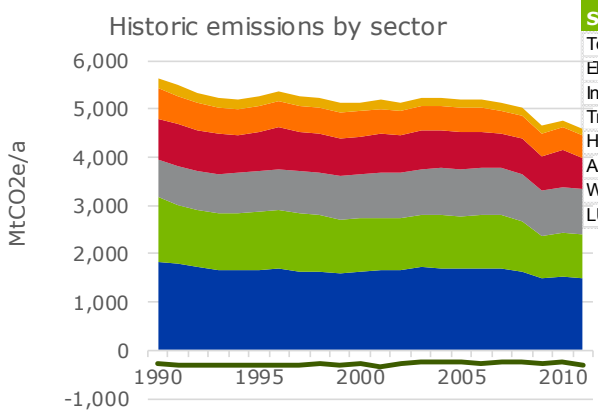
Past trends of decarbonisation indicators



Indicator	Value	Unit	Year
Per capita emissions	9.63	tCO2e/ cap	2011
Emission intensity of electricity	352.08	tCO2/kWh	2011
Emission intensity of economy	0.33	tCO2e/ USD	2011
Energy intensity of economy	0.12	ktoe/ million	2008

Per_capita_emissions
Electricity_intensity
Energy_intensity
Emission_intensity

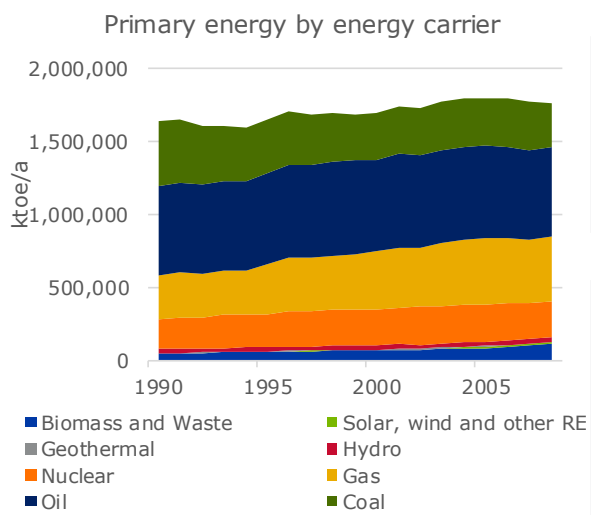
National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	4291.5	MtCO2e/a	100%
Electricity_and_Heat	1496.9	MtCO2e/a	35%
Industry	907.1	MtCO2e/a	21%
Transport	929.2	MtCO2e/a	22%
Households_and_services	648.8	MtCO2e/a	15%
Agriculture	471.4	MtCO2e/a	11%
Waste	145.2	MtCO2e/a	3%
LULUCF	-307.1	MtCO2e/a	-7%

Electricity_and_Heat
Industry
Transport
Households_and_services
Agriculture
Waste
LULUCF

Energy mix



Fuel	Value	Unit	Share in 2008
Biomass_waste	107699.557	ktoe	6%
Solar_wind_other	12006.573	ktoe	1%
Geothermal	5778.198	ktoe	0%
Hydro	28556.73	ktoe	2%
Nuclear	244400.09	ktoe	14%
Gas	443074.74	ktoe	25%
Oil	612975.421	ktoe	35%
Coal	304812.656	ktoe	17%

Indicator	Value	Unit	Year
Share of global emissions	11.7	%	2010
Domestic fossil fuel production	391,728	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	49	%	2011
Economic relevance of fossil fuel imports	6.0	% of GDP	2011
Fossil fuel subsidies	n.a.	Billion USD	n.a.
Fuel import dependence	51	% of imports	2011
Fuel import bill	1014.04	Billion USD	2011

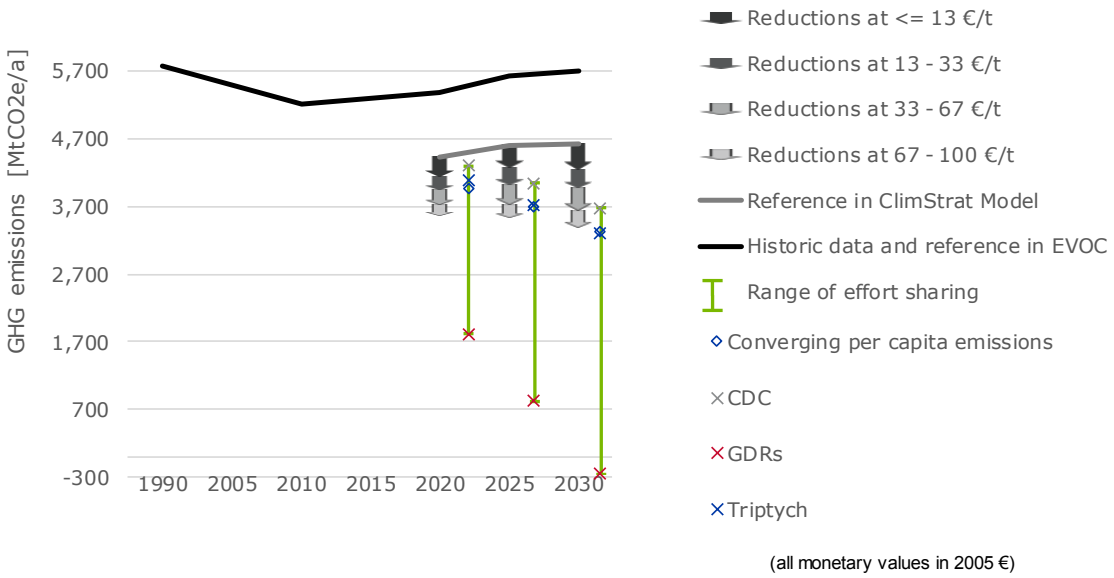
The EU has a population of about half a billion people and accounts for about 10% of global GHG emissions, making it the world's third largest emitter. Per capita emissions stood at about 9.6t CO_2-eq. in 2011, substantially above the world average. EU member states differ substantially on key indicators. Per capita emissions range from 21.36 t (Luxembourg) to 4.95 t CO_2 (Portugal). Per capita GDP ranges from €83,400 (Luxembourg) to €5,500 (Bulgaria). The EU his highly dependent on fossil fuel imports,

which account for about half of its primary energy consumption and lead to a fuel import bill of about 1 trillion USD.

4.2 Mitigation Potential and Effort Sharing Allocations

The various effort sharing proposals considered in this study yield strongly varying results for the EU, ranging from 26-69% below 1990 levels in 2020 to 37-105% below 1990 levels in 2030. While CPE and CDC are based on globally converging per capita emissions starting from current levels, Triptych is based on convergence of sectoral indicators irrespective of countries' development status. These approaches therefore do not include aspects of historical responsibility and economic capability. By contrast, the GDR proposals focuses on historical responsibility and economic capability and thus yields strongly different results, suggesting a target beyond 100% in 2030.

Figure 15: Results of Effort Sharing Calculations and Mitigation Costs for the EU



The median of the proposals considered in this study lies at 31% below 1990 levels in 2020, 36% below 1990 levels in 2025, and 43% below 1990 levels in 2030. According to the calculations in this study, the EU could achieve targets as suggested by the median at relatively moderate costs. Marginal costs reach about 100 €/tCO_2-eq. in 2030 while average costs reach about 60 €/tCO_2-eq. By contrast, a target as suggested by the GDRs proposal would incur costs well above 500 €/tCO_2-eq.

Table 14: Results of Effort Sharing Calculations for the EU

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	3.953	3.679	3.323	-32%	-36%	-43%	-24%	-29%	-36%
CDC	4.290	4.028	3.664	-26%	-30%	-37%	-18%	-23%	-30%
GDRs	1.799	809	-273	-69%	-86%	-105%	-65%	-84%	-105%
Triptych	4.065	3.704	3.292	-30%	-36%	-43%	-22%	-29%	-37%
Median	4.009	3.692	3.307	-31%	-36%	-43%	-23%	-29%	-37%

As noted, these calculations are based on the assumption of purely domestic efforts, so use of international emissions trading would tend to lower these costs. A target as suggested by the GDRs proposal would in practice only be feasible through financing large quantities of emission reductions outside the EU's borders.

4.3 Political System

The EU is a supranational organisation on which the currently 28 member states confer competences to attain common objectives (TEU, Art. 1). Competences not conferred upon the EU in the Treaties stay with the member states (TEU, Art. 4.1). The major policy-making bodies of the EU are:

- the European Council, the assembly of the heads of state or government,
- the Council of the European Union, which is composed of one representative of each member state at ministerial level,
- the European Parliament, the members of which are elected by the EU's citizens in nationally organised elections,
- and the European Commission, which consists of one commissioner from each Member State, who are appointed by the European Council after they have been approved by the European Parliament.

The EU has three types of binding legislation: Regulations, directives and decisions. Regulations are binding in their entirety and directly applicable in all member states. By contrast, a directive sets out the end results that all EU member states must achieve but gives them leeway on the choice of form and methods. Decisions apply in specific cases, involving particular authorities or individuals, and are fully binding on those to whom they are addressed. In addition, EU institutions may issue recommendations and opinions to make their views known without any legal implications (TFEU, Art. 288).

The European Council has no legislative competence but determines the top-level political directions and priorities of the EU (TEU, Art. 15). The Council of the EU and the European Parliament share budgetary authority and the power to legislate (TEU, Art. 14). The European Commission is charged with upholding the general interest of the Union. It ensures the application of the Treaties and EU legislation and has a virtual monopoly on initiating the EU's legislative process and presenting legislative proposals to the Council and the Parliament. It also is the Union's executive body and thus responsible for implementing the EU's legislation, budget and programmes (TEU, Art. 17). Within the Commission, the competence for climate policy traditionally lay with the Directorate-General for the Environment. In 2010, a separate Directorate-General for Climate Action (DG CLIMA) was created. The task of DG CLIMA is to develop and implement international and domestic climate action policies and strategies as well as to conduct the international climate negotiations on behalf of the EU (European Commission, 2014). Subsequent to the 2014 European elections, the new Commission President Juncker united the Directorate-Generals on Energy and Climate Action in the hands of one Commissioner, to be supervised by a new Commission Vice-President for Energy Union (EurActiv, 2014e).

Combating climate change falls into the subject area of the environment (TFEU, Art. 191.1), which is an area of shared competence (TFEU, Art. 4.2). That is, both the EU and its member states may legislate and adopt legally binding measures, but Member States may legislate only in the absence of legislation by the EU (TFEU, Art. 2.2). In addition to the individual member states, the EU as such is therefore also a party to both the UNFCCC and the Kyoto Protocol (UNFCCC, 2014c, 2014d). However, member states have kept their sovereign national prerogative on energy supply structures (TFEU, Art. 194), the main determinant of EU emissions.

EU climate policy thus has a multi-level structure. While the EU has established a number of policy instruments and the Council may in principle decide on environmental issues by majority voting, the member states usually make every attempt to achieve consensus. Consensus is required where energy supply structures are concerned. The consensus approach applies even more in the case of international negotiations, where each member state could decide to not ratify an agreement. The EU speaks with one voice and thus the member states and the Commission constantly have to coordinate their views and positions.

Due to its complicated and consensus-forcing decision-making structure and the many and very diverse interests involved, the EU is often caught in a "joint decision trap", resulting in outcomes at the

lowest common denominator (Scharpf, 1988). While this diagnosis was originally made already in the 1980s when the EU had only 12 member states, it applies at least as much to the current EU with 28 members and much more heterogeneous socio-economic circumstances than the EU had before its Eastern enlargement.

4.4. Historical and Current Domestic Climate Policy and Politics

4.4.1 Early Frontrunner Days

Right from the start of international climate policy in the late 1980s the EU (at the time still the European Community) has been one of its foremost actors. Jachtenfuchs in fact argues that the Commission deliberately seized on climate policy as an opportunity to enhance the status of the then European Community in international relations by displaying environmental leadership. In addition to the international level the Commission also early on launched debates about introducing a Community-wide carbon/energy tax. However, this scheme failed repeatedly in the Council of Ministers, not least because fiscal matters require unanimity to be passed. After more than ten years of discussion a much watered-down version was finally adopted in 2003, setting only relatively low minimum levels for national energy taxation instead of establishing an ambitious Community-wide tax (Jachtenfuchs, 1996; Luhmann, 2003; Zito, 2002).

Disappointed about the failure of this and other policy instruments, in the late 1990s Commission officials seized on emissions trading as a new opportunity to finally establish meaningful policies and measures at the European level. In addition, there were a number of initiatives in various member states considering the viability of national trading schemes, and trading schemes were in fact established in Denmark and the UK. However, this plethora of initiatives gave rise to the question of linking schemes and potential compatibility problems, especially since a number of EU countries came to the conclusion that the trading volumes would be too small if they established domestic systems. Moreover, there was concern that a patchwork of domestic systems might run counter to the functioning of the European internal market, especially as regards state aid and competition issues (Christiansen & Wettestad, 2003; Zapfel & Vainio, 2002). Finally, the worrying trends in most Member States' GHG emissions led the Commission to heavily emphasise the necessity of adopting meaningful policy instruments at the European level (European Commission, 1999).

The Commission published a Green Paper on emission trading in 1999, and in 2001 followed up with a proposal for a directive for establishing an EU-wide emission trading system. The negotiations were difficult, but for most actors the issue was how to implement the scheme rather than if it should be implemented at all. Moreover, the discussions had received added momentum by the crisis in the UNFCCC negotiations, highlighted by the abortive Conference of the Parties in The Hague in November 2000 and the announcement by then newly elected US President Bush in March 2001 that the US would not ratify the Kyoto Protocol. This crisis strengthened the resolve of the EU to save the Kyoto Protocol by showing leadership in the UNFCCC negotiations as well as by implementing meaningful policies and measures at the domestic level (Zapfel & Vainio, 2002). The emissions trading directive was finally agreed on in October 2003 and established the EU emission trading system (EU ETS) as the world's largest emission trading system so far.

4.4.2 EU Climate Policy in Rough Waters

The EU's Eastern enlargement in 2004/2007, which increased its membership from 15 to 27 member states[23], significantly altered its economic and cultural composition and thus also its climate policy dynamics. In addition to the sheer number of countries that now need to come to agreement, the new EU is much more heterogeneous than the old one in terms of wealth and national energy mixes, with many of the new member states relying heavily on coal. As noted above, member states have so far guarded their national prerogative on energy policy and since individual member states' energy mar-

[23] After the accession of Croatia in 2013 the EU now has 28 member states.

kets so far have a mostly domestic focus, their policy preferences are mainly a function of their respective energy mix and import dependency structures (Fischer & Geden, 2013).

The new difficulties made themselves felt for example in the negotiations on the EU's integrated climate and energy package in 2008. The package was to implement the threefold so-called "20-20-20" - target for 2020 agreed on by the European Council in 2007: to reduce GHG emissions by 20% below 1990 levels, to supply 20% of overall energy consumption from renewable sources, and to reduce absolute energy consumption by 20% below baseline. While the GHG and renewables targets are binding, the energy efficiency target is not. The Council also envisaged the possibility to increase the GHG target to -30% by 2020 in case of adoption of an international climate agreement with comparable reductions by the other industrialised countries and meaningful contributions from economically more advanced developing countries (European Council, 2007).

The negotiations on the package were tough as several of the new member states (especially those whose electricity supply mainly relies on coal) as well as Italy feared that the package would increase electricity prices, which they considered would hamper their economic growth and undermine energy security. In addition, many industries and member states were concerned about risks of carbon leakage, that is, the shifting of production to places outside the EU, where they would not be subject to similar carbon constraints. Discussions were also hampered by the onset of the financial crisis which heightened fears about potential negative impacts of ambitious climate policy (Modern Power Systems, 2008; Stigson et al., 2013a).

The climate and energy package was ultimately adopted in December 2008 and includes four pieces of legislation: a revision of the EU emission trading directive originally adopted in 2003, the EU effort sharing decision, the renewable energy directive and the carbon capture and storage directive. In the final compromise, the new member states were granted derogations from the shift to 100% auctioning for electricity providers in the EU ETS. The final decision also included substantial free allocation of allowances to industries deemed at risk of leakage. Critics maintain that the free allocation is overly generous, benefiting a high number of industries that can hardly be deemed to be at any real risk of leakage (BBC News Website, 2010; Branger, Lecuyer, & Quirion, 2013; Modern Power Systems, 2008).

Subsequent to the adoption of the climate and energy package, the global financial crisis led to a sharp drop in EU emissions, which hit in particular the centrepiece of EU climate policy, the EU ETS. Except for 2008, the EU ETS has been oversupplied in every single year of its existence so far, leading prices to currently hover around EUR 5 per tonne (Branger et al., 2013). The economic recession has had a similar impact on overall EU emissions. According to the European Environment Agency, 2013 emissions were 19% below 1990 levels, so the 2020 climate target is almost achieved 7 years early (European Environment Agency, 2014). The 2020 target thus only amounts to keeping emissions stable.

Efforts to increase the EU's 2020 target and to reform the ETS have nonetheless so far failed. Discussions first directly addressed possibilities of increasing the EU target to 30% and were subsequently couched into a larger perspective of adopting a roadmap to 2050, which according to a proposal by the Commission should include strengthened near-term ambition (European Commission, 2010, 2011).

However, energy-intensive industries repeatedly protested against a unilateral move. For example, Gordon Moffat, director general of Eurofer, the European Confederation of Iron and Steel Industries, posited that "it is impossible for manufacturing industry to achieve a -30% target by 2020 without cuts in production and significant losses of jobs." (Allan, 2010) Eurofer also accused the Commission of using biased models that "systematically underestimate the negative effects on industry and employment." (Eurofer, 2011) The European Parliament's Committee on Industry, Research and Energy largely echoed these concerns. The Committee claimed that existing climate policy was already leading to relocation of production and that higher carbon prices would exacerbate this trend (ITRE Committee, 2011).

Resistance also came from some Directorates-General within the Commission as well as several member states. For instance, Energy Commissioner Oettinger stipulated that stronger reductions would

only lead to faster de-industrialisation of Europe. As for member states, observers at various times singled out in particular France, Germany, Italy and the new member states from Central and Eastern Europe as being difficult. Strong support for increasing ambition came in particular from the new coalition government in the UK that assumed office in 2010. Despite several attempts, the Council of the EU was ultimately unable to adopt unanimous conclusions on the Low Carbon Roadmap due to the opposition of Poland (Adam & Traynor, 2010; EurActiv, 2010; Harvey, 2011; Nachmany et al., 2014).

Even a stopgap measure to backload auctioning of a share of the EU ETS allowances to the end of the decade proved almost too difficult to adopt. European businesses again warned that any move to increase allowance prices would jeopardize growth and employment. A European Parliament vote in April 2013 went against the proposal, the EU's largest emitter Germany was for a long time not able to voice an opinion due to divisions within its ruling coalition, and Poland and Cyprus long held out in complete opposition to the adjustment. Backloading was finally approved in November 2011, after general elections in Germany had removed the anti-backloading liberal party from government (Czuczka & Krukowska, 2013; Deutsche Welle, 2013; Eurochambres, 2012; Utility Week, 2013).

4.4.3 Discussions around Post-2020 Policy

The EU just adopted the main outlines of a new climate and energy package for the period from 2020 to 2030. It is not yet completely clear how exactly this package will be converted into the EU's post-2020 offer under the UNFCCC, but a close connection between the targets can be expected. The discussions have again highlighted sharp divisions among the member states and EU institutions regarding both the level of ambition and the format of the new package.

Regarding the format, the main controversy was whether to continue with the current trio of targets or not. DG CLIMA and Austria, Belgium, Denmark, France, Germany, Ireland, Italy and Portugal called for setting a new renewables target for 2030. The European Parliament was vocal in calling for maintaining the current trio of targets and in the Parliament's view all of these targets were to be binding and to be broken down to the individual member states. By contrast, the UK, the Visegrad plus 2 group (Czech Republic, Hungary, Poland and Slovakia plus Bulgaria and Romania), various groups within the Commission and business groups, in particular Business Europe and Eurelectric, argued that the EU should have only a GHG target for the period post-2020 in order to provide flexibility on how to achieve targets, leaving the composition of the energy mix up to the individual member states, and in order to minimise negative interactions among policy instruments. Several of these countries are planning to expand nuclear power generation and the Visegrad countries in addition want to maintain their reliance on fossil fuels. Their traditional energy security concerns have been further heightened by the Ukraine crisis, which has prompted them to highlight the potential of their domestic coal and shale gas reserves as well as the need for better intra-EU intraconnectivity to minimise import dependence (EurActiv, 2014b, 2014c; Hübner, 2014; Meyer-Ohlendorf, Duwe, Umpfenbach, & McFarland, 2014; Visegrad+ Group, 2014).

As for the level of ambition of the emission target, after some internal wrangling a proposal from the Commission from January 2014 suggested a target of "at least" 40% that would have to be achieved domestically, that is, without use of emission credits from abroad. Energy Commissioner Oettinger had advocated a target of only 35% (EurActiv, 2014a). A "green growth group" of 13 member states (Belgium, Denmark, Estonia, Finland, France, Germany, Italy, the Netherlands, Portugal, Slovenia, Spain, Sweden, and the UK) supported "at least 40% domestic" (BMUB, 2014). "At least 40% domestic" was also supported by the European Parliament (European Parliament, 2014). By contrast, due to their focus on fossil fuels, in particular the Visegrad group called for a less ambitious target. The Visegrad countries also complained about running ahead of the UNFCCC negotiations, arguing that the EU should not commit itself ahead of other Parties (McGrath, 2013; van Renssen, 2014).

There were thus some differences in the battle lines on the various issues. While the UK and the Visegrad plus group were opposed to targets for efficiency and renewables, they were at odds on the level of ambition of the emission target.

On the level of ambition for renewables and efficiency, the Commission proposed targets of 27% and 30% respectively. The European Parliament criticised the Commission's proposals as short-sighted and unambitious, calling for a 30% renewables target and a 40% efficiency target (European Parliament, 2014).

In addition to the question of the level of ambition there was also a strong controversy about the EU's internal effort sharing. While the old Western European member states favour an effort sharing approach based on emission reduction potential, the poorer Central and Eastern European member states complain that this would shift too high a share of the effort to them and therefore favour a continuation of the current approach based on GDP per capita (Reuters, 2014b; Visegrad+ Group, 2014).

On 23 October, the European Council agreed on the headline elements of the post-2020 package. The Council endorsed a binding target of at least 40% domestically. To support poor member states, the Council agreed to set aside 2% of EU ETS allowances to improve energy efficiency and support modernisation of the energy system of member states with GDP per capita below 60% of the EU average. These member states may also continue allocating 40% of their allowances to the energy sector for free. In addition, 10% of the allowances to be auctioned by member states are to be distributed among the countries with GDP per capita below 90% of the EU average. National targets for the non-ETS sectors will continue to be set with the same method used for the 2020 package, based on GDP per capita. Countries with non-ETS targets significantly above the EU average and countries without free allocation to industrial installations are to be allowed use of a limited amount of EU ETS allowances for meeting their non-ETS targets, with details to be decided before 2020. The Council also endorsed a binding EU target of at least 27% for the share of renewable energy in 2030 and a non-binding indicative target of 27% for improving energy efficiency. The efficiency target is to be reviewed in 2020, which may include an increase to 30%. Both targets will not be translated into nationally binding targets (European Council, 2014).

A report by HSBC argued that the Commission's proposals, which ended up being close to what was adopted, offered "the lowest level of climate ambition possible". According to HSBC the renewables target actually implies a slowdown of the current trend, from a rate of 5 per cent per annum in 2010-2020, to 2 per cent during the 2020-2030 decade (quoted according to Vorrath, 2014).

Given its strong role in the legislative and implementation process, the new composition of the Commission following the 2014 European elections will also have a strong influence on the future direction of EU climate policy. The new Commission president Jean-Claude Juncker, previously Prime Minister of Luxembourg, was in favour of a binding efficiency target and has united the so far separate Directorate-Generals on Energy and Climate Action in the hands of one Commissioner. In addition, these and other Directorate-Generals are to be supervised by a new Vice-President for Energy Union. Reactions to this new setup have been mixed. While some commentators consider that the new setup will facilitate the long-overdue mainstreaming of climate concerns into energy policy, others fear that climate policy will be sidelined in the new Commission. Juncker's choice as Energy and Climate Commissioner, Miguel Arias Cañete, also drew heavy criticism due to having previously worked for, still retaining shares of and having family ties to Spanish oil companies. Moreover, the EU's heads of state and government picked Polish Prime Minister Donald Tusk as new president of the European Council. Given Poland's blocking behaviour in EU climate policy, some analysts fear that this augurs badly for future EU climate policy (Darby, 2014; EurActiv, 2014d, 2014e).

4.5 Historical and Current International Climate Policy Positions

The EU has historically seen itself as frontrunner in international climate policy and was one of the main driving forces behind the adoption and entry into force of the Kyoto Protocol. Success in the climate negotiations has historically hinged on the EU being able to form a "green group" with the Alliance of Small Island Developing States (AOSIS) and other progressive countries (Oberthür & Ott, 1999). The EU was also the first Party who presented its intended commitment in the negotiations under the Bali Action Plan, hoping to jump-start others into following suit, in particular by offering the

prospect of increasing the EU target from 20% to 30% in the framework of an international agreement with adequate levels of ambition by the other main emitters (Stigson et al., 2013a).

At the same time, the EU, together with the other industrialised countries, has always supported the notion that according to the principle of common but differentiated responsibilities the climate regime should successively be expanded so as to include contributions from all countries, pointing in particular to the rapidly rising emissions from the emerging economy countries. While the negotiations under the Bali Action Plan proceeded on two tracks, a track on post-2012 targets under the Kyoto Protocol and a separate track on new actions under the Convention, in the run-up to Copenhagen the EU took the position that the result of the negotiations should be a universal framework covering all emitters while integrating the key features of the Kyoto Protocol in respect of industrialised countries (W Sterk, 2010).

After the failure of the effort to achieve a comprehensive legally binding agreement under the Bali Action Plan in Copenhagen, the EU declared itself ready to agree to a second commitment period under the Kyoto Protocol if in exchange there was agreement on launching a new round of negotiations to develop a comprehensive legally binding agreement. On this basis, the EU was able to form an alliance with AOSIS, the Least Developed Countries and other progressive countries at the Durban conference in 2011, and to ultimately achieve the adoption of the Durban platform in 2011 (W. Sterk, Arens, Mersmann, & Wang-Helmreich, 2013).

In the Durban platform negotiations, the EU has emphasised that "the 2015 Agreement must be truly 'applicable to all'", aiming to address 100% of global GHG emissions by ensuring participation and ambitious mitigation commitments by all countries. The EU has posited that the new agreement should be a new Protocol under the Convention with legally binding mitigation commitments by all Parties. The EU has maintained that mitigation commitments need to be differentiated according to the principles of the Convention, but those principles "must be applied in a dynamic way such that commitments are ambitious, fair and reflect the changed and changing responsibilities and capabilities of Parties" (EU, 2013, p. 2f). Similar to the US and others, the EU has posited that it "cannot accept a static interpretation of CBDRRC that differentiates commitments of Parties according to a binary split based on the Annex to the Convention." (EU, 2014, p. 4)

On finance, the EU considers that much of the transformational investment will be private. The EU therefore sees a role for all Parties to take action on climate finance. As with the mitigation commitments, the financial provisions of the new agreement should, in the EU view, be able to adapt to future changes in environmental and economic realities, such as changes in the ability to pay and responsibility for global emissions. All Parties should implement ambitious domestic policies and create enabling environments as basis for mobilising private sector investment. The most capable and responsible Parties would be required to provide international public climate finance. The EU wants to gradually broaden the range of contributor countries, including emerging economies (EU, 2013, 2014).

4.6 Conclusions

The EU's current 20% target for 2020 falls short of the results of all effort sharing proposals analysed in this study. Even the most lenient approach allocates a 26% target to the EU, the median of the proposals lies at 31%. In addition, the EU has essentially already achieved the 20% target, instead of reducing emissions it thus only means to keep emissions stable for the rest of the decade. In effect, the EU will probably substantially overachieve its 20% target, which raises the question of how to deal with the resulting surplus of allowances.

The EU is the first Party which was publicly discussing and has decided figures for its 2030 target. However, its climate policy is strongly stymied by its need to achieve consensus among 28 member states with strongly varying national circumstances. The 40% target now adopted lies at the lower end of the range of the effort sharing approaches considered by this report, which is 37-105%.

The new EU target may also be substantially affected by the surplus of allowances in the EU ETS. The surplus is expected to amount to 2.6-4.5 billion allowances in 2020. If this surplus is fully carried over

and used in the post-2020 period, the 40% target could effectively be reduced to 24-31%. There are discussions to address this issue as part of the introduction of a market stability reserve, but no decisions have been taken yet. A further 1.3 billion allowances are projected to accumulate in the sectors covered by the effort sharing decision, but as of now banking of these allowances is not possible (Carbon Market Watch, 2014; Höhne et al., 2013).

According to the calculations in this study, the EU could achieve the targets suggested by those effort sharing approaches that do not take into account historical responsibility and economic capability at relatively moderate costs. If the EU strengthened its 2020 target to a level as suggested by the median of the effort sharing proposals, it could achieve this target by mobilising reduction potential in the cost range of 13 to 33 €/t CO_2-eq. Historic highs of EU ETS allowances prices have been around 30€/t CO_2-eq., so the cost of strengthening the 2020 target would not be beyond what the EU has already seen. For 2025, a target as suggested by the median of the effort sharing results could be achieved by mobilising reduction potential in the range of about 67 €/t, while for 2030 reduction potential in the area of about 100 €/t would need to be mobilised. By contrast, the GDRs proposal, which focuses on historical responsibility and economic capability, would impose much stricter targets on the EU, going beyond 100% in 2030. Such a target would incur costs well above 500 €/t if implemented purely domestically, but would in practice only be feasible through financing large volumes of emission reductions outside the EU.

While the Green Growth Group of climate-progressive EU countries sees the 40% as the floor of ambition, to be strengthened in case of a successful outcome of the Paris conference, there are substantial groups in the EU which advocate for even lower climate ambition. In particular the coal-dependent Central and Eastern European member states are concerned that ambitious climate policy would strongly increase the cost of energy and endanger national energy security. Energy security concerns have been further heightened by the Ukraine crisis, which has prompted these states to highlight the potential of their domestic coal and shale gas reserves to minimise import dependence. For these countries, the 40% target is open to be adjusted in either direction in the light of the results of the Paris conference. The proposed setup of the Juncker Commission has also prompted fears that climate concerns will in future be even more sidelined in favour of energy security issues.

Energy security concerns have prompted in particular Poland to call for the creation of an EU energy union, but the new climate and energy package in effect marks a re-nationalisation of energy policy. The energy efficiency target continues to be non-binding and the new renewable energy target is only binding at the EU level. It is as yet unclear how achievement of the EU-wide renewables target is to be ensured without breaking it down into national targets.

With the inclusion of the words "at least" in front of the 40% GHG reduction target the EU has openly committed itself to a ratchet-up option of its currently still moderate target. However, other countries will measure the EU on the basis of its further ambition when it translates this package into an INDC. In turn, progressive forces within the EU may use this international scrutiny internally, in order to further strengthen and operationalise the target package on the way to the envisioned 80-95% decarbonisation goal up to 2050.

5. India

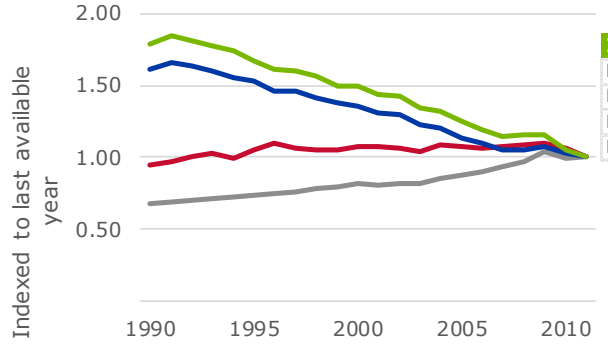
5.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	1221.156	mln cap	2011
GDP	1.3E+12	US$ (2005)	2011
Air pollution index	134	ug/m3, mear	2012

Indicator	Value	Unit	Year
Vulnerability	0.43	-	2011
HDI	0.58	-	2011
Electrification rate	75.3	%	2011

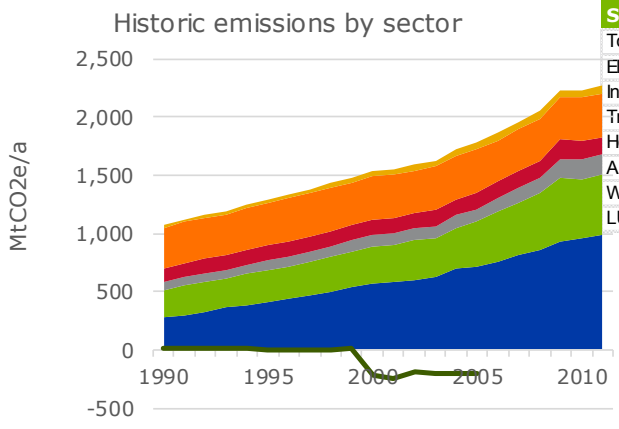
Past trends of decarbonisation indicators



Indicator	Value	Unit	Year
Per capita emissions	1.86	tCO2e/ cap	2011
Emission intensity of electricity	855.8419	tCO2/kWh	2011
Emission intensity of economy	1.71	tCO2e/ USD	2011
Energy intensity of economy	0.56	ktoe/ million	2011

Per_capita_emissions
Electricity_intensity
Energy_intensity
Emission_intensity

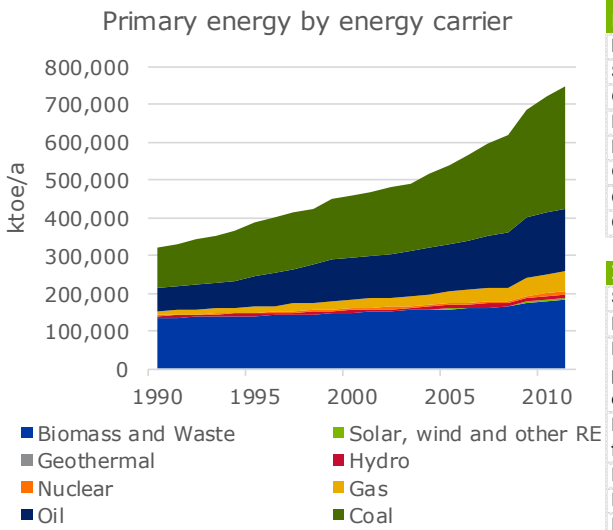
National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	980.7	MtCO2e/a	n.a.
Industry	522.8	MtCO2e/a	n.a.
Transport	172.9	MtCO2e/a	n.a.
Households_and_services	153.9	MtCO2e/a	n.a.
Agriculture	373.4	MtCO2e/a	n.a.
Waste	64.7	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Electricity_and_Heat
Industry
Transport
Households_and_services
Agriculture
Waste
LULUCF

Energy mix



Fuel	Value	Unit	Share in 2011
Biomass_waste	184801	ktoe	25%
Solar_wind_other	2411	ktoe	0%
Geothermal	0	ktoe	0%
Hydro	11237	ktoe	2%
Nuclear	8675	ktoe	1%
Gas	50380	ktoe	7%
Oil	165690	ktoe	22%
Coal	325782	ktoe	43%

Indicator	Value	Unit	Year
Share of global emissions	5.4	%	2010
Domestic fossil fuel production	333,815	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	62	%	2011
Economic relevance of fossil fuel imports	3.0	% of GDP	2011
Fossil fuel subsidies	39.7	Billion USD	2011
Fuel import dependence	28	% of imports	2011
Fuel import bill	178.79	Billion USD	2011

With over 1.2 billion inhabitants, India is the second-most populous country in the world. Due to its large size, it has one of the largest GDPs in the world. However, while India is home to a very productive industrial base and a wealthy high-to-middle-income class, it is also home to a very large poor

population, mostly in rural areas. Especially rural areas account for the country's comparably low electrification rate, and low score on the Human Development Index.

Since 1990, India's emissions have risen dramatically. Especially emissions from electricity and heat generation have increased almost five-fold until 2011. This increase can be strongly attributed to the build-up of fossil fuelled power plants – energy generated from coal and oil has seen a large increase over the same period of time. Biomass and Waste has consistently been used as an energy source, and still accounts for a quarter of the share of energy carriers. Renewable energies beyond biomass have only played a negligible role for energy provision.

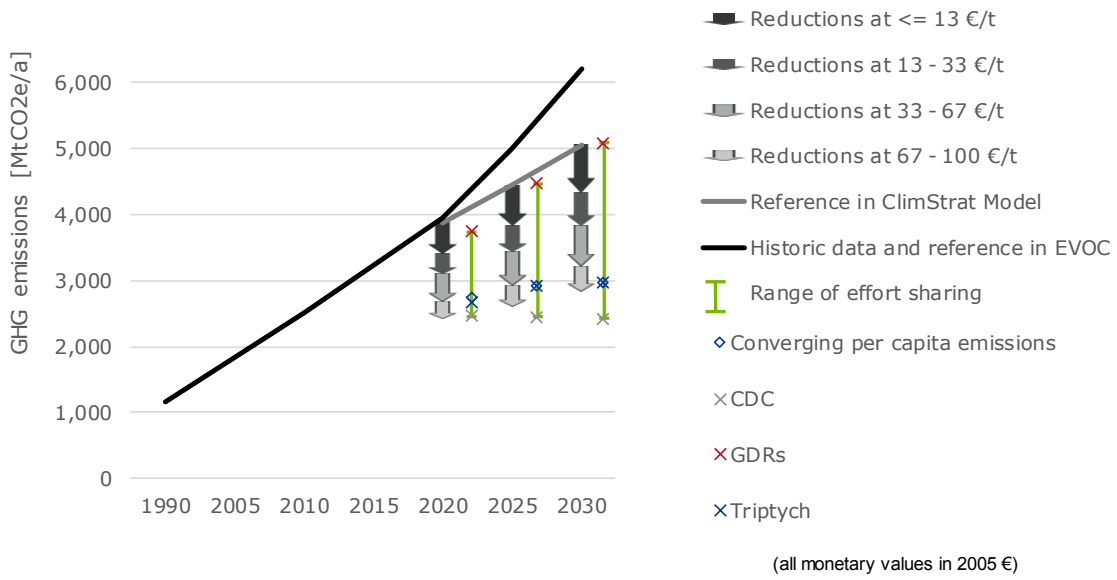
India's per capita emissions are very low, not least due to its large poor population base. Despite low emissions per capita, India's sheer size and population account for its high share of global emissions. With continuing development, the country's emissions can be expected to rise further in the future.

5.2 Mitigation Potential and Effort Sharing Allocations

Due to its size and large population, India has high total GHG emissions, which are projected to grow dramatically. Assuming that no additional mitigation actions were to be implemented, total GHG emissions would increase in India from 1.2 Gt CO_2-eq./a in 1990 to 6.2 Gt CO_2-eq./a in 2030 (see Compared to other countries analyzed in this study the results of different effort sharing approaches do not differ significantly. For 2025, the range is about 405-480 Mt CO2-eq. whereas for 2030, it increases to 375-480 Mt CO2-eq. The median of the emission targets from the four effort sharing models we analyzed – 465 Mt CO2-eq. in 2025 and 443 Mt CO2-eq. in 2030 – could be reached with average abatement costs well below 100 €/tCO2-eq. up to 2030. Even considering the effort sharing model which requires most ambitious actions for South Africa (CPE), marginal abatement costs would be below 100 €/tCO2-eq.

Figure 10). By contrast, India's GHG emissions per capita have so far been rather low (1.4 t CO_2-eq./a in 1990). These are to increase substantially – assuming the above growth in overall emissions, per capita emission levels are to reach 4.1 t CO_2-eq./a in 2030. However, this would still be far below current per capita emission levels of industrialised countries.

Figure 16: Results of Effort Sharing Calculations and Mitigation Costs for India



If India implemented all current or planned mitigation actions, it could almost limit its GHG emissions to the level implied by the Greenhouse Development Rights proposal. The median of the emission targets from the four effort sharing models that were analysed could be reached with average abatement costs below 100 €/tCO_2-eq./a both in 2020 and in 2030. Since India represents a high share of the global low-cost emission reductions, international emission trading would most likely not reduce these costs as strongly as in other countries.

Table 15: Results of Effort Sharing Calculations for India

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	2.722	2.891	2.954	135%	149%	155%	8%	15%	17%
CDC	2.440	2.428	2.409	111%	110%	108%	-3%	-4%	-5%
GDRs	3.724	4.448	5.067	221%	284%	337%	48%	76%	101%
Triptych	2.649	2.894	2.962	129%	150%	156%	5%	15%	17%
Median	2.686	2.893	2.958	132%	150%	155%	6%	15%	17%

5.3 Political System

The Republic of India is a federal republic with a parliamentary form of government. The Republic is based on the Constitution of India, which was adopted by the Constituent Assembly on 26th November 1949 and came into force on 26th January 1950. The bicameral Parliament consists of the Council of States (Rajya Sabha) and the House of People (Lok Sabha), whose majority party provides the prime minister. In general both the Council of States and the House of People are equal partners in the law making process, but some unique power (e.g. in case of revenue raising) is given to the House of People that consists of directly elected members. Elections for the House of People were last held from April to May 2014. Following the success of the Bharatiya Janata Party (BJP, Indian People's Party), Narendra Modi was appointed as the new prime minister and head of government on 26 May 2014.

India is a Union of States, comprising 29 state territories and 7 union territories. The legislative powers are distributed between the centre and the states. According to the Constitution of India, "The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country" (Art. 48 A). While the federal level is responsible for climate change agreements and the formulation of an overall national strategy, the state level is provided with legislative powers in some areas relevant to climate action, such as agriculture, water and land improvement. Some of the sectors subject to climate change policy such as electricity are listed to concurrent jurisdictions, where responsibilities are distributed to federal and state level. The specific topic areas are regulated in the 7th schedule of the Indian constitution: I Union List, II State List and III Concurrent List (Art. 246).

5.4 Historical and Current Domestic Climate Policy and Politics

5.4.1 Development First!

While India has been an active participant of the UNFCCC negotiations from the beginning (see next section), climate change has for a long time been a "non-issue" in domestic politics. Instead, more importance has been attributed to other issues, such as reducing poverty and enhancing social and economic development (Dubash, 2012). In terms of climate change impact, India is extremely vulnerable, e.g. in light of its agriculture-dependent population. According to a number of studies and available data, awareness of climate damages as well as attention to adaptation have grown noticeably but have so far not been translated into commitments to climate mitigation (ibid.).

Since 600 million Indians do not have access to electricity, measures that aim to increase energy access, energy supply and security are of growing importance (Government of India, 2014c). To better match energy supply and demand, India has in the past implemented a wide variety of ambitious policies like energy efficiency (Pahuja, Pandey, Mandal, & Bandyopadhyay, 2014). Even though the primary objectives are not necessarily climate-related - but rather aim at development or other sustainability goals - they explore mitigation potentials and are important to assess with respect to India's climate policy framework.

5.4.2 Mitigation as a Co-benefit in India's Climate Strategy

Recent climate change-related policies and programmes explicitly stress the linkage between development objectives and climate objectives. This holds true for the first National Action Plan on Climate Change (NAPCC) that was prepared by the Prime Minister's Council on Climate Change in 2008. The

plan aims at identifying "measures that promote our development objectives while also yielding co-benefits for addressing climate change effectively" (Government of India, 2008). The action plan comprises Eight National Missions, covering the following subjects: Solar, Enhanced Energy Efficiency, Sustainable Habitat, Water, Sustaining the Himalayan Ecosystem, Green India, Sustainable Agriculture and Strategic Knowledge for Climate Change. Generally, there is no mention of the level of mitigation or abatement implied by a measure, underlining the focus on development actions with climate co-benefits instead of climate policies (Byravan & Rajan, 2012).

In 2009, then Prime Minister Manmohan Singh called upon all states to develop State Action Plans on Climate Change (SAPCCs). The SAPCCs were meant to decentralise action beyond the missions of the NAPCC since various issues, such as for instance water and agriculture, are dealt with on the state level (Dubash & Jogesh, 2014). First evaluations suggest that these action plans could support sustainable development (ibid.). Some states conducted GHG inventories and formulated mitigation related actions. Interestingly, contrary to initial guidance, the Ministry of Environment & Forests "advised against inclusion of these inventories on the grounds that it might unnecessarily expose India to international pressure" (ibid.).

In 2010, after the Copenhagen Climate Summit, India published a document entitled "India Taking on Climate Change – Post Copenhagen Domestic Actions" (Government of India, 2010b). Besides announcing the evaluation of the policies mentioned in the NAPCC, India signalled the release of its national GHG Emissions Inventory for 2007. The Government of India emphasised that "despite its already low emissions intensity", it intends to do even more and announced the intention "to further reduce the emissions intensity of its GDP by 20-25% between 2005 and 2020" (ibid.). This commitment has been criticised as unambitious (see also section 0). For comparison, in 2010 India's GHG emissions per GDP ratio was equal to the US or the Arab Emirates, double of Germany, but half of countries like China or South Africa (World Bank, 2014a). India's emission intensity target was reiterated in India's 12th Five Year Plan (2013), together with the objective to increase the GDP growth to 9 or 10 % a year (Government of India, 2013b).

5.4.3 Slight Headwinds against Coal

India has seen a massive installation of wind power in recent years - making the country top five of cumulative wind capacity in 2013 and even top four in newly installed capacity ("GLOBAL STATISTICS - GWEC," n.d.). However, despite this progress, India's energy mix is dominated by coal which is unlikely to change in a foreseeable future, as recently stated by the Planning Commission of the Government of India (Government of India, 2014c).

As announced in the "Strategic Plan for New and Renewable Energy Sector 2011-17", the Ministry of New and Renewable Energy plans to increase the contribution of Renewable Energy in the total energy mix of the country to 6 per cent by 2022, with about 10 per cent contribution to the total electricity mix (Government of India, 2011). The budget for 2014/15, which was presented to Parliament in July 2014, (Government of India, 2014b) shows some efforts towards New and Renewable Energy, such as allocations of EUR 62.7 million for so-called "Ultra Mega Solar Power" projects in Rajasthan, Gujarat, Tamil Nadu, Andhra Pradesh and Laddakh, EUR 50.2 million for a scheme for solar power driven agricultural pump sets and water pumping stations as well as EUR 12.5 million for the development of 1 MW solar parks on the banks of canals.

To increase energy efficiency and cut down on coal, in 2010, the Government of India announced a levy on both domestically produced and imported coal, at the rate of INR 50 (EUR 0.64) per tonne. Its earnings, expected to be around EUR 390 million for the financial year 2010–2011, were meant to go into a National Clean Energy Fund. However, as recently revealed, just over 1 % of the amount has been allocated to clean energy projects over the past three years (Jai & Patil, 2014). Although the coal levy was doubled recently, it is still rather low, e.g. compared to the budget for fuel subsidies. The 2013- 2014 budget for petroleum product subsidies has been cut by more than 32%, but compared to the previous year, it still amounts to approximately EUR 9.5 billion (OECD & IEA, 2013a).

5.4.4 Mitigation Costs - Call for International Support

In April 2014, the "Expert Group on Low Carbon Strategies for Inclusive Growth", set up by the Planning Commission in 2010, delivered its final report. It spells out two scenarios: BIG (Baseline, Inclusive Growth) and the LCIG (Low Carbon, Inclusive Growth). According to the report, the pursuit of Low Carbon Strategies would bring down the average GDP growth rate by 0.15 percentage points (to around 6.9 % to 7 % (BIG)), while per capita CO_2 emissions (in 2030) would fall from 3.6 tonnes per person in the BIG scenario to 2.6 tonnes per person in the LCIG scenario. However, the report emphasises that in both scenarios the total carbon emissions would continue to rise to the year 2030. Moreover, the cumulative costs of low carbon strategies have been estimated to be around 834 billion US dollars at 2011 prices over the two decades between 2011 and 2030. That is why the report concludes that "International help, in both finance and technology, would therefore be critical to support India's pursuit of Low Carbon Strategies" (Government of India, 2014e).

The results of the expert group are largely consistent with the calculation on mitigation potential done for this project. Emissions in the BIG scenario (3.6 tons per capita) are slightly higher than baseline emissions in the ClimStrat model (3.4 tons per capita). The implementation of a target consistent with a reduction of 1 ton per capita under the baseline in the ClimStrat model results in abatement costs of EUR 26 billion in the year 2030. Those costs are in the same order of magnitude as costs in the LCIG scenario, that amount to EUR 29 billion per year when spread out equally over the 20 year period. Further, in ClimStrat as well as the LCIG scenario India's total emissions are projected to further increase even at relatively high carbon prices.

5.4.5 A new Prime Minister - A New Climate Policy?

India was counted among the group of "critical countries elections" with high importance for the 2015 climate agreement, as its domestic elections in May 2014 provided an opportunity to shape the national interest debate on climate change (Gallagher, 2013). Although, compared to national issues, climate change only played a marginal role during the election campaign, both the Congress Party and the BJP mentioned the topic in their manifestos. The BJP acknowledged the challenges of climate change and notes to "take Climate Change mitigation initiatives with all seriousness and work with the global community and institutions in this regard" (Bharatiya Janata Party, 2014). Despite this "fairly significant mention" (da Costa, 2014) of climate change, no quantified targets are given that would allow estimating the impact of the new Government's programme in terms of emission reductions.

Following the success of the BJP, Narendra Modi was appointed as the new prime minister and head of government on 26 May 2014. As the chief minister in the Indian state of Gujarat, he had acquired a reputation as a climate change leader, though some ascribe this to his support for big business and the acquiescence of a friendly press (E. King, 2014a). During his term in office, the state Gujarat became India's frontrunner in solar energy and established a separate Department for Climate Change. Opinions of whether this success can be replicated in the whole of India are divided, though. The current conservative government started with some climate-friendly tendencies, e.g. it changed the name of the ministry from 'Environment and Forests' to 'Environment, Forests and Climate Change'. Moreover, Prakash Javadekar, a former president of an environmental civil society organisation (GLOBE India), was announced as the minister of state (Yeo, 2014a).

A few months after the new government took office, concerns about India's domestic climate policy are increasing, questioning whether there was much substance behind the first visible changes and announcements (E. King, 2014a). The government is considered to be standing at a crossroads between a development approach based on zero emission clean energy and another one based on coal (Naidoo, 2014). Current activities, such as simplifying land clearances for coal mining as well as the lack of environmental monitoring and compliance mechanisms, indicate the direction the government tends to choose (ibid.).

5.5 Historical and Current International Climate Policy Positions

India's position in international climate policy is said to be dual, since on the one hand it is a "poor and developing economy with low levels of historical and per capita emissions" and on the other hand a "large and rapidly growing economy with rising emissions" (Dubash, 2012). Historically, India's international climate policy position developed around the first perspective, claiming the right to develop and calling upon industrialised nations to meet their historical obligations (ibid.).

In the early years of the UNFCCC process India was a strong actor in the climate negotiations and an important voice in the G77, allying with AOSIS and the EU in the negotiations on the Kyoto Protocol to push for ambitious agreements (so called Green Group). Based on its equity perspective, India has always been strict on a clear division of responsibilities between industrialised and developing countries. Consequently, India has argued against binding, quantitative emission mitigation commitments for developing countries. However, with growing emissions – India today is the world's third largest emitter – pressure on India has increased to contribute to mitigation.

5.5.1 From a "G77" Copenhagen - to a "Like Minded" Durban

Under the Copenhagen Accord, the Government of India pledged to reduce the emissions intensity of its GDP by 20-25% by 2020 in comparison to the 2005 level (Government of India, 2010a). This pledge, however, is considered unambitious, as it could be achieved with India's current development pathway (Stigson, Buhr, & Roth, 2013b). Regarding the key drivers for India's pledge, national as well as international circumstances have been identified: Nationally, India was driven by competitiveness and energy security reasons, while internationally, pressure on emerging economies and the intensity based target of China might have been pivotal (ibid.). Moreover, with help of this voluntary pledge, India was putting more pressure on industrialised countries to set more ambitious targets.

In 2011 in Durban, India strongly opposed that a new treaty should include all countries in a legally binding agreement. The strong socio-economic differences among the G-77 have become more and more apparent and consequently the group is losing its coherence in the climate negotiations. India is currently part of the "Like-minded developing countries" group and has increasingly taken a defensive position, using equity "as a shield, not a sword" thus demanding ambitious, economy-wide emission reduction targets from others (developed countries) but not constructively exploring options to reach a new, ambitious agreement (D'Monte, 2014b).

5.5.2 A Call for Equity – Without Operationalisation

Historically, India has been one of the strongest voices making a stance for equity in the UNFCCC negotiations. It has repeatedly stressed that cumulative historic emissions should be considered, when discussing equity principles. Consequently, India has been calling for international climate finance and has made this support a condition for increasing its own mitigation activities.

The common but differentiated responsibilities (CBDR) approach is reflected in its submissions to the UNFCCC as well as in its national policy documents, insisting on India's right to economic development and growth. In its 12th Five-Year-Plan, the Government of India stressed that a global compact "is possible only if there is a fair distribution of the burden". [Since] "[...] it is the industrialised countries that have historically contributed the bulk of the accumulated stock of GHG, and are also the most able to pay, they must bear burden of global mitigation and adjustment" (Government of India, 2013b). This position is reiterated in both domestic documents (e.g. India's Economic Survey, published in July 2014 (Government of India, 2014a)) as well as in international arenas like in the joint statement issued at the 18th BASIC Ministerial Meeting on Climate Change in August 2014 (Government of India, 2014d).

It is interesting to note that India has actively rejected the Africa Group's proposal for an 'Equity Reference Framework'. The intention of such a framework would be to set guidelines how to share the global effort based on historical responsibilities, development needs and current capabilities. Given India's low per capita emissions, such a framework would most likely be rather favourable for India.

However, it would require transparency and multilateral assessments of national contributions – something India has so far not been willing to commit to. Recently, this strategy is being challenged by Indian analysts though: "India's rejection of an assessment process sacrifices an opportunity to operationalise equity and risks allowing developed countries off the hook" (Dubash & Rajamani, 2014).

5.5.3 Contributions Conditional on Support

India has repeatedly made it clear that stronger efforts by India would require international financial support and technology transfer as emphasised e.g. in the Submission of India on Long Term Finance (Government of India, 2013a) and in the first National Action Plan on Climate Change (NAPCC) in 2008: "The success of our national efforts would be significantly enhanced provided the developed countries affirm their responsibility for accumulated green-house gas emissions and fulfil their commitments under the UNFCCC, to transfer new and additional financial resources and climate friendly technologies to support both adaptation and mitigation in developing countries" (Government of India, 2008).

This position was reiterated by Prakash Javadekar, Environment, Forests and Climate Change minister at the Ban-Ki Moon Climate Summit in September 2014, where Javadekar said, "It is self-evident that developing countries can do more if finance and technology support and capacity building is ensured" (Gupta, 2014).

An interesting example of how industrialised countries have dealt with this issue came up in bilateral talks with French, UK and US delegations on climate change hosted by Prakash Javadekar. The US delegation proposed to link pacts on the power sector to climate change agreements, while "one would not happen without the other" (Sethi, 2014a). Thus the US links the offer of development aid to India's position in the climate negotiations.

5.5.4 Very Modest Domestic Critique

India has quite a few internationally acknowledged experts on climate change in research and civil society. In the past, they have been very loyal to the government's position and have fully supported the equity principle in terms of iterating the division between Annex I and Non-Annex I countries and declining any commitments on GHG emission targets. Recently, the Indian government has been criticised for its rather passive position in the climate negotiations. Some ask for India to "put forward ambitious plans on climate actions" (Mandal, 2014). However, the critiques generally stress that India should make a strong point on equity (e.g. CAN International, 2014; Dubash & Rajamani, 2014). Former environment minister Jairam Ramesh recently asked India to give up its "ostrich-like" position in the climate negotiations, but was linking this to a call for a stronger stance towards equity implying that India should not abandon cumulative historic emissions as key equity principle (D'Monte, 2014a). In summary, internal critique of India's position in the negotiation hardly calls for stronger mitigation actions.

5.6 Conclusions

5.6.1 Background and Positions

India is a large GHG emitter in absolute terms – but with low per capita emissions. Despite its powerful industry base and highly capable middle class, India has a high share of very poor inhabitants lacking basic infrastructure like energy supply. Thus, economically and with view to its GHG emission profile India is distinctively different from China. This has just recently been acknowledged by the EU's climate commissioner Connie Hedegaard, when she stated that India "had to be part" of a new agreement, not necessarily agreeing to reducing greenhouse gas emissions but maybe by enhancing energy efficiency or promoting renewable energy (E. King, 2014b).

India's total emissions are growing dramatically. Assuming that the country implemented all current and planned measures (but no more), GHG emissions in 2030 would amount to 5 Gt CO_2-eq., which is a growth by factor five compared to 1990. Although emissions per GDP have decreased over time, there is an increase of emissions per capita, which would surpass 4 tCO_2-eq./a in 2030. This would suffice to

meet the upper end of the range of effort sharing proposals considered in this study. To stay within the limits suggested by the median of the fair share allocations, India would need to implement mitigation actions with average abatement costs below 100 €/tCO_2-eq. both in 2020 and 2030.

In the international climate negotiations, India has stressed the issue of equity and has consequently objected to major mitigation commitments for Non-Annex I countries. Under the influence of other BASIC countries putting pledges on the table, India has been pressured to pledge an emission intensity target for 2020. In the negotiations, India has underscored that reliable and sizeable climate finance must be made available by industrialised countries, in particular through the Green Climate Fund (GCF).

Domestically, climate change is slowly changing from a non-issue to something that is at least verbally addressed (as witnessed in the renaming of the Ministry). However, domestic climate policies and politics in India are influenced by the aim of enhancing development and reducing poverty, while being confronted with the consequences of climate change. Sometimes mitigation can be a co-benefit, e.g. in rural electrification and basic energy supply with renewables. In national climate action plans like the NAPCCC, there is no clear attribution of the level of mitigation to be achieved, following the reasoning that these plans are development strategies with climate as a co-benefit.

The new Prime Minister, Narendra Modi, has been supporting renewables and climate policy at the state level in the past. However, it is unclear yet how strong his support for mitigation efforts will be in his new position. The fact that he did not attend the Ban Ki Moon Climate Summit does not support a vision of strong engagement. However, many other countries, including Germany, have not been present with their heads of state or government either.

5.6.2 Expectations

India's position in the run-up to a 2015 agreement will strongly depend on the overall position of China and China's role in the Like-Minded developing country group. A strong contribution by China could increase the pressure on India to follow up. This holds true also for the type of contribution that India may be willing to commit to.

However, in any case India will most likely insist on strong climate finance contributions of industrialised countries, in particular with regard to the GCF. A pledge conditional on support is generally something which would be in line with India's negotiation strategy. In this respect, one option to gain India's support would be to address issues in the GCF, which India is explicitly interested in, like rural energy access with renewables.

Recently, there have been very little signs that India may take up a proactive and ambitious role in the UNFCCC negotiations. It has even objected to approaches to operationalise the concept of equity, as e.g. pursued by African countries. This is somewhat surprising as India, with its low per capita emissions, would be in a good negotiating position. A game changer to India's position in the UNFCCC negotiations would be if it actively pursued an operationalisation of the equity principle. By doing so, India could heavily increase the pressure on industrialised countries to commit to substantial mitigation efforts and climate finance. In the past India has committed to keep its per capita emissions below the OECD average – which in the current situation can almost be considered a non-pledge. If India committed to an ambitious per capita cap, it could take up a negotiation position which could bring a new dynamic into the UNFCCC process.

6. Japan

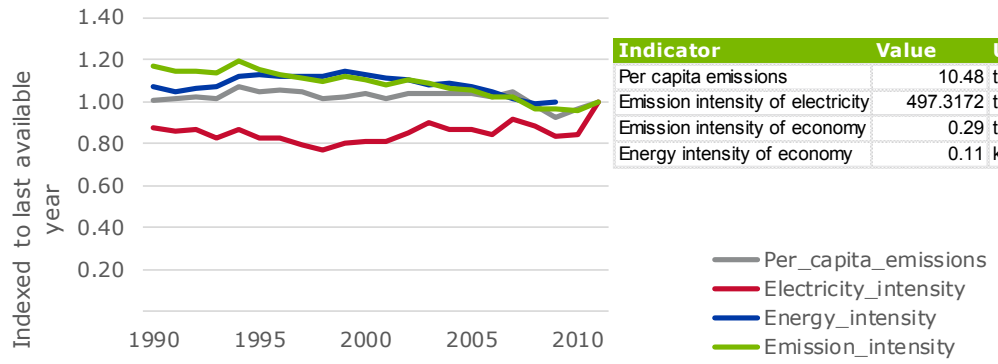
6.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	127.817	mln cap	2011
GDP	4.6E+12	US$ (2005)	2011
Air pollution index	21	ug/m3, mear	2010

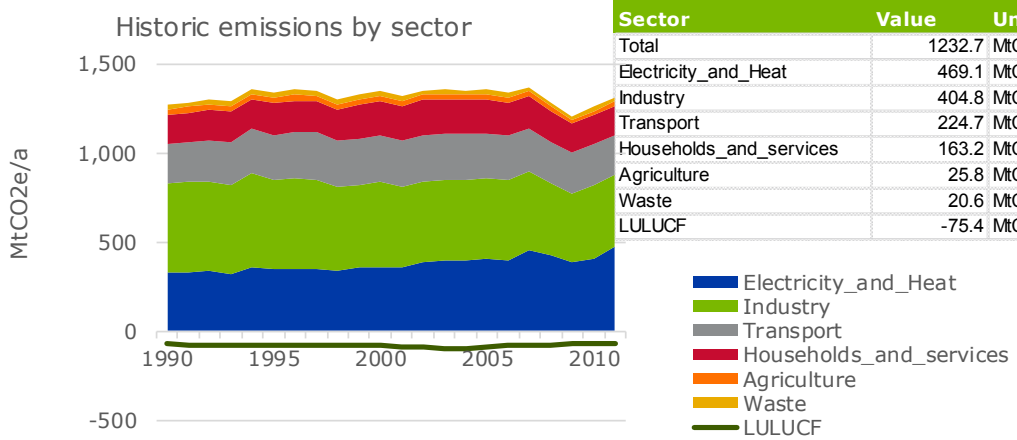
Indicator	Value	Unit	Year
Vulnerability	0.29	-	2011
HDI	0.89	-	2011
Electrification rate	100	%	2005

Past trends of decarbonisation indicators



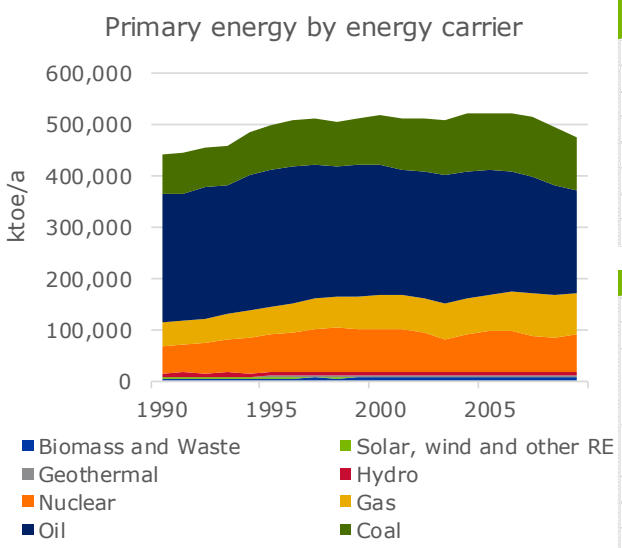
Indicator	Value	Unit	Year
Per capita emissions	10.48	tCO2e/ cap	2011
Emission intensity of electricity	497.3172	tCO2/kWh	2011
Emission intensity of economy	0.29	tCO2e/ USD	2011
Energy intensity of economy	0.11	ktoe/ million	2009

National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	1232.7	MtCO2e/a	100%
Electricity_and_Heat	469.1	MtCO2e/a	38%
Industry	404.8	MtCO2e/a	33%
Transport	224.7	MtCO2e/a	18%
Households_and_services	163.2	MtCO2e/a	13%
Agriculture	25.8	MtCO2e/a	2%
Waste	20.6	MtCO2e/a	2%
LULUCF	-75.4	MtCO2e/a	-6%

Energy mix



Fuel	Value	Unit	Share in 2009
Biomass_w aste	6002.094	ktoe	1%
Solar_w ind_other	1246	ktoe	0%
Geothermal	2481	ktoe	1%
Hydro	7155	ktoe	2%
Nuclear	26520	ktoe	6%
Gas	99952	ktoe	22%
Oil	206297	ktoe	45%
Coal	107420	ktoe	24%

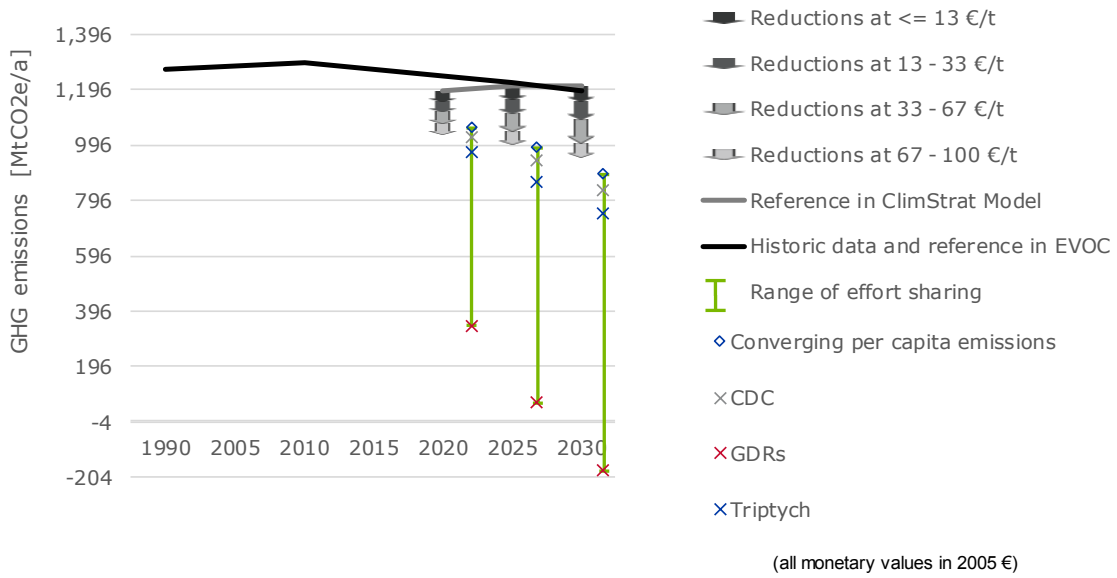
Indicator	Value	Unit	Year
Share of global emissions	2.8	%	2010
Domestic fossil fuel production	3,873	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	7	%	2011
Economic relevance of fossil fuel imports	6.3	% of GDP	2011
Fossil fuel subsidies	n.a.	Billion USD	n.a.
Fuel import dependence	89	% of imports	2011
Fuel import bill	274.35	Billion USD	2011

6.2 Mitigation Potential and Effort Sharing Allocations

The calculations made for this study yield strongly varying results for the different effort sharing proposals for Japan, both regarding emission reductions and related costs. According to these calculations, Japan's emissions would have to be between 17% to 73% below 1990 levels in 2020 and between 30% and 115% below 1990 levels in 2030. The median of the proposals considered in this study lies at 22% below 1990 levels in 2020, 29% below 1990 levels in 2025, and 38% below 1990 levels in 2030.

The GDRs proposal would require significantly more emission reductions from Japan than the other effort sharing approaches. According to GDRs, Japanese emissions would have to be negative in 2030. The least efforts in Japan would be required by the CPE. For further details, see Table 16 and the text below.

Figure 17: Results of Effort Sharing Calculations and Mitigation Costs for Japan



Most of these targets could only be achieved at very high marginal costs above 100 €/t CO_2-eq. The marginal costs of achieving the median of the reduction target range from about 100 €/t CO_2-eq. for 2020 to about 200 €/t CO_2-eq. for 2030. While even the least ambitious of the effort sharing proposals regarding Japanese future emissions, the CPE, would entail marginal abatement costs of between about 80 and 150 €/t CO_2-eq., reaching the GDRs' target, the strictest of the four proposals, would involve marginal abatement costs above 500 €/t CO_2-eq. While some of the emission reductions envisaged by the effort sharing proposals could be reached at very low or even negative costs, others are very expensive. This leads to moderate average costs of achieving the targets of between 35 €/t CO_2-eq. and 75 €/t CO_2-eq. for the CPE, but to overall very high average costs of between about 450 €/t CO_2-eq. to about 600 €/t CO_2-eq. for the GDRs.

As noted above, these calculations are based on the assumption of purely domestic efforts. With the use of international emissions trading, these costs would tend to be lower.

Table 16: Results of Effort Sharing Calculations for Japan

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	1.056	985	888	-17%	-22%	-30%	-19%	-24%	-32%
CDC	1.020	935	830	-20%	-26%	-35%	-21%	-28%	-36%
GDRs	340	62	-185	-73%	-95%	-115%	-74%	-95%	-114%
Triptych	970	861	745	-24%	-32%	-41%	-25%	-34%	-43%
Median	995	898	788	-22%	-29%	-38%	-23%	-31%	-39%

6.3 Political System

According to the Japanese Constitution of 1947, Japan is a constitutional monarchy with a parliamentary government. The Emperor of Japan only exercises a ceremonial role and symbolically represents Japan's head of state. He appoints the Prime Minister as directed by the National Diet, the Japanese Parliament. The Prime Minister is head of government and head of cabinet, Japan's executive branch, which consists of the Ministers of State appointed by the Prime Minister. The Prime Minister is required to command the parliamentary majority (CIA (Central Intelligence Agency), 2014a; Climate Policy Watcher, n.d.-b; Government of Japan, 2013a).

Japan has a bicameral parliament with the National Diet consisting of the House of Representatives (lower house) and the House of Councillors (upper house). While members of the House of Representatives are elected by popular vote for a term of office limited to four years, the term of office in the House of Councillors lasts for six years. The National Diet is the only power in Japan that is responsible for passing laws. Most of the times, draft bills originate in government agencies and are presented to the Diet by the Cabinet. Both houses of the Diet have to approve a bill in order for it to become law (CIA (Central Intelligence Agency), 2014a; Government of Japan, 2013a; Townshend et al., 2013).

The political landscape in Japan is dominated by the Liberal Democratic Party (LDP), which has been in power almost continuously since 1955. Since 1996, the LDP's reign has only been interrupted once by three years under the Democratic Party of Japan (DPJ). After Prime Minister Junichirō Koizumi's (LDP) third and last term in office ended in 2006, governments kept on changing on a yearly basis until 2012: Three Prime Ministers from the LDP (Shinzō Abe, Yasuo Fukuda and Tarō Asō) were followed by three Prime Ministers from the DPJ (Yukio Hatoyama, Naoto Kan and Yoshihiko Noda) until current and former Prime Minister Shinzō Abe regained power in 2012. As of September 2014, the LDP held 61%, the DPJ 11% of the seats in the House of Representatives while the LDP held 47% and the DPJ 24% of the seats in the House of Councillors (Government of Japan: House of Councillors, 2014; Government of Japan: The House of Representatives, 2014). The high frequency of changes in the government is quite common in Japan. The changes in government have a particularly strong impact on politics and policies when they lead to another political party in power (see 2.4).

Regarding politics, climate policy in Japan is to a great extent determined, on the one hand, by the relationship between the ministries most involved in climate policy (see Table 17) and, on the other hand, by the balance of power in the political landscape. Though there have been six different Prime Ministers in Japan since 2007, the ministries' positions regarding climate change have not changed significantly in the last couple of years. Their relationship to one another and the policy-making process on climate change have, however, been altered repeatedly with substantial consequences for the ministries' relative strength and the importance given to climate change action in the government (Government of Japan, 2013a; Kachi, Tänzler, & Sterk, 2014; Rudolph & Park, 2010)(Government of Japan, 2013a; Kachi et al., 2014; Rudolph & Park, 2010).

Table 17: The Most Important Bodies regarding Climate Policy in Japan

	Responsibilities	Positions
Ministry of the Environment (MoE)	Climate policy	Strong ties to academia and NGOs
Ministry of Economy, Trade and Industry (METI)	Energy policy	Strong ties to industry and the Japan Business Federation Keidanren; emphasis on environmental and economic compatibility of measures
Ministry of Foreign Affairs (MoFA)	Determination of Japan's position in international climate negotiations	Coordination and consolidation of the ministries' positions
Global Warming Headquarters	Evaluation of the policies and measures relevant for climate change	

6.4 Historical and Current Domestic Climate Policy and Politics

Japan is among the countries in the world which have only negligible mineral resources (CIA 2014a). This fact has had severe impacts on Japan's politics and history since the start of industrialisation. Today, Japan covers about 84% of its primary energy needs with imports (World Nuclear Association, 2014) and depended on imported fossil fuels for 88% of its electricity in 2013, due to the temporary shutdown of all nuclear plants after the Fukushima accident (World Nuclear News, 2014). To reduce dependencies and achieve a higher level of self-reliance, storage of imported energy resources and the reduction of energy use are pivotal. The same accounts for the diversification of exporting countries and fuels.

6.4.1 Early Energy Policies

Japan introduced its first law on energy efficiency as early as 1979 (Law Concerning the Rational Use of Energy) after oil supply suffered insecurity due to the two oil crises. Still today, this law represents the pillar of Japanese energy conservation policy. It was last revised in 2008 to be enforced wholly by 2010. Also, Japan started focusing on nuclear energy after the first oil crisis in 1973. Close relationships between the industry, politicians and bureaucrats – particularly at the Japanese Ministry of Economy, Trade and Industry (METI[24]) – have paved the way for the nuclear power sector's growth over the years and preserved its importance. The sector's growth in turn has led to path dependencies which make a switch to other energy sources significantly more difficult (Nachmany et al., 2014; Townshend et al., 2013; Willacy, 2011).

6.4.2 Actions Relating to the Kyoto Protocol

Japan started acting on climate change relatively early. The Action Program to Arrest Global Warming dates from 1990. After the Kyoto Protocol had been adopted in 1997, Japan established a legal framework for climate change policy by introducing the Guidelines for Measures to Prevent Global Warming as well as the Law Concerning the Promotion of the Measures to Cope with Global Warming (Act on Promotion of Global Warming Countermeasures, amended in 2002). Japan ratified the Kyoto Protocol in 2002 and quickly became active regarding its implementation, especially with measures regarding energy efficiency and industrial innovation, in order to reach its Kyoto target of emission reductions of 6% compared to 1990 levels between 2008 and 2012. When the Kyoto Protocol became effective in 2005, Japan adopted the Kyoto Protocol Target Achievement Plan that defined quantitative sectoral targets as well as the policies and measures that were to make Japan reach its Kyoto target. The plan underwent a complete revision in 2008. The same year, Prime Minister Yasuo Fukuda (LDP) declared

[24] Up to 2001 the Ministry of International Trade and Industry (MITI)

that Japan would reduce its emissions by 60 to 80% of 2008 emissions by 2050. This target was complemented by the mid-term goal of an emissions reduction of 15% from 2005 levels by 2020 by his successor Tarō Asō (LDP), which translates into 8% compared to 1990. To reach this emission reduction target, the LDP aimed to rely to a great extent on win-win-measures which are beneficial for both the environment and industry, such as measures on energy efficiency and other industrial standards as well as on international offsetting, while it refused to introduce measures that would be painful for parts of the economy. Battles behind the scenes concerning less lenient measures between 2002 and 2009, such as those on the introduction of a carbon tax in 2004 and 2005 and of daylight savings in 2005, were won by METI and rejected. In 2007, Japan's total emissions still exceeded its Kyoto target by 15% with emissions at 9% above 1990 levels (Climate Policy Watcher, n.d.-b; Government of Japan, 2013a; Kachi et al., 2014; Tiberghien, 2010; Townshend et al., 2013).

6.4.3 Re-Surge of Environmental Policy

In September 2009, the DPJ replaced the LDP – who had been in government since 1994 and led the government since 1996 – after having won a landslide victory in the general elections. Under the LDP, environmental policy had to a large extent been determined by close relationships between politicians, bureaucracy and the industry. The national discourse regarding climate change had usually focused on the high costs of climate action rather than its benefits and high costs or taxes were hard to communicate to the public. The DPJ started leading Japan into a different direction. Non-governmental organizations (NGOs) had built up relationships with individual politicians and bureaucrats – especially at the Ministry of Environment (MOE) – and contributed to the DPJ's stance significantly. When the DPJ came into power, it embraced ambitious emission reduction targets. However, the DPJ's plans were not generally green. Thus, in its election campaign, it promised to scrap road tolls on expressways. In 2010, heated debates regarding this promise arose within the DPJ between opponents and advocates of this promise's implementation. Arguments centred on the necessity to keep campaign promises versus the high costs of this measure rather than on environmental issues. In the end, most tolls were kept to reduce the fiscal pressure Japan was facing (Tiberghien, 2010; Wakefield, 2010).

6.4.4 Copenhagen Pledge

At COP 15 in Copenhagen, the new Prime Minister Yukio Hatoyama (DPJ) pledged USD 15 billion of climate finance by 2012 as well as quantified economy-wide emission reductions of 25% from 1990 levels by 2020 under the condition of ambitious targets by all major economies (see 0 for details) despite strong opposition from the industry, bureaucrats and a number of think tanks. The envisaged emission reductions were to a great extent to be achieved with nuclear power, which had been a priority of Japan's energy strategy since the first oil crisis in 1973 (see above). Correspondingly, Japan's Strategic Energy Plan of 2010 included the construction of nine new or additional nuclear plants by 2020 and more than 14 by 2030. The extension of nuclear power was to support the Strategic Energy Plan's goal to increase zero-emission power from 34% in 2010 to about 70% in 2030. Further targets centred on, inter alia, Japan's energy self-sufficiency ratio in energy supply and self-developed fossil fuel supply as well as on energy efficiency (Climate Policy Watcher, n.d.-b; Kachi et al., 2014; Ministry of Economy Trade and Industry (METI), 2010; World Nuclear Association, 2014).

In 2010, an attempt was made to make Japan's Copenhagen Pledge legally binding. A new bill of the Act on Promotion of Global Warming Countermeasures was discussed in the National Diet, which not only included Japan's conditional Copenhagen Pledge but also extended it by adding an emissions reduction target of 80% below 1990 levels by 2050. Furthermore, it envisaged a national cap-and-trade scheme, a green tax scheme as well as a full-fledged feed-in tariff for renewables. These were to supply 10% of Japan's primary energy by 2020. On top of that, the bill required other legislation to be compatible with short- and long-term climate goals. There was, however, substantial opposition from several business groups, bureaucrats and a number of think tanks to this bill as they were concerned about the effects it could have on the economy. The bill was passed by the Cabinet and then by the House of Representatives in March and May 2010, respectively, but the House of Councillors stalled it, inter alia, because DPJ rule lacked a stable leadership. Prime Minister Hatoyama (DPJ) resigned in June and was

succeeded by Naoto Kan. At the House of Councillors election in July, the DPJ lost its majority. The bill was amended and approved by the Cabinet again in autumn. The House of Councillors, however, still rejected the bill and it was abandoned after the House of Representatives was dissolved in November 2012 (Kachi et al., 2014; Kuramochi, 2014; Nachmany et al., 2014; Townshend et al., 2013).

6.4.5 Great East Japan Earthquake

In March 2011, the Great East Japan Earthquake hit, followed by the devastating accident at the Fukushima Daiichi Nuclear Power Station. Subsequently, all nuclear power plants in Japan were shut down gradually until the last one (Tomari 3) went offline for maintenance in May 2012. In July 2012, however, the first two nuclear power plants (Ohi Unit 3 and Ohi Unit 4) were restarted. At the end of fiscal year 2012, 50 nuclear power stations were nominally in operation with a total generation capacity of 46,148 MW. However, in practice only Ohi Units 3 and 4 generated electricity. Thus, in 2012, 15,939 GWh was generated with nuclear power plants, opposed to 288,230 GWh in 2010, the year before the nuclear accident at Fukushima (2011: 101,761 GWh) (Federation of Electric Power Companies of Japan (FEPC), 2014; Japan Nuclear Energy Safety Organization, 2014). Similarly, in 2013, nuclear power accounted for 1.72% of Japan's total electricity production with a total of 13,947 GWh (International Atomic Energy Agency, 2014). Further nuclear power plants are expected to be rebooted starting early in 2015 (Wang & Tsukimori, 2014).

In the aftermath of the nuclear accident public as well as political support for nuclear power declined substantially. Heated debates centred around nuclear safety and Japan's dependency on nuclear power. The government entrusted the newly created Energy and Environment Council with the task to completely revise Japan's national energy and climate strategy. In October 2011, a White Paper from the Japanese government suggested that Japan would reduce its dependency on nuclear energy as much as possible in the medium to long term. This decision was reaffirmed and detailed in the Energy and Environment Council's Innovative Strategy for Energy and the Environment in September 2012. The Innovative Strategy envisaged a nuclear phase-out by the end of the 2030s combined with the targets to reduce power demand by 20% compared to the 2010 Basic Energy Plan and to reach a share of 30% of power from renewable energy and 15% combined heat and power (CHP). Furthermore, it included a GHG mitigation target of 5 to 9% in 2020 and of about 20% in 2030 compared to 1990. The Innovative Strategy, however, never became legally binding and was later overturned by the LDP after it had regained power in 2012 (Government of Japan: The Energy and Environment Council, 2012; Kuramochi, 2013, 2014; Townshend et al., 2013; World Nuclear Association, 2014).

To enable Japan to meet its mitigation commitments, several measures were introduced in areas which had previously not been the focus of Japan's mitigation strategy, e.g. commercial and residential buildings and renewable energy. Looking for greater supply of energy from renewable energy sources, Japan's National Diet approved the introduction of a full-fledged feed-in tariff for renewable energy to start in July 2012 (Act on Purchase of Renewable Energy Sourced Electricity by Electric Utilities) after a deal was made by unpopular Prime Minister Naoto Kan to resign after several pieces of legislation – inter alia, the feed-in-tariff – had been passed by the parliament. Furthermore, in 2012, the Cabinet included an emission reduction target of 80% by 2050 in Japan's Fourth Basic Environment Plan, developed the Global Warming Action Plan for the coming years and introduced the Global Warming Tax as increase of the existing fossil fuel tax (Government of Japan, 2013a; Harlan, 2013; Herold et al., 2013; Kuramochi, 2014; Townshend et al., 2013).

6.4.6 Shift to Financial and Economic Recovery

After the LDP regained power in the general elections of December 2012, its new administration quickly made plans to abandon the Innovative Strategy. The new and former Prime Minister Shinzō Abe (2006-2007, 2012-) has made the revitalization of Japan's economy after the financial and economic crises his top priority and ordered a review of Japan's emission reduction target in his first month in office. At COP 19 in Warsaw in November 2013, Japan declared a revised emission reduction target for the year 2020 of 3.8% from 2005 levels "for the time being" (Government of Japan, 2013a).

This target does not account for emission reductions that may result from the future use of nuclear power but includes forest sequestration as well as offsetting. Japan's revised emission reduction target translates into an increase of emissions of 3.1% instead of emission reductions of 25% (Copenhagen Pledge) in 2020 compared to 1990 levels. According to the Climate Action Tracker, this changed level of ambition can only be partially justified with the shutdown of nuclear plants in Japan after Fukushima but can also be traced back to a lack of political will. Even a total replacement of the nuclear power projected for 2020 by coal would only cut Japan's Copenhagen pledge in half. If replaced by oil, gas or renewables, the share of the nuclear shutdown in the downgrading of Japan's emission reduction target would be much lower (38% with oil, 23% with gas, 0% with renewables). To reach the Warsaw Target, Japan would barely have to introduce additional measures (Government of Japan, 2013a; Jefferey et al., 2013).

6.4.7 Restart of nuclear power?

A new Strategic Energy Plan was formulated and approved by the Cabinet in April 2014. It overturns the decision to phase out nuclear power and refers to nuclear, coal and hydro power as "baseload sources". While it states that "Japan will minimize its dependency on nuclear power" (Ministry of Economy Trade and Industry (METI), 2014), it does not provide numbers on the composition of Japan's future energy mix and related emission projections yet (Ministry of Economy Trade and Industry (METI), 2014). Concerns about energy security, additional fuel costs and additional emissions are among the reasons for the nuclear restart. The Ministry of Economy, Trade and Industry's (METI) 2014 Annual Report on Energy paints a picture of the nuclear shutdown's consequences regarding these topics: While in the last full fiscal year before the nuclear disaster at Fukushima, in 2010, Japan depended on imported fossil fuels for 62% of its electricity, this figure rose to 92% in 2012 when nearly all nuclear power plants were shut down and was still at 88% in fiscal year 2013. In fiscal 2012, Japan only met 6% of its energy demand self-sufficiently (mainly with hydropower and other renewable sources). Nuclear energy is considered to be a "quasi-domestic energy source" (Japan Atomic Industrial Forum (JAIF), 2014) due to the stock available nationally. This figure had fallen after the nuclear shutdown from nearly 20% in 2010, when Japan still met 15% of its energy demand with nuclear energy. Correspondingly, Japan paid additional fuel costs of about 35 billion USD in 2013. Between fiscal 2010 and fiscal 2013, energy costs for domestic users have risen by 19% and those for industrial users by 28%, even though total electricity consumption fell by 8% between 2010 and 2012 due to energy conservation measures. While in fiscal 2010, electricity generation was responsible for 377 Mt CO_2, 483 Mt CO_2 resulted from electricity generation in 2012 (Japan Atomic Industrial Forum (JAIF), 2014; Ministry of Economy Trade and Industry (METI), 2014; World Nuclear News, 2014).

Public support for nuclear power, however, has declined substantially since Fukushima. In a recent poll, two out of three Japanese opposed a nuclear restart (Climate Policy Watcher, 2014; Yoshida, 2014). Nevertheless, parties and candidates opposing nuclear power have not been able to capitalize on this situation at the polls, inter alia, at elections in the Lower House in 2012, the Upper House in 2013 and gubernatorial elections in Tokyo in 2014. Since July 2013, Abe's LDP holds the majority in both chambers of the National Diet. This leaves Prime Minister Shinzō Abe's Cabinet confident to continue with his plans to restart Japan's nuclear power plants. Now almost two years in power, Abe has been in office almost twice as long as each of his six predecessors.

6.5 Historical and Current International Climate Policy Positions

In recent years, Japan's position in international climate change negotiations has shifted and it has downgraded its former emission reductions target substantially. The country is irrevocably connected to the Kyoto Protocol, which was adopted in its capital in 1997 and in which it committed to emission reductions of 6% compared to 1990 levels for the first commitment period (2008-2012), despite strong opposition from the USA and Japanese industry groups. There was a widespread sentiment in the country that the 6% target was too ambitious due to Japan's high energy efficiency. Japan nevertheless ratified the Protocol five years later. Further emission reductions were declared in 2009 combined with financial contributions for fast-start finance for developing countries' climate action. While

Japan was of the opinion that the commitment by developed countries to jointly mobilise USD 100 billion of climate finance by 2020 was too high, before COP 15 in Copenhagen it announced to contribute USD 9 billion of fast-start finance by 2012. Finance transfer from the public and the private sectors are included in this pledge. With this announcement, Japan hoped to incentivise increased commitments by other countries. At the COP session, Japan's financial pledge was raised by Prime Minister Yukio Hatoyama (DPJ) to USD 15 billion. Furthermore, with the aim of playing a leading role in international climate policy, Japan pledged an economy-wide emission reduction target of 25% from 1990 levels by 2020. The emissions reduction pledge was declared under the condition that "a fair and effective international framework in which all major economies participate" (The Government of Japan, 2009) was established in which those economies set ambitious targets themselves (Aburaki, 2010; Government of Japan, 2013a; Herold, Cames, & Cook, 2010; Wolfgang Sterk et al., 2010; Tiberghien, 2010).

Japan is part of a loose coalition of developed countries outside the EU. During the negotiations of the Kyoto Protocol, this coalition which until then had been called JUSCANZ (Japan, USA, Canada, Australia, New Zealand) morphed into the Umbrella Group. In line with the Umbrella Group's position, a multilateral agreement that is applicable to all major emitters – particularly to China and India – is Japan's main goal in international climate negotiations. In general, the Umbrella Group puts great emphasis on its demand that developing countries which have achieved a certain level of development should be treated equally to developed countries and take on emission reduction commitments themselves. The group argues that the economic developments inside these countries during the last 1-2 decades have made the UNFCCC's division into Annex I and non-Annex I Parties obsolete. The sensitive issue of differentiation between developing countries and developed countries is of great importance to Japan. At COP 14 in Poznan in 2008, for example, Japan suggested, on the one hand, to broaden the scope of developed countries and, on the other hand, to differentiate and graduate developing countries. Also, for the 2015 agreement in Paris, Japan has stressed its preference for equal obligations concerning the MRVability of countries' commitments as well as the need of fair and transparent MRV for Parties' contributions (Herold et al., 2013; Santarius et al., 2009; Wolfgang Sterk, Arens, Eichhorst, Mersmann, & Wang-Helmreich, 2011).

Even though the DPJ, in government since 2009, had much stronger ties to environmental NGOs than the LDP, Japan delivered a body blow to the proceedings of COP 16 in Cancún (2010) on the very first day when it announced that it would not inscribe its emissions targets for the time after 2012 into the Kyoto Protocol under any circumstances. This was followed suit by a similar announcement from Russia later in the conference. They were not prepared to go any further without the USA and the rapidly industrialising countries, especially China. Also, as noted above, Japan holds the opinion that its emission reduction target under the first commitment period of the Kyoto Protocol was unduly strict as it had already achieved high energy efficiency standards and marginal abatement costs for further emission reductions are relatively high. While these positions were not new, having them stated in such a forceful way created significant tensions in the negotiations as the continuation of the Kyoto Protocol had been a red line for developing countries (MOFA, 2010; Wolfgang Sterk et al., 2010).

Japan refused not only to participate in the Kyoto Protocol's second commitment period, but has also downgraded its previously announced emission reduction targets for 2020 substantially. At COP 19 in Warsaw in November 2013, Japan declared a tentative revised emission reduction target for the year 2020 of 3.8% from 2005 levels. This new target does not account for emission reductions from the use of nuclear power but includes forest sequestration as well as offsetting. It is significantly less ambitious than Japan's Copenhagen Pledge. The revised target's focus has shifted from domestic emissions reductions – inter alia via the increased use of nuclear power – to supporting emission reductions in other countries. One means to achieve such emission reductions is Japan's Joint Crediting Mechanism (JCM). This mechanism accounts for Japan's critique regarding the CDM and has streamlined provisions. Furthermore, nuclear power and CCS are eligible under the JCM (Government of Japan, 2013a; Herold et al., 2010, 2013; Jefferey et al., 2013; Kuramochi, 2014; Ministry of the Environment, 2013a).

The announcement of Japan's Warsaw target was accompanied by a pledge of support of USD 16 billion from 2013 to 2015 for adaptation and mitigation measures in developing countries. Thus, Japan has pledged the lion's share of both fast-start finance from 2010 to 2012 and additional climate finance until 2015. However, in contrast to other countries, loans and private flows are included in this figure. It remains to be seen how much of this money is actually additional (Jefferey et al., 2013; Ministry of the Environment, 2013b). Regarding the work of the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP), Japan reiterated its view that that 2015 agreement "should be durable by appropriately reflecting current and future evolutions of the international community" (Government of Japan, 2014b). To this end, Japan stresses that the UNFCCC's principle of common but differentiated responsibility and respective capabilities "has to be interpreted in a dynamic context" (Government of Japan, 2014b). For Japan, this means that each party should submit emissions reduction contributions to the agreement which can be compared, evaluated and reviewed. Contributions should be determined nationally. Furthermore, Japan emphasises the importance of international cooperation regarding the sharing of information and knowledge on adaptation projects, programs and policies as well as regarding low-carbon development strategies. These should be established in all countries. Last but not least, Japan suggests that countries should not be legally bound to provide finance, technology development and transfer as well as capacity-building (Government of Japan, 2013b, 2013c, 2014a, 2014b; UNFCCC (United Nations Framework Convention on Climate Change), 2012).

6.6 Conclusions

The calculations made for this study yield strongly varying results for the different effort sharing proposals for Japan, both regarding emission reductions and related costs. According to these calculations, Japan's emissions would have to be between 17 to 73% below 1990 levels in 2020 and between 30 and 115% below 1990 levels in 2030. To reach the median of the four effort sharing proposals' targets, Japan would have to reduce its emissions compared to 1990 levels by about 22% in 2020, by 29% in 2025 and by 38% in 2030. While the median of the marginal abatement costs for reaching the proposals' targets amounts to about 100 €/t CO_2e for 2020 and to about 200 €/t CO_2e for 2030, the CPE's target could be reached at about 80€/t CO_2-eq. for 2020 and about 150 €/t CO_2-eq. for 2030. The GDRs' target, the strictest of the four proposals, would involve marginal abatement costs above 500 €/t CO_2-eq. Costs in this range could be reduced significantly with international carbon trading.

After an increase in ambition regarding climate action under the reign of the DPJ, Japan reduced its emission reduction target significantly in 2013. Japan's Warsaw target is far from any of the emission reduction targets suggested in the effort sharing proposals analysed. Japan has, however, stressed that the Warsaw target is tentative. Moreover, Japan's Strategic Energy Plan of 2014 clearly states that so far, no final decision has been made regarding Japan's future energy mix. As a large share of Japan's mitigation potentials from energy efficiency is already fairly exhausted, future emissions in the energy sector depend heavily on the energy resources to be used. A large shares of renewables and/or nuclear will lead to significantly less emissions than betting on energy from fossil fuels.

However, only part of the downgrading of its emission reduction target at COP 19 in Warsaw can be attributed to the energy sector and the nuclear shutdown after the nuclear accident at Fukushima: The difference in emissions between the Copenhagen Pledge and Japan's Warsaw Target is much higher than the increase in emissions by a full replacement of nuclear power by coal by 2020 would account for. With very high domestic mitigation costs and a continuingly weak economy, short- and medium-term economic interests and the lack of political will inside the government contribute significantly to Japan's lack of ambition regarding climate action. Under Japan's current political landscape, it is unlikely that Japan will increase its 2020 target in the near future. Since the DPJ lost the last general elections as well as the last elections for the House of Representatives and the House of Councillors to the conservative LDP, the revitalization of Japan's economy has become the top priority of the government again. Japan is, however, likely to continue its strategy to support emission reductions in developing countries with its offsetting mechanisms as well as with climate finance.

7. Maldives

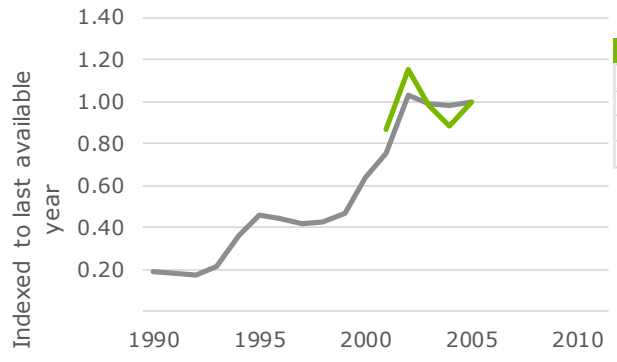
7.1. Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	0.332	mln cap	2011
GDP	1.6E+09	US$ (2005)	2011
Air pollution index	n.a.	ug/m3, mear	n.a.

Indicator	Value	Unit	Year
Vulnerability	0.40	-	2011
HDI	0.69	-	2011
Electrification rate	n.a.	%	n.a.

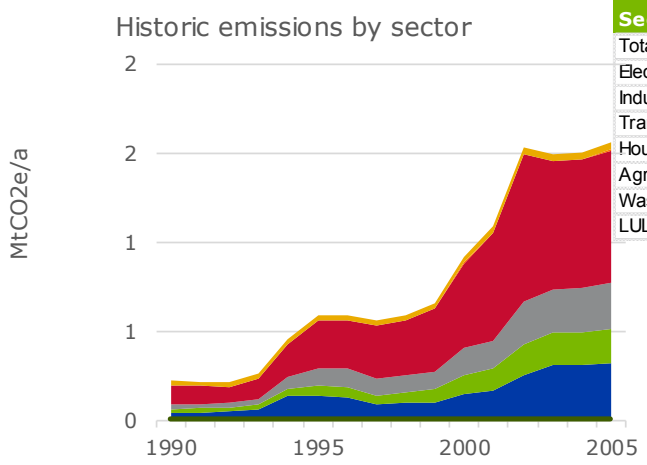
Past trends of decarbonisation indicators



Indicator	Value	Unit	Year
Per capita emissions	5.23	tCO2e/ cap	2005
Emission intensity of electricity	n.a.	tCO2/kWh	n.a.
Emission intensity of economy	1.57	tCO2e/ USD	n.a.
Energy intensity of economy	n.a.	ktoe/ million	n.a.

Per_capita_emissions
Electricity_intensity
Energy_intensity
Emission_intensity

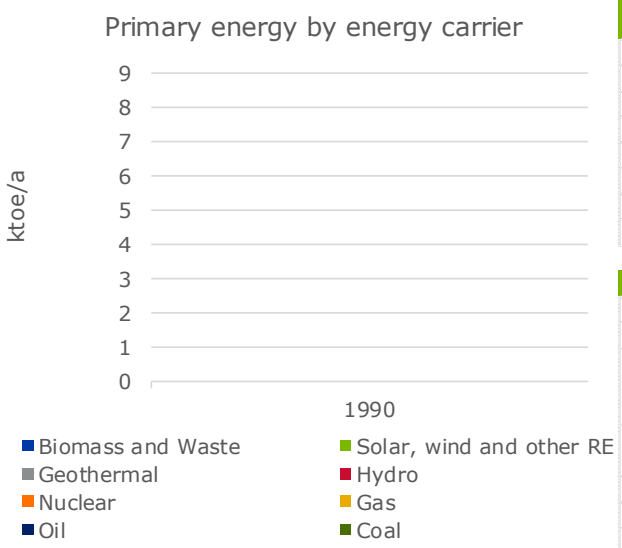
National GHG emission indicators



Sector	Value	Unit	Share in 2005
Total	1.6	MtCO2e/a	100%
Electricity_and_Heat	0.3	MtCO2e/a	20%
Industry	0.2	MtCO2e/a	12%
Transport	0.3	MtCO2e/a	16%
Households_and_services	0.7	MtCO2e/a	48%
Agriculture	0.0	MtCO2e/a	0%
Waste	0.0	MtCO2e/a	3%
LULUCF	0.0	MtCO2e/a	0%

Electricity_and_Heat
Industry
Transport
Households_and_services
Agriculture
Waste
LULUCF

Energy mix



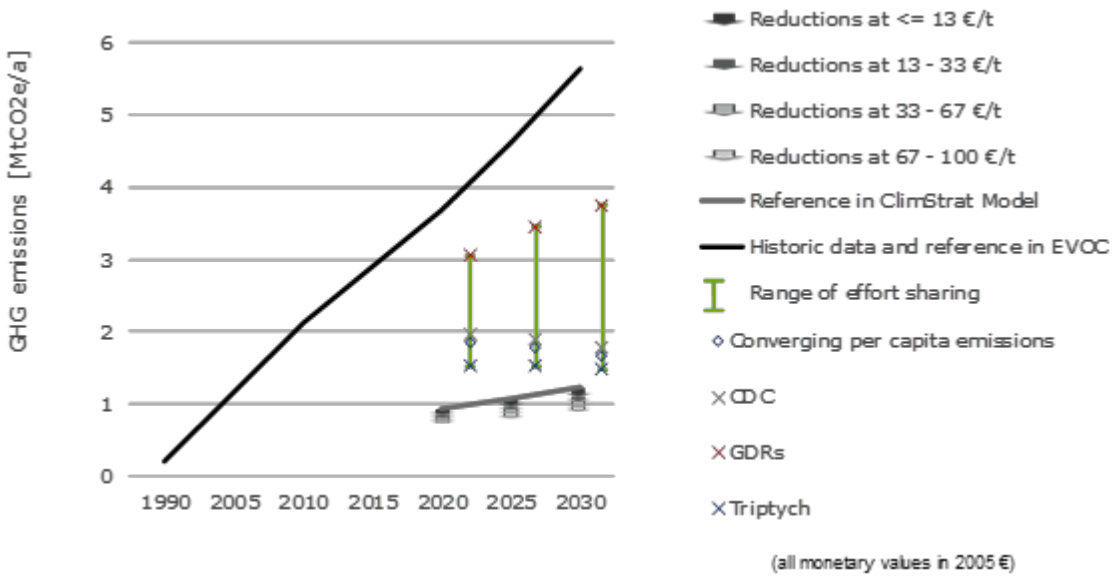
Fuel	Value	Unit	n.a.
Biomass_w aste	n.a.	ktoe	n.a.
Solar_w ind_other	n.a.	ktoe	n.a.
Geothermal	n.a.	ktoe	n.a.
Hydro	n.a.	ktoe	n.a.
Nuclear	n.a.	ktoe	n.a.
Gas	n.a.	ktoe	n.a.
Oil	n.a.	ktoe	n.a.
Coal	n.a.	ktoe	n.a.

Indicator	Value	Unit	Year
Share of global emissions	0.0	%	2010
Domestic fossil fuel production	n.a.	ktoe/a	2012
Domestic fossil fuel production (share of total energy)	n.a.	%	2012
Economic relevance of fossil fuel imports	9.8	% of GDP	2011
Fossil fuel subsidies	n.a.	Billion USD	n.a.
Fuel import dependence	n.a.	% of imports	2012
Fuel import bill	0.36	Billion USD	2011

7.2 Mitigation Potential and Effort Sharing Allocations

Emission levels achievable with available mitigation potential in the Maldives are substantially below what would be required according to all effort sharing approaches. This illustrates the need for international support for mitigation in this least developed country.

Figure 18: Results of Effort Sharing Calculations and Mitigation Costs for the Maldives



According to the EVOC model effort sharing calculations, the Maldives has a BAU which starts at historical levels of about 2 MtCO2e in 2010. The BAU scenario described by the model envisages a development where emissions are rising steeply and almost triple by 2030 compared to 2010's emission level.

This development stands in a sharp contrast to the official target of reducing emissions to achieve carbon neutrality by 2020.

The ClimStrat model, which calculates the emissions levels after implementing measures up to certain marginal abatement costs, describes a very different BAU, where emissions reach 1 MtCO2e in 2020 and remains almost stable at this level until 2030.

The effort sharing calculations for the Maldives display a quite wide range of options, where emissions are reduced by 25% below BAU in 2025 and 34% in 2030 with the GDR approach and by as much as 67% below BAU in 2025 and 74% in 2030 with the Triptych approach. The median value for all the effort sharing approaches foresees a 60% reduction of GHG emissions by 2025 and 70% by 2030.

The calculations for mitigation potential based on marginal abatement costs reveal that emission reductions up to 13 €/t CO2e would reduce emissions by 10% below the ClimStrat BAU and end up at 0.98 Mt CO2e in 2025. In 2030, these low cost emission reductions would lead to 12% reduction compared to BAU and absolute emissions of 1.1 Mt CO2e.

Increasing the amount available for abatement measures to cost up to 100€/tCO2e would reduce emissions further and lead to 25% lower emissions than BAU in 2025 and 32% lower than BAU in 2035. Total GHG emissions in Maldives after introduction of emission reduction measures up to this level would be 0.82 Mt CO2e in 2025 and 0.91 Mt CO2e in 2030.

From these calculations, it becomes evident that to achieve carbon neutrality by 2020 would be very expensive and most likely be carried out through international carbon trading. However, since the Maldives now has stopped confirming its carbon neutrality target in official documents and speeches, it is difficult to say how these results currently compares with the actual climate policy of the Maldives.

Table 18: Results of Effort Sharing Calculations for the Maldives

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	2	2	2	753%	722%	670%	-14%	-17%	-22%
CDC	2	2	2	807%	780%	727%	-9%	-11%	-17%
GDRs	3	3	4	1317%	1503%	1642%	43%	62%	76%
Triptych	2	2	1	600%	603%	580%	-29%	-29%	-31%
Median	2	2	2	780%	751%	699%	-11%	-14%	-19%

7.3 Political System

The Republic of the Maldives, often referred to as the Maldive Islands, is an island nation with 1192 islands and almost 360.000 inhabitants located in the Indian Ocean-Arabian Sea.

Since the year 1968 when the first Constitution was approved by referendum, Maldives is a presidential republic with executive, legislative and judicial branches. The President is both, Head of State and Head of Government, and since January 1, 1998, Commander-in-Chief of the Armed Forces and the Police of the Maldives. The President appoints the cabinet which is approved by the members of the People's Majlis (Parliament). The constitution was amended in the years 1970, 1972, 1975, and 1997 and again in 2008. Following the introduction of the new Constitution in 2008, direct elections for the President take place now every five years, with a limit of two terms in office for any individual

Beginning in 2003, following the death of a prisoner in custody, the country experienced several anti-government demonstrations calling for political reforms and for more freedoms. As one result, political parties were eventually allowed in June 2005. The main parties registered in Maldives are PPM (Progressive Party of Maldives) headed by Maumoon Abdul Gayyoom, MDP (Maldivian Democratic Party) headed by Mohamed Nasheed, JP (Jumhooree Party) headed by Qasim Ibrahim, MDA (Maldives Development Alliance) headed by Ahmed Shiyam, and AP (Adhaalath Party) headed by Sheikh Imran Abdulla. The first party to register was the MDP by popular opposition figure Mohamed Nasheed who was arrested more than twenty times during his predecessor rule.

In November 2008, the first multiparty presidential election took place, bringing an end to the 30-year rule of Gayoom, who his critics call an autocrat limiting freedoms and suppressing human rights. Nasheed defeated Gayoom and became the first democratic elected President of the country. During his presidency, the Nasheed government had a strong focus on climate change and energy sector reforms as well as on social, health and employment issues.

On December 23, 2011, the opposition held a rally in the capital Male in the name of protecting Islam, which they believed Nasheed's government was unable to maintain. On January 16, 2012, judge Abdulla Mohamed, the Chief Justice of the Maldives Criminal Court, was arrested on charges that he was blocking the prosecution of corruption and human rights cases against allies of former President Gayoom. After days of anti-government protests in the capital as well as on other inhabited islands, President Nasheed resigned on February 7, 2012. Nasheed told foreign media that he was deposed by a military coup led by his Vice-President Waheed, who was sworn in as President only days later. On February 23, 2012, the Commonwealth suspended the Maldives from its democracy and human rights watchdog while the ousting was being investigated, and backed Nasheed's call for elections before the end of 2012.

Presidential elections were eventually held during the year 2013: the result of the initial vote held on September 7, 2013 was annulled by the Supreme Court, and the new election was first scheduled for September 27, then cancelled with a re-run on November 9. As no candidate achieved the majority, a run-off election (delayed again by a Supreme Court decree after Abdulla Yameen, half-brother of Gayoom, claimed he needed more time to campaign) was held on November 16. Yameen was elected President with his share of the vote rising from 30% in the first round to 51% in the second round. In comparison Nasheed's share increased by only 2% between rounds.The Maldives ranks high on the

list of governments that restrict religious freedom. Islam is the official religion of the Maldives and open practice of any other religion is forbidden and liable to prosecution. Article 2 of the revised constitution says that the republic "is based on the principles of Islam." Article nine says "a non-Muslim may not become a citizen"(Republic of the Maldives, 2008).

The Maldives has advanced from 'least developed country' (LDC) to attain 'developing country' status in 2011. In 2012, the Maldives reached a per capita GDP of US$6,567, up from US$275 in 1980. This means that the country relies on support from developed countries and international institutions for developing nationally appropriate mitigation actions (NAMAs) and for implementing measuring, reporting and verification (MRV) standards and low-carbon development strategies (LCDSs).

7.4 Historical and Current Domestic Climate Policy and Politics

As one of the most low-lying countries in the world, Maldives is exceptionally vulnerable to the impacts of climate change. The height of 80% of the islands is lower than a meter. With future sea levels projected to increase in the range of 10 to 100 centimeters by the year 2100, the entire country could be submerged; therefore making adaptation and mitigation measures a key priority for the country.

In terms of contributing to climate change, the Maldives has a rather small impact on the global scale: with a small population and low per capita emissions (3.3t/y), its greenhouse gas (GHG) emissions are minimal and account for only 0.01% of global GHG emissions (mitigationpartnership.net).

Climate change is already constant reality for Maldivian communities experiencing water shortages, damage to homes and infrastructure, damage to food crops from saltwater intrusion and an increase in epidemic outbreaks of diseases such as dengue and chikungunya linked to climate-related hazards (Global Climate Alliance, n.d.). The issue is therefore high on the political agenda and quite a number of political initiatives and programmes, supported and funded by different donors for the energy as well as the climate sector have been adopted together with the Maldivian Government.

7.4.1 Environmental Action Plans

Maldives has a long tradition for National Environmental Action Plans. The first was set up in 1989 and ten years later another plan was formulated for the period 1999-2008. Finally, the 3rd National environmental plan was put in place for the period 2009-2013. The plan pointed out the importance of country resilience to environmental disasters and other climate related hazards. In particular, its aim was to introduce early warning systems and to improve public information. Country resilience is an increasing concern for Maldives. A Tsunami Indicative Programme (TIP) was launched in the aftermath of the Tsunami in 2004, in order to facilitate development and capacity reconstruction and to assist local population. In 2008, a Safe Host Island strategy was introduced, with the goal to concentrate the population in fewer islands. A national plan on Disaster Management and mitigation has also been put in place to cope with any type of emergency situations that may occur in the Maldives and to improve disaster preparedness. In addition, the Maldives is highly vulnerable to climate change impacts. Critical infrastructures are exposed to the risk of sea level rise. A major concern is the impact of global warming on groundwater availability (Department of Climate Change and Energy and Ministry of Housing Transport and Environment - Republic of Maldives, 2010). For this reason, the government is interested in taking adaptation measures such as coastal protection, protection of coral reef management and freshwater management. In particular a breakwater has been constructed around Malé, the capital.

In 1999, long-term goals for the Maldives were outlined in the Vision 2020 National Strategy, which focused on Sustainable Development from an economic, social and environmental point of view. The aim of Vision 2020 is to lead the Maldives to a more equitable society, and to be top-ranked among the middle-income countries. The strategy was implemented through National Development Plans (NDPs). The aim of the 6th National plan (2001-2005) was primarily to foster economic activity, in particular tourism and fisheries. Also, the plan sought for a wider diversification of the economy. The 7th national development plan (2006-2010) stressed the importance of a diversified economy along with new job opportunities. However, according to a paper prepared on behalf of the the European Commission

(Nill, McDonnell-Lenoach, Tag, & Kuitems, 2010), weak coordination among ministries and weak management have counteracted the successful implementation of the National Plans. This might also be a challenge for the future implementation of both the '2010 Energy Policy and Strategy' and the '2014 Maldives Climate Change Policy Framework'.

7.4.2 Climate Policies and Strategies

The most prominent announcement of the Maldivian Government was the so called Carbon Neutrality Strategy by former President Nasheed from the year 2009. This was based on the idea to change the electricity sector (in addition parts of transport and cooking) from fossil fuel based generation to RE including energy conservation and efficiency programmes. In order to achieve carbon neutrality, it considered a range of power generation technologies such as solar PV, wind, biomass, ocean energy or waste-to-energy.

To support the development and implementation of the strategy, a number of studies were published to assess the technology and financial needs of the country such as the Maldives National Strategy for Sustainable Development (Ministry of Housing Transport and the Environmnent, 2009) that devised specific targets for the energy sector (i.e. 50% of renewables in the electricity generation mix by 2015), the User Pays Framework for Island Waste Management Services under the Maldives Environmental Management Project (MEMP) or the Maldives National Energy Policy and Strategy (Ministry of Housing and the Environment, 2010). The strategy embodied the principles set out in the 'Strategic Action Plan of the Government' and provided for developing sustainability, conservation and efficiency whilst promoting low carbon technologies. Nine main policy statements are outlined, together with some action points for how to achieve the different targets:

1. Provide all citizens with access to affordable and reliable supply of electricity
2. Achieve carbon neutrality in the energy sector by year 2020
3. Promote energy conservation and energy efficiency
4. Increase national energy security
5. Promote renewable energy technologies
6. Strengthen the management capacity of the energy sector
7. Adopt an appropriate pricing policy for the energy sector
8. Ensure customer protection
9. Enhance the quality of energy services.

In addition to the studies and strategies, donor funded programmes and funds were set up such as the Japan International Cooperation Agency's Project for Clean Energy Promotion in Male to implement grid connected electricity generation through PV technology. A total of 395kWp of Solar PV systems has been installed on rooftops of 5 public buildings in Male being operational since March 2012. GIZ's Support of the Climate Neutrality Strategy of the Maldives has supported the Government, utilities and the private sector to improve conditions for the implementation of a climate neutrality strategy. In 2010, a multi-donor Climate Change Trust Fund (CCTF) was set up by the Government of Maldives, the European Union (EU), and the World Bank Group to finance adaptation and low-carbon technology initiatives in the Maldives. The EU contributed $8.8 million to the Trust Fund. Part of CCTF's resources were utilized for the Clean Energy for Climate Mitigation (CECM) project for RE and energy efficiency demonstration activities on GDh.Thinadhoo Island. 300kW$_p$ (almost one third of the maximum electricity demand on the island) solar PV grid tied system will be installed on the various public buildings. By installing this amount it is expected to produce 500 MWh annually from solar PV and will avoid approximately 270 tCO2 per annum. In addition to the CECM project, energy efficiency and conservation activities will be carried out together with additional studies on potential RE technology which could be used for electricity generation for other islands.

The most detailed and advanced programme to achieve carbon neutrality and to change the diesel based electricity generation to RE and efficiency was the Maldives Scaling up Renewable Energy Investment Plan (SREP IP) from the year 2012 under the Climate Investment Fund (CIF). SREP IP consists of its two main components ASPIRE (Accelerating Sustainable Private Investments in Renewable Energy) funded by the World Bank Group and POISED (Preparing Outer Islands for Sustainable Energy Development) funded by the Asian Development Bank (ADB). Since the economy of the Maldives is heavily reliant on imports, the SREP IP with its two components for the Male area and for the outer islands was supposed to not only reduce the high dependency on fossil fuels but also lower the countries deficit. Maldives is seeking USD 30 million SREP funding together with leveraging from other sources of a total investment of over USD 138 million to design and implement projects, and to support the transformation of the energy sector by scaling up RE in the country.

The total installed capacity of renewable energy is still marginal compared to total installed capacity. Renewable energy sources currently account for 2 MW out of a total capacity of 283 MW (Ministry of Housing and the Environment, 2010). The Maldives has set two specific targets for renewable electricity production: 50% of electricity generation from renewables by 2015 and 60% of electricity generation from solar by 2020 (International Renewable Energy Agency, 2012)

MEE's estimates show a commercial potential of 15MW (of which 11MW are in Malé) for PV with the current grid's system. The total expected costs amount to $49 million, of which SREP IP estimates to provide $27 million through private sector engagement. Solar capacity is expected to reach 1.1 MW in 2015. In addition, ASPIRE aims at developing waste-to-energy technologies in the outer islands.

Yet, decarbonisation of the electricity sector can be a difficult task. In fact, simulations from the HOMER model applied to the Maldives show that that wind-diesel and solar-diesel hybrid systems are more likely to be adopted compared to a 100% renewable systems (van Alphen, van Sark, & Hekkert, 2007).[25]

Since Yameen became President, climate change and RE seems to be no longer as high on the agenda as it has been in the years before. Still, the Ministry of Environment and Energy (MEE) presented in July 2014 the 'Maldives Climate Change Policy Framework' (MCCPF). It prescribes the Government and the people of Maldives strategic polices for responding to climate change impacts over the next 10 years (2014–2024). The Policy defines five thematic goals and strategies that the Government and the people of Maldives have prioritized for implementation to ensure that safety and resilience are achieved (The Ministry of Environment and Energy, 2014)

MCCPF does no longer mention the carbon neutrality strategy or any kind of mitigation target for the Maldives' national GHG emissions. Instead, the MCCPF stresses the importance of a low emission development future and of ensuring energy security for the Maldives. Energy efficiency as a central component of the National Energy Policy and will help to reduce greenhouse gas emissions and energy costs, and contribute directly to energy security and affordable energy. This is crucial as imported fossil fuels, primarily diesel, dominate energy consumption making up 82% of the total primary energy demand in 2009. Developing energy efficient products and services is expected to support the growth of the energy sector and create jobs. The national energy strategy from 2010 is supposed to"create an enabling environment for the growth of a reliable and sustainable energy sector" (Government of Maldives, 2014; Ministry of Housing and the Environment, 2010).

7.4.3 Institutional framework

The former Government of the Maldives under President Nasheed had a strong focus on climate policy and on changing the fossil fueled based economy to sustainability, RE and energy efficiency. But with the change in Government in 2013, combined with the lack of a strong political coordination and deci-

[25] MEE did some research with a Chinese company some year back showing that there is not enough wind for commercial generation.

sion-making body to pursue and implement the climate and energy policy, not enough progress has been made to reach this ambitious target.

Nonetheless, there has been a restructuring of the former Ministry of Housing and Environment in order to improve governance and sector management. The Ministry of Environment and Energy (MEE) created in the year 2012 has a focused mandate on energy, climate change, environment and water resources. Within MEE, a dedicated Climate Chance Department oversees all climate change related activities and programmes on the national as well as on the international level, supported by the Energy Department overseeing the development and implementation of policies, legislation, and project/programmes for the RE sector, energy efficiency and transportation. In addition to MEE, the Maldives Energy Authority (MEA) is the regulator in charge of the electricity sector. MEA plays a critical role in establishing tariffs, issuing guidelines and regulations to ensure the reliability, security of the grids, and that the rights and obligations of consumers and service providers are safeguarded. This includes regulations on licensing, standards of performance, energy efficiency labelling, investment approvals and technical regulations. Still, both MEE and MEA need to improve their capacity to manage the adaptation, mitigation as well as the energy sector reforms much more effectively.

7.5 Historical and Current International Climate Policy Positions

International cooperation and commitments are a fundamental consideration in the formulation of the Maldives' climate policies and strategies and the Maldives was one of the first countries to sign the Kyoto Protocol and ratify it in 1998. The Maldives Climate Change Policy Framework from 2014 envisages as the fourth policy goal that the Maldives shall "inculcate national, regional and international climate change advocacy role in leading the international negotiations and awareness in cross- sectorial areas in favour of the most vulnerable and small island developing states" (ibid, p. 12).

The first policy goal of the Maldives Climate Change Policy Framework is to "ensure and integrate sustainable financing in climate change adaptation opportunities and low emission development measures" (ibid, p. 12) and indicates the position of the Maldives regarding International Climate Finance. The Maldives will "continue to advocate and ensure for the delivery of predictable and sustainable financial resources from the developed countries, responsible for climate change, based on the polluter pays principle to support the implementation of climate change measures now and in future" (ibid, p. 13).

The Maldives belongs to the distinct group of developing countries "Small Island Developing States" (SIDS). Within the United Framework Climate Change Convention (UNFCCC), most SIDS countries including the Maldives are negotiating as part of the "Alliance of Small Island States" (AOSIS). AOSIS was established in 1990 under the leadership of the Maldives, Vanuatu and Trinidad and Tobago, with the main purpose to strengthen and consolidate the positions of the SIDS regarding climate change. The alliance has been active since its inception and was the one to present the first draft text of a Protocol in 1994. There is sparse literature about the role of the Maldives within the group or in the international negotiations generally. The country has not presented individual submissions on their own since the establishment of AOSIS.

AOSIS currently has 39 member states and five observer states. Although it has broadened its scope, the main focus of the alliance remains the climate change negotiations, in which it is now recognized as a major player (Betzold, Castro, & Weiler, 2012). Despite their small size and small share of global population, the AOSIS also obtained a seat on the UNFCCC Bureau and a SIDS seat in other UNFCCC bodies such as the Executive Board of the Clean Development Mechanism, the Adaptation Fund and the Green Climate Fund (Betzold et al., 2012).

AOSIS is the negotiating group that is advocating strongest for a global long-term target of keeping the global temperature increase below 1.5°C compared to pre-industrial temperature levels. In their submissions and statements, they often emphasize the importance of referring to the latest scientific findings when assessing the requirements for mitigation actions associated with this target (AOSIS, 2013a). Together with most other non-Annex I countries, AOSIS call for developed countries to take

the lead when it comes to national and international climate action. Developed countries should "undertake urgent, ambitious and decisive action to significantly reduce emissions of all greenhouse gases, including fast action strategies, and to support SIDS, and other particularly vulnerable countries, in their efforts to adapt to the adverse impacts of climate change, including through the provision of increased levels of financial and technological resources" (AOSIS, 2012).

At COP18 and COP19, AOSIS was advocating for the establishment of a "Loss and Damage Mechanism", whose main objective is to address loss and damage associated with impacts of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change (AOSIS, 2013b). This had been on AOSIS' agenda since 2012, and was successfully accomplished when the COP19 established the "Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts".

7.5.1 Climate Finance

One of the key interests of AOSIS in the international climate finance negotiations has been to make the climate finance architecture more efficient and accessible to small and most vulnerable countries that are already experiencing the adverse effects of climate change. The group sees climate finance as an integral building block of the new agreement and expects its provisions to address the gaps in the current financial architecture and to increase the predictability of flows. The group stated that developed countries should have the same obligations to provide support as under the Convention and that they take the lead in scaling up climate finance. In particular the group looks for scaling up climate finance from the USD 100 billion that developed countries committed to mobilize by 2020 and for prioritising public finance to meet the concrete and immediate adaptation needs of the most vulnerable countries while recognizing the need to mobilize private investments as well. In their statements in the ADP negotiating process, AOSIS also stressed the need for the establishment of a robust system for monitoring, reporting and verifying financial flows provided building on the experiences of the biennial reports and developed countries reports under the fast start finance period. Finally, the group highlighted the importance of anchoring the Green Climate Fund (GCF) in the new agreement as a key pillar and the major channel for climate finance. AOSIS sees the operationalization of the GCF also as an opportunity to improve access to climate finance by particularly vulnerable and capacity-constrained countries through capacity building and readiness support aiming at strengthening national institutions in their efforts to directly access international funds.

7.6 Conclusions

The Maldives will negotiate the post 2020 climate treaty on behalf of the AOSIS group, as it has been doing since the negotiations of the Kyoto Protocol. A main requirement of this negotiation group is to ensure that pledges and commitments inscribed in a new treaty will be sufficiently stringent to hold warming below 2°C or 1.5°C.

The total actual contribution in terms of emissions of Maldives to global climate change is still extremely small. At the same time, the country is extremely vulnerable to climate change, which explains its main focus on adaptation measures in its national climate and energy policy. This is again reflected in the AOSIS negotiation position, where high attention is given to the loss-and-damage mechanism and there is a strong demand to make the climate finance architecture more efficient and accessible to small and most vulnerable countries that are already experiencing the adverse effects of climate change. The group sees climate finance as an integral building block of the new agreement and expects its provisions to address the gaps in the current financial architecture and to increase the predictability of flows.

The Maldives announced a national target of carbon neutrality by 2020 in 2009. However, this target has not been confirmed in most recent publications from the Government on national and international climate policy strategies. It is therefore uncertain whether the Maldives has abandoned this target. This might be a consequence of the fact that achieving carbon neutrality through domestic measures

would be difficult and probably requires extensive carbon trading, which again is expensive for a developing country like the Maldives, and which would go significantly beyond its "fair share".

The Maldives has set concrete targets for renewable energy development, such as 50% of electricity generation from renewables by 2015 and 60% of electricity generation from solar by 2020 (International Renewable Energy Agency, 2012). Further, a multi-donor Climate Change Trust Fund has been set up by the Government of Maldives, the European Union (EU), and the World Bank Group to finance adaptation and low-carbon technology initiatives in the Maldives.

However, the renewable energy share at the Maldives is still marginal: 2 MW out of a total capacity of 283 MW derives from renewable sources. Also, the national climate plans and strategies developed by the Maldives contain little concrete information about actual GHG emissions and reduction potential.

Emission levels achievable with available mitigation potential in the Maldives are substantially below what would be required according to all effort sharing approaches. This illustrates the need for international support for mitigation in this least developed country.

8. Mexico

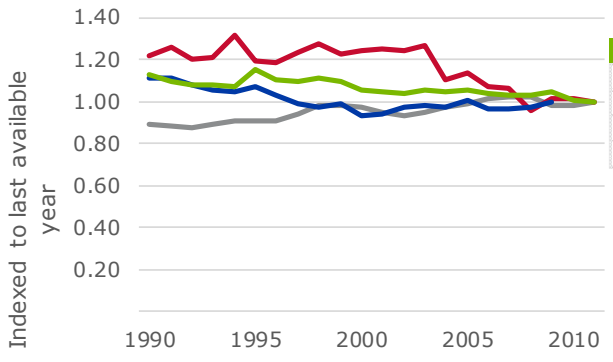
8.1. Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	119.361	mln cap	2011
GDP	9.9E+11	US$ (2005)	2011
Air pollution index	79	ug/m3, mear	2011

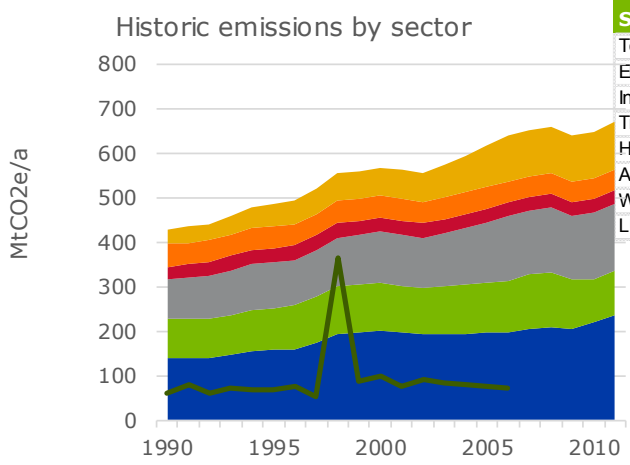
Indicator	Value	Unit	Year
Vulnerability	0.29	-	2011
HDI	0.75	-	2011
Electrification rate	95	%	2000

Past trends of decarbonisation indicators



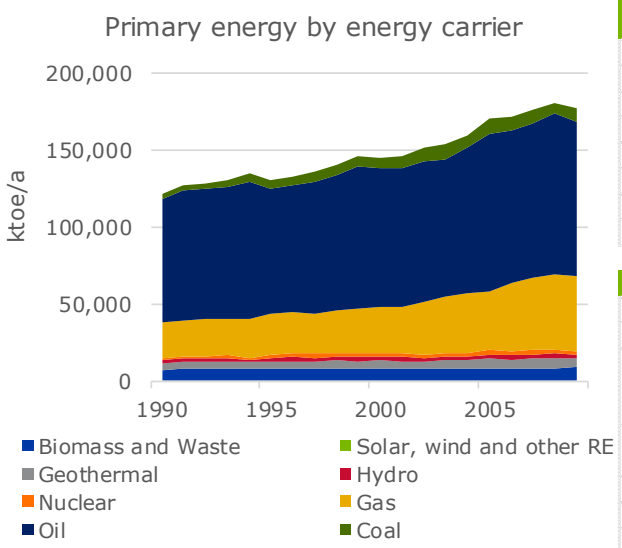
Indicator	Value	Unit	Year
Per capita emissions	5.60	tCO2e/ cap	2011
Emission intensity of electricity	450.0514	tCO2/kWh	2011
Emission intensity of economy	0.67	tCO2e/ USD	2011
Energy intensity of economy	0.20	ktoe/ million	2009

National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	233.2	MtCO2e/a	n.a.
Industry	101.2	MtCO2e/a	n.a.
Transport	148.9	MtCO2e/a	n.a.
Households_and_services	31.2	MtCO2e/a	n.a.
Agriculture	47.4	MtCO2e/a	n.a.
Waste	106.3	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Energy mix



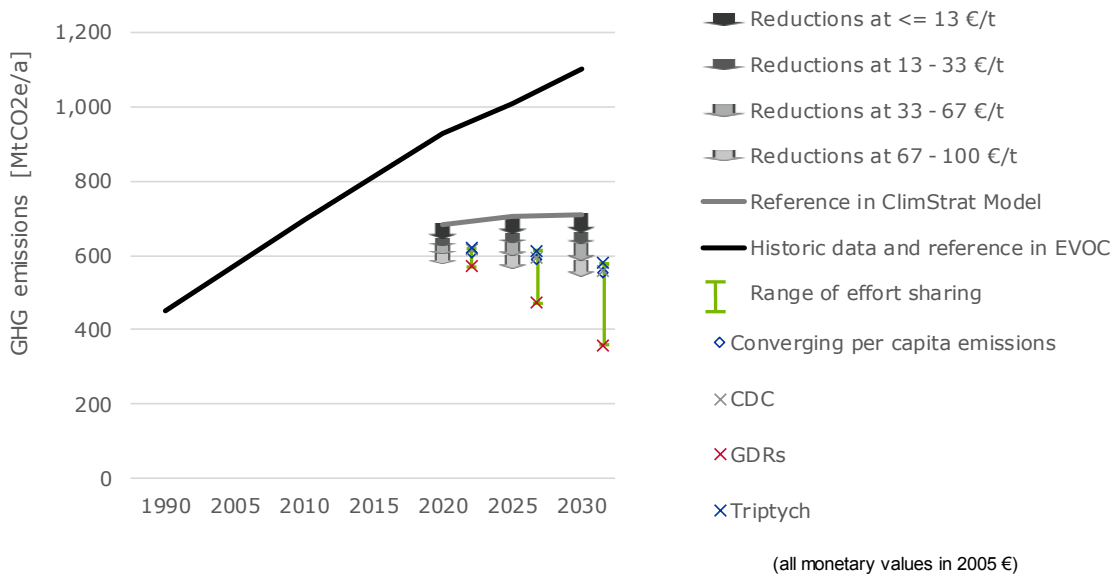
Fuel	Value	Unit	Share in 2009
Biomass_w aste	8558.21	ktoe	5%
Solar_w ind_other	284	ktoe	0%
Geothermal	5594	ktoe	3%
Hydro	3119	ktoe	2%
Nuclear	2629	ktoe	1%
Gas	56218	ktoe	30%
Oil	100093	ktoe	54%
Coal	10015	ktoe	5%

Indicator	Value	Unit	Year
Share of global emissions	1.3	%	2010
Domestic fossil fuel production	208,313	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	91	%	2011
Economic relevance of fossil fuel imports	1.9	% of GDP	2011
Fossil fuel subsidies	15.9	Billion USD	2011
Fuel import dependence	-23	% of imports	2011
Fuel import bill	36.26	Billion USD	2011

8.2 Mitigation Potential and Effort Sharing Allocations

Mexican emissions have been rising steadily since 1990 and are currently around 700 MtCO2e. Most of the effort sharing approaches considered here suggest that Mexico should reduce emissions below today's level already by 2020, and further in 2025 and 2030. Potentials exist to achieve the levels required by most effort sharing approaches.

Figure 19: Results of Effort Sharing Calculations and Mitigation Costs for Mexico



The effort-sharing calculations carried out in this project show that the range of allocations in different effort-sharing approaches is quite large in Mexico's case. In 2030, they vary between approximately 550 MtCO2eq for most approaches and 350 MtCO2eq in the GDRs approach. The median for the effort-sharing allocations is 31% and 23% above the 1990-level in 2025 and 2030, respectively. This would mean a reduction below the EVOC BAU of 42% in 2025 and of as much as 50% in 2030.

To achieve the median emissions allocation levels would require reduction measures at costs up to 51€/t in 2020, up to 59€/t in 2025 and up to 78€/t in 2030, according to the analysis carried out for this project.

The Table below displays the figures for the range of the effort sharing results, the range of the marginal abatement costs of achieving the respective effort sharing targets, the marginal cost of achieving the median reduction target, the range of the average costs of achieving the effort sharing targets and the average cost of achieving the median reduction target, each for the years 2020, 2025 and 2030.

Table 19: Results of Effort Sharing Calculations for Mexico

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	604	584	549	34%	30%	22%	-13%	-16%	-21%
CDC	611	591	555	36%	31%	23%	-12%	-15%	-20%
GDRs	566	468	356	26%	4%	-21%	-19%	-33%	-49%
Triptych	615	609	575	37%	35%	28%	-12%	-12%	-17%
Median	607	588	552	35%	31%	23%	-13%	-15%	-21%

8.3 Political System

Mexico is a presidential federation consisting of 31 regions plus Mexico City as Federal District. Legislation is passed by a bicameral parliament, the Congress, with a lower and an upper house referred to as Chamber of Deputies and the Senate respectively. Laws have to be approved by both chambers with some exceptions. Foreign policy and international agreements, for instance, only need to pass the Sen-

ate. Accordingly, an international climate agreement required the majority of the members of the Senate to be approved by the legislative (Garcia Trejo, 2005). The federal budget and all related laws, also those relating to climate change issues, are approved by the Chamber of Deputies[26] (GLOBE International, 2014).

Due to the presidential nature of Mexico's political system, the president and parliament each enjoy direct popular legitimation through presidential and legislative elections, so that a president cannot necessarily count on a majority in Congress to implement his or her policies. In the legislative process, bills either need presidential assent to become law, or, if not approved by the president, require a two-third majority in Congress.[27]

In December 2012, a new president, Enrique Peña Nieto from the Party for Institutionalized Revolution (PRI), was elected. Climate policy is not a priority of the new administration as economic growth and poverty reduction are seen as more important policy goals.[28] At the time of writing, the PRI had a relative majority in the lower house, but needed votes from other parties to pass bills. To still be able to push through structural reforms, a "Pact for Mexico" was signed among the three main parties, the PRI, the conservative National Action Party (PAN) and the leftist Party of the Democratic Revolution (PRD), at the beginning of Peña Nieto's term. In the Senate, the PRI built a coalition with two minor parties (the Green Party and the New Alliance), and, therefore, holds an absolute majority.

In the past, frequent changes in the Mexican Government and Congress with subsequent shifts in priorities were seen as big obstacle for political long-term planning. These changes were rooted in legislation prohibiting re-election at any political level in both the legislative and executive branches. This changed with the electoral reform of December 2013, which permitted the re-election of future parliamentarians for a period of up to 12 years (Presidencia de la República, 2014). The eletoral reform is expected to build up deputies' knowledge in specific policy areas and is, therefore, thought to improve continuity in decision-making.

As Mexico is a federal state, some climate-related competencies are transferred to regional and municipal governments. This, for instance, concerns forest management and the reduction of deforestation and degradation (IETA, 2013), the protection and management of natural reserves, or waste management (Government of Mexico, 2014b). Furthermore, municipalities have a huge impact on the environment as they are in charge of planning land-use and, thus, regulate property appropriation.

As in many developing countries, in Mexico competing priorities like combating poverty and inequality, and the fact that climate change is considered as sectorial issue but not as transversal challenge create a major barrier for implementing climate change strategies and measures. Within some departments (mainly at the federal level), the negative impact of non-action and the need for mitigation are well understood. However, relevant information on climate change, potential mitigation measures and related benefits is not always available to all actors, especially not at the local level. Some of these barriers could be remedied with the new strategic approach to climate policy taken with the General Law on Climate Change passed in 2012 (see following section).

8.4 Historical and Current Domestic Climate Policy and Politics

From a global perspective, Mexico is probably one of the non-Annex-I countries that have done the most to implement climate policies and measures. This is also facilitated by the fact that Mexico is an emerging economy and an upper middle-income country. On paper, Mexico has a highly developed comprehensive climate policy system, emphasising the need for coordination between the different authorities, integration of a wide range of stakeholders and a strong relationship to international institutions. Over the past years, the government was very active in developing programmes and plans on

26 Article 74 and 76 I of the Constitution of the United States of Mexico.

27 Article 72 C of the Constitution of the United States of Mexico.

28 http://www.reuters.com/article/2012/07/24/us-mexico-climate-policy-idUSBRE86N0A220120724.

climate action. In practice, however, there are a number of barriers to the implementation of an effective climate policy.

The most important actors in Mexico's climate policy setup are the Interministerial Commission on Climate Change (CICC) and the institutions set up by the General Law on Climate Change (LGCC)[29]. Launched in 2005, the CICC is responsible for coordinating the formulation of climate policies, provides institutional support at the highest level for the design and implementation of the national REDD+ strategy, and also coordinates Mexico's participation in the international climate negotiations (particularly under UNFCCC) and the Clean Development Mechanism (CDM). The Commission is comprised of 13 federal ministries (often referred to as Secretariats).[30]

In 2006, the CICC adopted an initial document outlining Mexico's mitigation and adaptation strategy. Mexico's hosting in 2010 of COP16 in Cancun, significantly pushed the country's national climate policy. By 2009, the CICC presented the Special Programme on Climate Change 2009-2012 (PECC)[31], which set out different mitigation and adaptation measures to be taken in the short, medium and long run. With respect to mitigation, it stated that national efforts should focus on the energy generation and consumption, agriculture, forest, land use and waste sectors. Later, legislative documents added transport and energy efficiency in industrial processes as key sectors for GHG emissions reductions (Government of Mexico, 2014b).

Another milestone in Mexico's climate policy was taken on 5 July 2012, when the president signed the LGCC, which constitutes the legal framework for developing Mexico's national climate change policy. Previously the law had been passed in both houses of parliament with strong support from all major political parties.[32] In effect, Mexico became one of the few non-Annex I countries to have a domestic law specifically created to address climate change with a holistic approach (Carlos de Obeso, 2012).

The LGCC created a well-designed National System for Climate Change (SNCC)[33]to foster an effective climate policy spanning all levels of government, and aiming at the inclusion of a wide range of non-governmental stakeholders, including academia, civil society and the private sector.

Also, the law set up crucial institutions to develop and pursue a national climate policy. It created the National Institute for Ecology and Climate Change (NIECC)[34], one of whose major functions is to generate the National Inventory of GHG Emissions. And it set-up a national Fund for Climate Change,[35] that is to gather and channel national and international, private and public funds to finance mitigation or adaptation related projects. By the time of writing (November 2014), the Fund had officially been constituted, but neither had its rules of operation been fixed, nor had money from the 2014 federal budget been dedicated to the Fund (Chamber of Deputies of Mexico, 2014). In general, Mexican climate change regulation lacks transparency with respect to the origin and destination of funds (Transparency Mexico, 2013).

In 2013, the newly installed government published a new National Strategy for Climate Change (ENCC) (Secretariat of Environment and Natural Resources, 2013a). The document contains lines of actions

[29] Ley General de Cambio Climático.

[30] The CICC includes representatives from the Ministry of Interior (SEGOB), Ministry of Foreign Affairs (SRE), the Ministry of Agriculture, Rural Development, Fisheries and Food (SAGARPA), the Ministry of Communications and Transport (SCT), the Ministry of Navy (SEMAR), the Ministry of Social Development (SEDESOL), the Ministry of Tourism (SECTUR), the Ministry of Economy (SE), The Ministry of Public Education (SEP), the Ministry of Health (SSA), the Ministry of Energy (SENER), the Ministry of Environment and Natural Resources (SEMARNAT) and the Ministry of Treasury and Public Credit (SHCP).

[31] Programa Especial de Cambio Climático 2009-2012.

[32] In the Senate, the bill passed with 76 votes in favor, 5 abstentions and 5 votes against. Parlamentary Gazette 2012: Dictamenes a discusión, April 12. In the Chamber of Deputies, 280 congressmen votes in favor, 10 abstentions and 1 vote against the bill. Parlamentary Gazette 2012: Votaciones de la Camara de Diputados.

[33] Sistema Nacional de Cambio Climático.

[34] The new Institute evolved out of the Instituto Nacional de Ecología (INE), a more centralized public research institute with a more general environmental research agenda.

[35] Fondo de Cambio Climático.

for Mexico's climate policy for the short, medium and long run. More concrete measures on how to work towards achieving the national goals under the current presidency were named in the recently published Special Programme for Climate Change 2014-2018 (Secretariat of Environment and Natural Resources, 2014). The PECC 2014-18 quantifies the effects of the measures described in the plan to cause an emissions reduction of 83.2 MtCO2eq per annum by 2018.

The more significant actions listed refer to GHG emissions reductions in the petro-industry and from electricity generation (by 23%), the promotion of energy efficiency via national standards for public lighting, buildings and government vehicles, the increase of public investment in renewable energies, the implementation of pilot projects for biofuel production, the simplification of regulation for renewable energies, the expansion of waste water treatment, the extension of NAMA projects, the establishment of a carbon tax and the creation of a voluntary system for emissions trading within Mexico.

Notably, however, lines of action and goals published in both the ENCC and the PECC 2014-18 are only indicative goals and do not reflect whether the Congress is willing to pass changes in laws, for instance, with respect to the introduction of a carbon tax. Also, the lack of political will has failed to give power to the newly created institutions, both in terms of funding and the ability to act beyond making unheard recommendations.

The legal achievements in climate mitigation were supported by several green civil society organizations and think tanks. Organisations like the Centro Mario Molina or CTSEMBARQ have contributed valuable studies that helped to make informed public policy decisions with respect to renewable energy or environmentally friendly cities. International NGOs like Greenpeace, the Nature Conservancy or World Wildlife Fund have offices in Mexico. Together with Mexican organisations, they form a network of expertise and advocacy for environmental protection.

Beyond these general efforts to mitigate climate change, the Mexican government has particularly focused on the energy sector trying to reduce emissions through the promotion of renewables and energy efficiency, with mixed success. In 2008, the Law for the Use of Renewable Energies and Financing for the Energy Transition (LAERFTE) was passed setting the target for 2024, to produce 35% of electricity from clean energies (including nuclear power) and 50% for 2050 (Secretariat of Environment and Natural Resources, 2013b) Also, a new Law on the Electric Industry, passed in August 2014, stipulated that the national renewable targets will be enforced by establishing a market for clean energy certificates (Government of Mexico, 2014a).

Nevertheless, net contribution of renewables to the national energy production decreased between 2003 and 2012, from 8% to 6.3%[36](Secretariat of Energy, 2013), largely because complementary policies have not sufficiently supported the energy transition. Some critics have argued that Mexico will not meet its national goals because Peña Nieto's administration has not made renewable energy a political priority like the previous administration did (CNN Mexico, 2014b).

To incentivise private investment in renewables, the Energy Minister, for instance, announced in 2013, the creation of a financial mechanism within the National Fund for Energy Transition that insures investors against high exploration risks (Secretariat of Energy, 2012)(Meana, 2014). At the same time, however, the 2013 tax reform eliminated concessions for green investments (García, 2013). Accordingly, there are some initiatives to support renewable energies in Mexico, but real incentives for private investors and public programmes enabling the deployment of this sector's full potential are still missing.

Regarding energy efficiency, Mexico has created two institutions: the National Commission on the Efficient Use of Energy (CONUEE)[37] and the Trust for Electric Energy Savings (FIDE)[38]. Both are engaged

[36] But while in 2003, electricity from renewable energy came almost entirely from hydroelectric and geothermal sources, in 2012, wind energy contributed 8% to the national electricity generation, biomass and biogas 2% and solar energy 0.02%.

[37] Comisión Nacional para el Uso Eficiente de la Energía.

[38] Fideicomiso para el Ahorro de la Energía Eléctrica.

in a number of activities that implement efficiency measures, including education, the establishment of a labelling system and low-interest credits to efficiency projects. While CONUEE is also directly involved in the design of efficiency standards, FIDE complemented these efforts with two large-scale appliance substitution programmes replacing traditional light bulbs and old refrigerators with more energy efficient ones. However, there are concerns about rebound effects, as the lower operating cost led to an increased use. This points to the need for complementary measures, like for example information campaigns to address rebound effects (Davis & Irarstorza, 2013).

One of the big hurdles to mitigation is rooted in the fact that Mexico's oil, gas and electricity industries are government controlled. As a result, prices for the consumption of electricity, gas and gasoline are fixed by the federal government and, in the case of gasoline, diesel and electricity, funds are given to the state-owned energy companies to cover production costs.[39] Although energy subsidies today are known to give greater benefit to rich households than to poor ones (Mexican Institute for Competition, 2012), they have in Mexico traditionally been considered as policy to help the poor. That this belief is deeply engrained is demonstrated by the fact that by 2010, subsidies for energy consumption were four times as high as the amount spent in all public mes to combat poverty together (Shields, 2013).

President Peña Nieto and the ruling party PRI are aware of these problems, but consider the regulation of tariffs and subsidies a "strategic axis" to guarantee equitable access to energy (Senate of Mexico, 2013). Also, the removal of energy subsidies is encountering strong opposition from centrist and left-wing parties as well all the general public (Party of Democratic Revolution, 2013). Still, gasoline subsidies are gradually reduced with the effect that many climate friendly investment projects have become profitable (Secretariat of Finance and Public Credit, 2014). While this elimination process was gradual and slow, subsidies for the consumption of gasoline and diesel are supposed to be completely eliminated by 2015 (CNN Mexico, 2014a).

In addition to fossil fuel subsidies, the PECC 2014-2018 expects Mexico's recently passed energy reform to have a negative impact on mitigation.[40] The aim of the reform is to attract foreign companies to use their know-how to exploit oil and gas; reserves that so far could not be exploited, for instance, relating to shale oil and gas. A subsequent increase in Mexico's total energy production is expected to trigger a rise in the country's GHG emissions (Shields, 2013).

Beyond the energy sectors, Mexico's government also adopted measures regarding forests and transport. The 2003 General Law of Sustainable Forest Development is the cornerstone of Mexico's forest policy. Also, Mexico developed a national REDD plan, and a number of strategies, plans and laws to directly support the REDD strategy. Several national and international NGOs and development organisations, including USAID, are - together with the National Forest Commission (CONAFOR) - currently engaging in REDD activities. Furthermore, the 'Law on Sustainable Rural Development foresees Payment for Environmental Services schemes (PSA)[41], that establish financial incentives for forest owners to engage in conservation measures. The most important scheme here is ProArbol, established in 2006, which focuses on conservation and restoration actions in communities, especially in marginalised ones. However, it is difficult to evaluate the effectiveness of the REDD strategy with the information available.

In the transport sector, in 2009 the Federal Mass Transport Programme (PROTRAM) was established with financial support from the World Bank to support the development and implementation of sustainable urban transport projects. The concept is now being further developed, with the target to turn the programme into a credited NAMA. In the past, a strong focus was given to the replacement of the

[39] Between 2005 and 2009, energy subsidies amounted to 1.5% of Mexico's GDP (Mexican Institute for Competition, 2012). In 2013, subsidies for gasoline and diesel amounted to €6billion (0.78% of GDP) and because the elimination policy took already place in 2013, the amount was even higher in 2012 (El Economista, 2014). Electricity subsidies were a little lower with €2billion in 2012 (Federal Commission of Electricity, 2012).

[40] Programa Especial de Cambio Climático 2014-2018.

[41] Esquema de Pago por Servicios Ambientales.

old vehicle stock. Newer measures include the obligatory replacement of taxis in Mexico City that are more than 10 years old, and the adoption of a vehicle standard for GHG emissions applying to new vehicles, aiming to converge with US emissions standards by 2016.

8.5 Historical and Current International Climate Policy Positions

In the international climate negotiations, Mexico has long been an important actor. Signing the UNFCCC in 1992, Mexico ratified it in 1993. Under the Convention, Mexico is classified as non-Annex-I country, making it one of the richest countries that do not have to commit to emissions reductions. In 1998, Mexico joined the Kyoto Protocol and in September 2000, became the first heavily populated oil-exporting country to ratify the Protocol.

In June 2000, Mexico together with Liechtenstein, Monaco, the Republic of Korea and Switzerland formed the Environmental Integrity Group (EIG), largely in opposition to the Umbrella Group,[42] whose positions they did not share (Yamin & Depledge, 2004). The EIG is the only negotiation group that includes both Annex-I and non-Annex-I countries. Its members share little in common, apart from all being members of the OECD, whilst not being part of any other negotiating group.

In the UNFCCC, Mexico's position is reflected in both submissions by the EIG and individual country submissions independent of the Group's position. The EIG argues in favour of an international climate regime with a high level of flexibility regarding the mechanisms of mitigation. A reliable system of common accounting elements, common standards and conformity checks should ensure environmental integrity (UNFCCC, 2012b). The group emphasises that adaptation must be a major component of the 2015 Agreement and that it should be addressed with the same level of priority as, and, whenever possible, in synergy with mitigation. Further, the EIG advocates strong international rules on finance mechanisms, technology development and transfer, and capacity building (UNFCCC, 2014a).

Mexico in its submission under the Copenhagen Accord in 2009, became one of the developing countries that proposed an emissions limitation target. The country "aims at reducing its GHG emissions by up to 30% with respect to the business as usual scenario by 2020, provided the provision of adequate financial and technological support from developed countries as part of a global agreement."(Government of Mexico, 2010). In their Special Programme on Climate Change 2009-2012, the Government also presented the long-term target to reduce emissions by 50% by 2050 compared to 2000 levels, assuming moderate reductions in the early years and more ambitions reductions later.

In May 2012, Mexico presented its baseline related to the 2020 pledge with emissions of 882 $MtCO_2e/a$ by 2020. Remaining emissions after the proposed reduction would be 618 $MtCO_2e$/year in 2020. With the publication of the new climate strategy in June 2013, the baseline was revised and adjusted upwards to annual emissions of 960 $MtCO_2$-eq in 2020.

According to the calculations made for this analysis, Mexico could achieve its pledge at costs up to 13€/t. The pledge is in line with the allocation level of most effort-sharing approaches assessed here. This suggests that Mexico has grounds to call for international assistance to meet the moderate costs associated with realising its pledge. Clarification of support requirements could speed up the implementation of actions.

Mexico's position on mitigation is that developed parties "must take the lead with quantified economy-wide emission reduction targets. Other parties in the position to do so must follow the lead with quantified economy-wide emission reduction targets." Parties not able to commit to economy-wide targets, must adopt other types of commitments, like sectoral or relative targets. The LDCs, in turn, should engage in low-emissions planning processes (Government of Mexico, 2014c).

Further, Mexico has in the past years been an important actor in the international climate finance negotiations. At the Copenhagen summit in 2009 for example, Mexico proposed the creation of a new

[42] The Umbrella Group is a loose coalition of non-EU developed countries including Australia, Canada, Japan, New Zealand, Norway, the Russian Federation, Ukraine and the US.

inclusive and efficient Multilateral Climate Change Fund (MCCF) that would receive financial contributions not only from Annex-I countries, but also from emerging economies and other developing nations that were ready to contribute, while ensuring that developing countries remain net beneficiaries of the Fund (Government of Mexico, 2008). The MCCF is regarded as a precursor for the Green Climate Fund. As host of 16th session of the Conference of the Parties (COP 16) in Cancun, Mexico was actively promoting the establishment the Green Climate Fund (GCF), which was a major outcome of the Cancun Agreements. Although being a developing country Party itself, Mexico also contributes to the Financial Mechanism of the Convention to support mitigation and adaptation actions by developing countries. Recently, the country contributed USD18.8million for the last GEF replenishment (Global Environmental Facility, 2014).

Under the ADP, Mexico as part of the Environmental Integrity Group (EIG) calls for the new agreement to include clear commitments by all developed countries as well as by other countries in a position to do so. The EIG expects this broadening of contributors to be based on principles of equity, common but differentiated responsibilities (CDBR) and respective capabilities (RC), as well as on a balanced approach to mitigation and adaptation support. In its last ADP submission of June 2014, Mexico argued, moreover, that financial contributions should be part of the INDCs (Government of Mexico, 2014d).

The EIG highlights that the finance provisions of the new agreement should be part of an independent chapter on Means of Implementation reflecting on the three pillars of finance, technology and capacity building. The Group further states that this provision should strengthen the existing operating entities of the Financial Mechanism of the Convention, enhance predictability due to clear projections for the long or mid-term, and enhance country ownership. While stressing the critical role of the private sector in mobilising climate finance after 2020, the EIG calls for commitments to mobilise public funds and means to facilitate and encourage private investment in the 2015 Agreement. A statement made by Mexico at the ADP session in June 2014, further highlighted the importance of finding the right incentives to leverage private finance since there are not enough public resources to address the global climate challenge. The EIG advocates for the GCF to become the main operating entity of the post-2020 regime and, thus, propose to engage the Fund also in mobilising private sector investments.

8.6 Conclusions

Mexico has a highly developed comprehensive climate policy system and has been very active in developing programmes and plans on climate action during the past years. The country is also an important actor in the international climate negotiations. In 2010, Mexico hosted the COP16 in Cancún. This event and its preparation significantly pushed national climate policy.

The country is among the few developing countries that have set a national target for emissions limitation. In 2009, the government announced a medium-term “aspirational” emissions reduction goal; to reduce emissions by 30% compared to the baseline scenario by 2020. This target is also in line with the fair share for emissions reductions calculated by the EVOC tool for 2020. In 2012, Mexico added a long-term goal which prescribes that GHG emissions in 2050 should be cut by 50% compared to the country’s 2000 emissions (i.e. 340 millions tons of CO_2eq). However, Mexico has made clear that this target can only be achieved if a multilateral climate change regime is established that creates financial and technological support mechanisms at a scale without precedent.

Mexico’s Special Programme for Climate Change 2009-2012 set out different mitigation and adaptation measures to be taken in the short, medium and long run. With respect to mitigation, it stated that national efforts should focus on the sectors of energy generation and use, agriculture, forest, land use and waste.

In 2012, the General Law on Climate Change was enacted. It confirms the national goals, strengthens climate change institutions and coordination and creates a national Fund for Climate Change in order to gather and canalize climate finance. The National Strategy for Climate Change, published in 2013, contains lines of actions for Mexico’s climate policy for the short, medium and long term. Concrete measures for how national goals shall be achieved were published in the Special Programme for Cli-

mate Change 2014-2018. The Programme also quantifies the potential effect of measures on national GHG emissions, which is estimated to cause an emissions reduction of 83.2MtCO2eq/year by 2018. Mexico also has a target for "clean energies" from 2008, which envisages 35% of electricity from clean energies (including nuclear power) by 2024 and 50% by 2050. The Special Programme for Climate Change 2014-2018 states an additional target for electricity generation; i.e. a 23% reduction in emission intensity by 2018.

Lines of action and goals published in both the National Strategy for Climate Change and the Special Programme for Climate Change are only indicative goals and do not reflect whether the Congress is willing to pass changes in laws, for instance, with respect to the introduction of a carbon tax.

The effort-sharing calculations carried out in this project show that the range of allocations in different effort-sharing approaches is quite large in Mexico's case. The median for the effort-sharing allocations is 31% and 23% above the 1990-level in 2025 and 2030, respectively. This would mean a reduction below the EVOC BAU of 42% in 2025, and of as much as 50% in 2030.

To achieve the median emissions allocation levels would require reduction measures at costs up to 51€/t in 2020, up to 59€/t in 2025 and up to 78€/t in 2030, according to the analysis carried out for this project.

It remains to be seen, whether Mexico will present a new emissions reduction target within its intended Nationally Determined Contributions in 2015. Given the already ambitious targets and plans, it might also choose to keep its present targets and include them in the necessary format in the INDCs.

9. Morocco

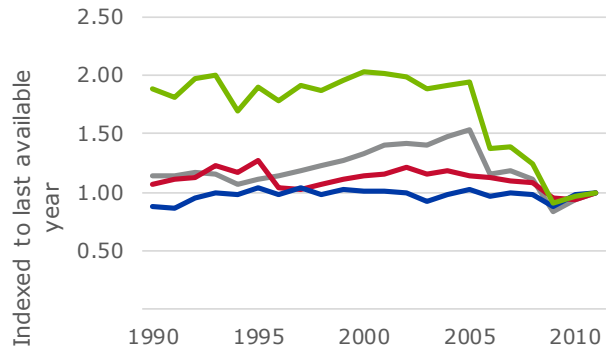
9.1. Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	32.059	mln cap	2011
GDP	7.9E+10	US$ (2005)	2011
Air pollution index	n.a.	ug/m3, mear	n.a.

Indicator	Value	Unit	Year
Vulnerability	0.36	-	2011
HDI	0.61	-	2011
Electrification rate	98.9	%	2011

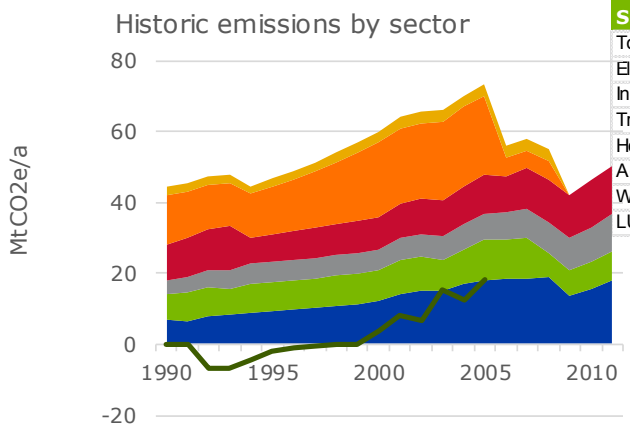
Past trends of decarbonisation indicators



Indicator	Value	Unit	Year
Per capita emissions	1.57	tCO2e/ cap	2011
Emission intensity of electricity	729.0408	tCO2/kWh	2011
Emission intensity of economy	0.63	tCO2e/ USD	2011
Energy intensity of economy	0.21	ktoe/ million	2011

Per_capita_emissions
Electricity_intensity
Energy_intensity
Emission_intensity

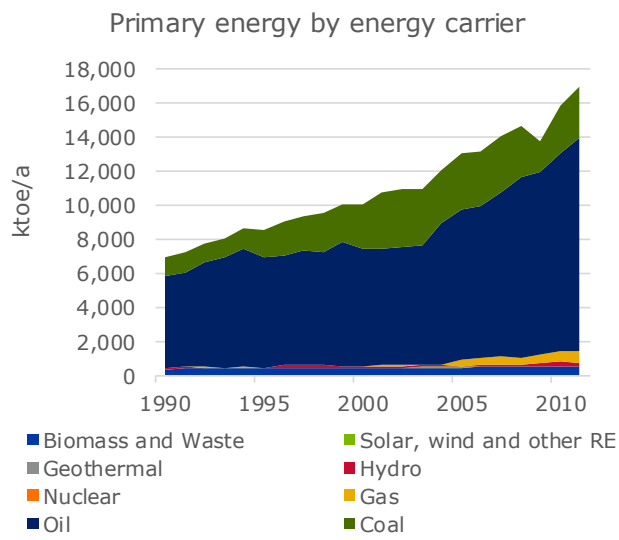
National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	17.9	MtCO2e/a	n.a.
Industry	8.3	MtCO2e/a	n.a.
Transport	10.5	MtCO2e/a	n.a.
Households_and_services	13.6	MtCO2e/a	n.a.
Agriculture	n.a.	MtCO2e/a	n.a.
Waste	n.a.	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Electricity_and_Heat
Industry
Transport
Households_and_services
Agriculture
Waste
LULUCF

Energy mix



Fuel	Value	Unit	Share in 2011
Biomass_waste	490	ktoe	3%
Solar_wind_other	60	ktoe	0%
Geothermal	0	ktoe	0%
Hydro	161	ktoe	1%
Nuclear	0	ktoe	0%
Gas	712	ktoe	4%
Oil	12488	ktoe	74%
Coal	2977	ktoe	18%

Indicator	Value	Unit	Year
Share of global emissions	0.2	%	2010
Domestic fossil fuel production	59	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	8	%	2011
Economic relevance of fossil fuel imports	5.1	% of GDP	2011
Fossil fuel subsidies	n.a.	Billion USD	n.a.
Fuel import dependence	96	% of imports	2011
Fuel import bill	11.22	Billion USD	2011

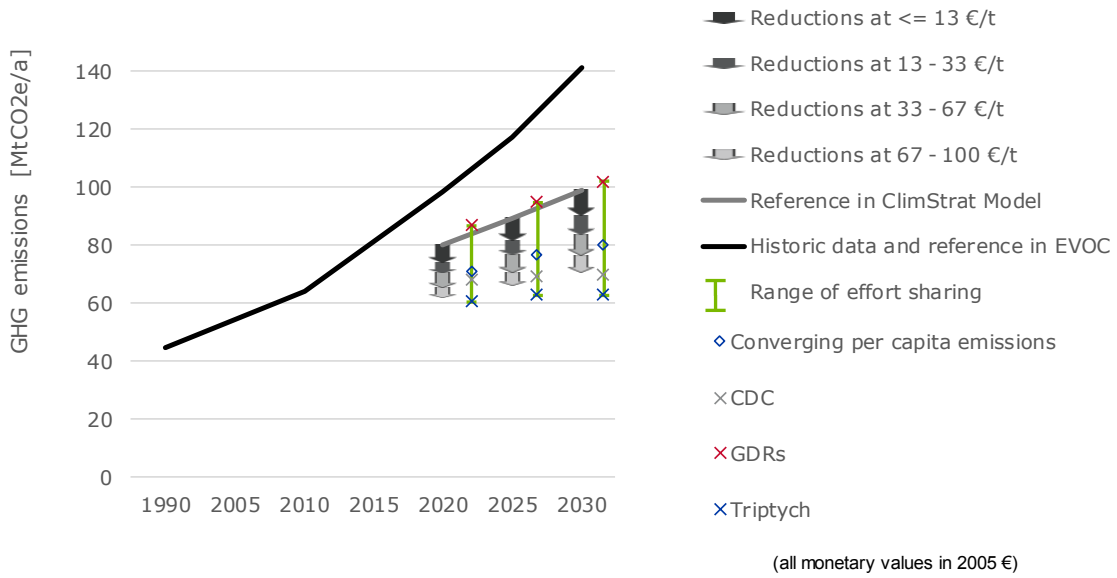
In terms of population, Morocco is one of the smallest countries analysed within this study. It is a low-to-middle income developing country, with a corresponding mid-range Human Development Index.

Within the MENA region, Morocco is singular because of its scarcity of fossil fuel reserves. Nearly all of the country's energy derives from imported oil, which is used not only as transport fuel, but to a large extent also for electricity generation. This also accounts for the relatively high emission intensity of electricity generation.

9.2 Mitigation Potential and Effort Sharing Allocations

Figure 20 displays emission targets that Morocco should take on according to the four effort sharing proposals considered in this study. The range is relatively broad.

Figure 20: Results of Effort Sharing Calculations and Mitigation Costs for Morocco



Allocations for 2020 range from about 60 to about 86 Mt CO_2-eq., which would mean a near doubling of 1990 levels (45 Mt). The median lies at about 69 Mt. This would mean a significant reduction of reference emission levels for that year, which the EVOC model calculates at about 99 Mt CO_2-eq.

Allocations for 2025 range from about 63 to about 94 Mt CO_2-eq. The median lies at about 73 Mt, 10 Mt lower than for 2020. Reference emissions, on the other hand, continue to climb to levels of ca.118 Mt CO_2-eq. in 2025.

Allocations for 2030 range from 62 to 102 Mt CO_2-eq., with a median of 74 Mt CO_2-eq. In the EVOC reference scenario, emissions keep growing to about 142 Mt CO_2-eq. in 2030.

Morocco has a high potential for emission reductions that have economic benefits. The country could reach the high range of allocations (calculated from the GDR approach) purely with measures already in place or planned by mid-2013. According to ClimStrat calculations, making full use of these measures would actually lead to a slightly stronger emissions reduction than needed to reach the high range for every calculated year. Reaching emissions levels consistent with the median of approaches, on the other hand, would incur marginal abatement costs possibly slightly above 100 €/t CO_2-eq. The median emissions pathway has no significant further emissions growth after 2025, with almost steady annual emissions at about 75 Mt CO_2-eq.

Reaching levels consistent with the Triptych approach, which is based on global convergence of sectoral emission intensities without taking into account the development status of countries, would need significantly higher effort: average costs were calculated as about six times as high as those incurred by reaching the median for each year. Marginal abatement costs would reach almost 500 USD/t CO_2-eq. in 2030. However, such high investments would also lead to a levelling-out of the emissions pathway at levels about 10 Mt CO_2-eq. lower than the median path in every year, with emissions even slightly decreasing after 2025.

Table 20: Results of Effort Sharing Calculations for Morocco

Effort Sharing Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	71	76	80	58%	71%	78%	10%	19%	24%
CDC	68	69	69	51%	54%	56%	5%	7%	8%
GDRs	86	94	102	93%	111%	128%	34%	47%	58%
Triptych	60	63	62	35%	40%	40%	-6%	-3%	-3%
Median	69	73	74	55%	62%	67%	8%	13%	16%

9.3 Political System

Morocco is a constitutional monarchy, headed since 1999 by King Mohammed VI. The King has far-ranging powers, including setting the military and security agenda of the country - the king is also head of the military forces. The king retains the right to rule by decree (GlobalEDGE, 2014). The current king is hailed for being more liberal and sympathetic towards democracy than his predecessors, and has stressed social and economic reforms under his leadership (European Forum for Democracy and Solidarity, 2014).

Originally a strongly centralised monarchical system, Morocco has been evolving into a more democratic system over the last decades. In 1996, a constitutional reform led to the establishment of a bicameral parliamentary system. Since 2001, a decentralisation process is slowly taking shape. Local governors are assigned by the king (ibid.).

In 2011, following calls for more democracy that gained traction with the region-wide "Arab Spring", the Moroccan constitution was amended, including stronger democratic aspects than before. The Prime Minister is now selected from the political party with the most votes instead of being chosen by the king, and can appoint his cabinet himself. In the 2011 elections, the moderately Islamist Justice and Development Party was voted into office (ibid.)

The Assembly of Representatives is directly elected every five years. Of the 395 seats, 60 seats are reserved for women, and 30 seats for males below the age of 40 (ibid). The Chamber of Councillors is elected indirectly by local and national electoral colleges every six years. It currently consists of 270 members, but is to be reduced to 120 (CIA (Central Intelligence Agency), 2014b). Among other powers, this bicameral parliament enacts national laws and oversees the government (Nachmany et al., 2014). Together, the two houses have the mandate to pass laws on most political issues, excluding religious and security issues as well as "major policy decisions" (GlobalEDGE, 2014). The Assembly of Representatives also has the right to dissolve the government, a right reserved exclusively for the king prior to the reform process (ibid.).

9.4 Historical and Current Domestic Climate Policy and Politics

Morocco represents a special case within the North African region: it is relatively poor and does not have access to extensive oil and gas reserves to fuel its energy demand, which has grown by about 7%/a in the recent years. The country meets more than 95% of its energy needs through imported fossil fuels (mainly oil), and is therefore highly susceptible to global oil price variations (WWF, 2013).

Not least due to a relatively high import bill for fossil fuels, and the dependence on other countries it creates, Morocco is currently taking strong strides to expand its renewable energy base, which in 2011 was still very small. It has a strong interest to diversify its energy sources and make use of the country's high potential for solar and wind energy. Morocco's climate policy therefore mainly has focused on energy. There are some efforts to strengthen policies for REDD and adaptation, but they are not developed nearly as far (Nachmany et al., 2014). Climate change issues lie with the Department of En-

vironment of the Ministry of Energy, Mining, Water, and Environment (Ministre de l'Energie, des Mines, de l'Eau et de l'Environnement, chargé de l'Environnement) (Government of Morocco, 2014).

Already in 2009, Morocco introduced its National Plan of Action against Climate Change (PNRC: Plan National de Lutte Contre le Réchauffement Climatique), which strongly focuses on the development of renewable energies in the country. The activities outlined in the PNRC were also submitted as NAMAs under the Cancún Agreements. These include targets of 2 GW of solar by 2020, 5 GW of wind by 2030, 2 GW of nuclear, 300 MW of small hydro, 870 MW of combined cycles, as well as specific hydropower and combined cycle plants and electricity saving programmes.[43]

In addition, Morocco's energy strategy includes targets to reduce energy consumption by 12-15% below BAU by 2020 and to increase the share of renewables in installed capacity to 42%, with 2 GW each from solar, wind and hydro. These 6 GW are expected to account for 20% of electricity consumption. By 2030, efficiency is to improve by 20% compared to BAU (Government of Morocco, 2014).

Morocco has also established an elaborate legal and institutional framework for the promotion of renewable energy and energy efficiency. A National Committee for Climate Change was established in 2001 and a Center for Development and Renewable Energies (CDER: Centre pour le Développement des Energies Renouvelables) was established already in 1982. In 2009, it was transformed into the National Agency for the Development of Renewable Energies and Energy Efficiency (ADEREE: Agence pour le Développement des Energies Renouvelables et de l'Efficatité Energétique). Morocco also has a dedicated Agency for Solar Energy (MASEN) as well as several promotion programmes. The government-owned Research Institute for Solar Energy and New Energies (IRESEN: Institut de Recherche en Energie Solaire et en Energies Nouvelles) is dedicated to research and development , networking and financing of renewable energy technologies and projects. In addition, Morocco has put in place a special financing organisation, SIE (Société d'Investissements Energétiques), for financing renewable energy projects within the country. (WWF, 2013).

A comprehensive Climate Change Policy (PCCM: Politique du Changement Climatique) was published in March 2014, building on the PNRC. The PCCM makes the fight against climate change a national priority. At its centre is Morocco's National Vision for 2030, "to achieve sustainable, low-carbon development resilient to the impacts of climate change, and to contribute to global efforts against climate change" (Government of Morocco, 2014, own translation).

The development of Morocco's renewable energy sector has received especially strong political support. King Mohammed VI has backed the country's energy strategy since the beginning, and is one of the main drivers for the uptake of renewable energy in Morocco. Investments in renewable energies have grown exceptionally in recent years (Bryden, Riahi, & Zissler, 2013).

However, the high-level commitment to and cognizance of the benefits of renewable energy deployment does not always lead to full local uptake of renewable energy projects due to constraints in access to centrally-governed funds, limited technical and legal capacity for the promotion and uptake of renewable energies, and in times limited uptake by regional authorities (WWF, 2013). Recognising this, ADEREE has established a number of capacity building programmes to overcome local capacity barriers (ibid.).

A full deployment of Morocco's renewable energy plans may also be in jeopardy because of continuing political dispute over the status of the West Sahara. Morocco has claimed the territory in 1975, but the region is host to a strong independence movement backed by Algeria. Morocco plans to build two major solar plants in the region, but would need international financial support to do so. Yet, a number of development banks including KfW, EIB and the World Bank will not provide financing because they need to remain neutral within the dispute (El Yaakoubi, 2014).

[43] Compilation of information on nationally appropriate mitigation actions to be implemented by developing country Parties, FCCC/SBI/2013/INF.12/Rev.2, 28 May 2013

9.5 Historical and Current International Climate Policy Positions

Within the UNFCCC climate negotiations, Morocco is one of the less vocal parties. It hosted the Conference of the Parties in Marrakech in 2001, which finalised provisions for the implementation of the Kyoto Protocol. Negotiations are led by members of the Ministry of Energy, Mining, Water, and Environment.

Morocco is a member of the G77 and the Arab Group, but rarely intervenes actively in overarching debates such as the discussions for a post-2020 agreement under the ADP. Not least because of its interest in international support for its renewable energy deployment, Morocco engages in the further development of the carbon markets within the climate regime, for example submitting views on the New Market Mechanism (NMM) in March 2013 (UNFCCC, 2013b).

While Morocco has not put forward its position on the post-2020 framework, it has submitted a wide range of NAMAs under the Cancún Agreements in 2010 (see above). It can be speculated that the country will not be unsympathetic to voluntary commitments of developing countries in a post-2020 agreement, subject to international support.

9.6 Conclusions

Within the North African region, Morocco is one of the most ambitious countries in terms of its plans for a future energy mix. It is committed to renewable energy deployment, with full support from King Mohammed VI. Putting the envisaged measures in place will strongly benefit the country, as it will lighten the dependence on costly fossil fuel imports, and may even lead to Morocco becoming an energy exporter (WWF, 2013).

Our quantitative analysis indicates that Morocco could reach the high end of the range of effort sharing results at zero additional cost in comparison to costs incurred from measures already in place or planned by mid-2013. It is conceivable that Morocco could take on a target within this range as an INDC in the Paris agreement. Given the country's high level of activity within the renewable energy field, the inclusion of a renewable energy target seems to be a possibility. However, as Morocco has not been highly vocal in the international negotiations on the post-2020 agreement, it is likely that the country will only come forward with a goal if other, more outspoken developing countries do the same.

Going beyond the high end of the effort sharing range (i.e. meeting more ambitious effort sharing targets) would incur moderate to high costs. International support will have to meet additional financial needs.

10. The Philippines

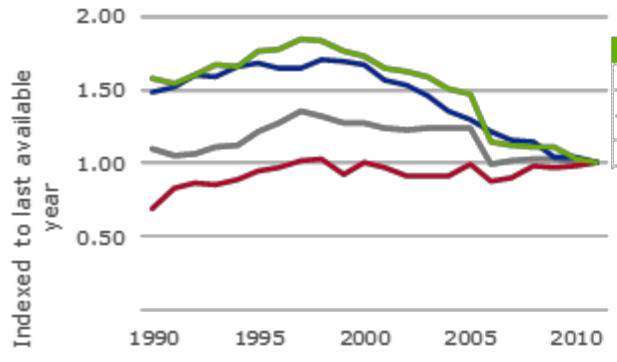
10.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	95.053	mln cap	2011
GDP	1.4E+11	US$ (2005)	2011
Air pollution index	50	ug/m3, mear	2010

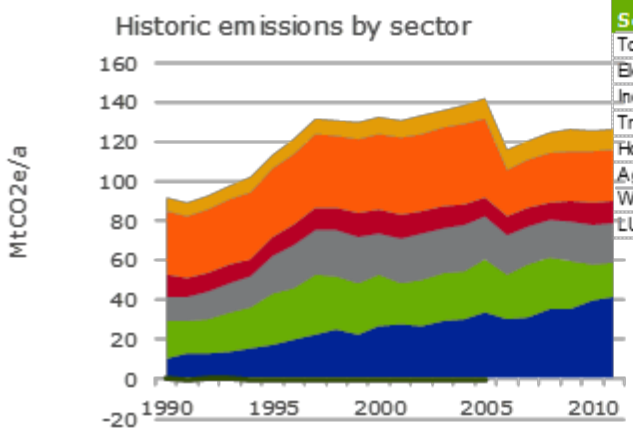
Indicator	Value	Unit	Year
Vulnerability	0.38	-	2011
HDI	0.65	-	2011
Electrification rate	70.2	%	2011

Past trends of decarbonisation indicators



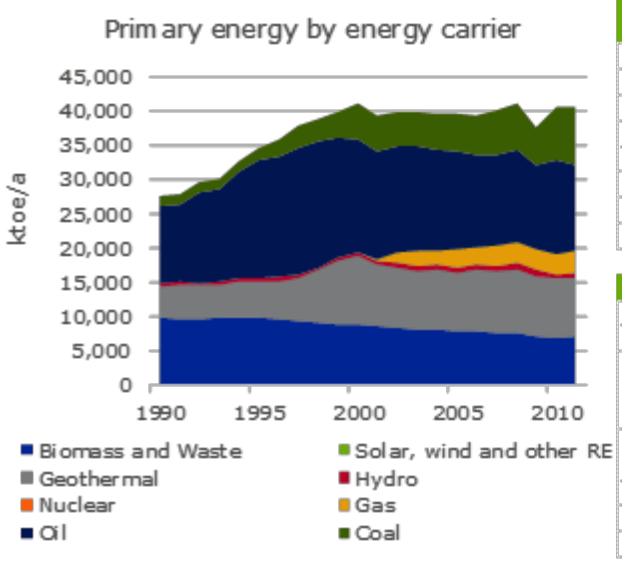
Indicator	Value	Unit	Year
Per capita emissions	1.33	tCO2e/ cap	2011
Emission intensity of electricity	491.5298	tCO2/kWh	2011
Emission intensity of economy	0.93	tCO2e/ USD	2011
Energy intensity of economy	0.30	ktoe/ million	2011

National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	41.7	MtCO2e/a	n.a.
Industry	17.1	MtCO2e/a	n.a.
Transport	20.1	MtCO2e/a	n.a.
Households_and_services	10.9	MtCO2e/a	n.a.
Agriculture	26.1	MtCO2e/a	n.a.
Waste	10.8	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Energy mix



Fuel	Value	Unit	Share in 2011
Biomass_waste	6927	ktoe	17%
Solar_wind_other	8	ktoe	0%
Geothermal	8547	ktoe	21%
Hydro	834	ktoe	2%
Nuclear	0	ktoe	0%
Gas	3291	ktoe	8%
Oil	12399	ktoe	31%
Coal	8447	ktoe	21%

Indicator	Value	Unit	Year
Share of global emissions	0.3	%	2010
Domestic fossil fuel production	7,692	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	32	%	2011
Economic relevance of fossil fuel imports	2.4	% of GDP	2011
Fossil fuel subsidies	1.46	Billion USD	2011
Fuel import dependence	41	% of imports	2011
Fuel import bill	12.89	Billion USD	2011

10.2 Mitigation Potential and Effort Sharing Allocations

The calculated effort sharing range indicates that a fair share of the Philippines in 2025 and 2030 is similar, or slightly higher, than current emission levels. Converging per capita emissions effort sharing approaches allow for continued emissions growth due to the Philippines' low per capita emissions compared to the global average. Under those approaches, emissions may still increase until 2030 and will be at the upper range of the available potential.

The most stringent approach for the Philippines is Triptych, which focuses on the convergence of sectoral indicators independently of the development status of countries. Under this approach, the Philippines would be required to stabilise emissions at current levels.

Sufficient potential is available to reduce emissions significantly below today's level and beyond the fair share indicated by the effort sharing results. This implies that with sufficient amounts of international support, the Philippines could tap into more ambitious ranges of the potential and contribute to further climate change mitigation.

Figure 21: Results of effort sharing and potential calculations for the Philippines

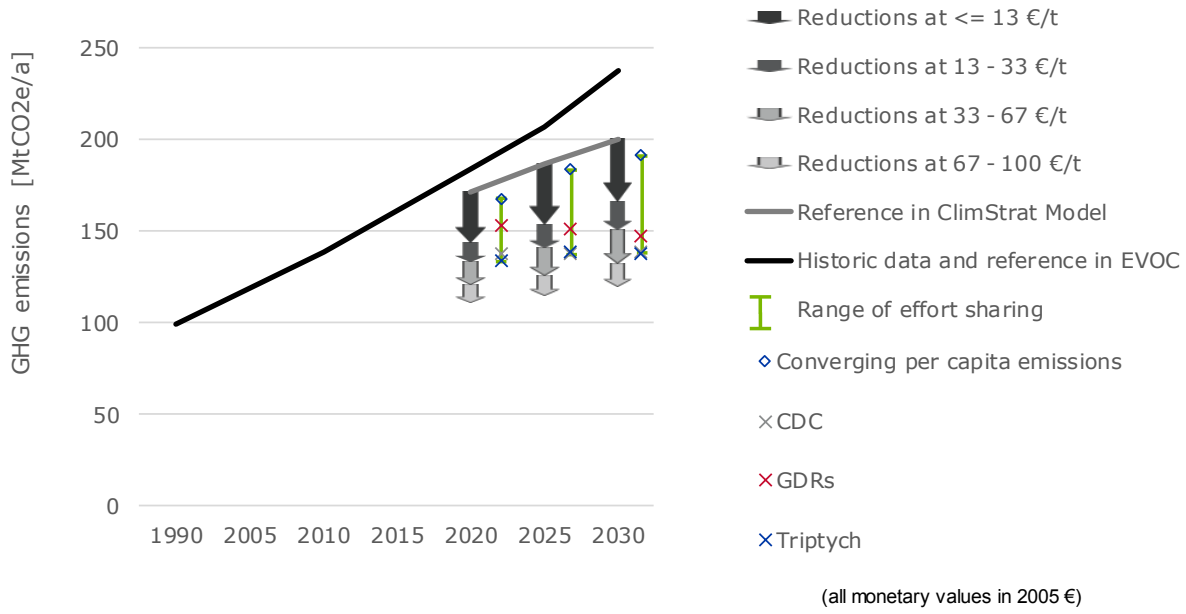


Table 21: Results of Effort Sharing Calculations for the Philippines

Effort Sharing Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	167	183	191	69%	85%	93%	20%	32%	37%
CDC	137	137	138	39%	38%	39%	-1%	-2%	-1%
GDRs	152	150	146	54%	52%	48%	9%	8%	5%
Triptych	133	138	137	35%	40%	39%	-4%	-1%	-1%
Median	145	144	142	46%	46%	44%	4%	4%	2%

10.3 Political System

As a result of the times as a US American colony, the Philippines' legislative system resembles that of the US, with an executive branch, a bicameral legislature (consisting of a House of Representatives and a Senate), and a judiciary branch. Local governments act as autonomous bodies and have their own legislature and judiciary, but the government has "general supervision" over local governments and has power over matters related to the environment, energy, and climate, with the local government playing the role of implementer for policies formulated at the national level in these areas (Republic of the Philippines, 2014a).

Bills and resolutions are proposed by the two houses in the legislature, which, after achieving consensus on a bill's contents (as determined by a majority vote in both houses), submit the bill to the president to be signed into law. The president has the power to veto a bill, but can be overridden by a two thirds supermajority vote from congress. The Senate has the power to vote on international treaties (which require a two thirds majority), while the House of Representatives has the power to vote for appropriation of funds (Republic of the Philippines, 2014b).

The President, who can serve for a maximum of two six-year terms, also has the power to issue executive orders to direct the activities of agencies and other government operations. These have been used in promoting climate change activities, with President Gloria Macapagal-Arroyo issuing three executive orders reorganizing federal bureaucracy to address climate change (Center for Environmental Concern Philippines, 2011).

The Philippines has a multi-party system, consisting of six major parties and a large number of other smaller parties. These parties are elected to seats in the House and Senate and generally form coalition governments of one major party and other smaller parties. Most parties run on anti-corruption, pro-poor, pro-development platforms. While climate change mitigation is rarely, if ever, an element of a party's platform, climate change adaptation (particularly in the form of disaster preparedness) has more recently become a point of discussion in Philippine politics (Traywick, 2013).

The country was ruled as a colony of Spain from the late-16th century until the end of the 19th century, when it became a colony of the USA. It gained commonwealth statues in 1935 and full independence in 1946, although the USA maintained military forces in the country until 1991. Both the USA and Spain maintain a close diplomatic and trade relationship with the Philippines in large part due to their colonial legacies (Tan, 2008).

Climate change has risen in importance on the agenda of the executive and legislature, with an effort to mainstream climate change in Philippine policy. However, observers have warned that funds for mitigation and adaptation efforts might be misappropriated (Carvalho, 2014). In addition to concerns about corruption, the technical capacity of officials needs to be strengthened in order to effectively carry out recent mitigation and adaptation policy goals and programs (World Bank, 2013).

10.4 Historical and Current Domestic Climate Policy and Politics

Philippine politics has been largely characterized by chaos and political controversy over the past three decades, such as periods of martial law, impeachments, government coups, government corruption cases, and mass political demonstrations (Kaufman, 2013). However, the past 2 administrations have been relatively stable and effective in pursuing an economic liberalization agenda, causing an improved economic outlook for the country (The Economist, 2014).

The country's energy mix is dominated by oil, with significant coal and gas use. The Philippines hold a substantial share of the world's geothermal power, making use of abundant potential in the volcanic region. Other renewables still account for a small percentage of primary energy production. Per capita and total emissions are very low.

The Philippines has been active in developing climate change policy since the early 1990s. While mitigation efforts have been included in policy initiatives, because of its status as a developing country efforts and resources are often aimed at sustainable development and climate change resilience and adaptation. For example, a "guiding principle" in the 2009 National Framework Strategy on Climate Change states that "The national priorities (...) of the National Framework Strategy on Climate Change shall be adaptation and mitigation, with an emphasis on adaptation as the anchor strategy" (Climate Change Commission, 2009).

There are currently no "green parties" or political parties with a strong climate component in their party platform. However, given the widespread and severe impact of extreme weather, such as Typhoon Haiyan, many politicians are in favour of climate change policy, particularly when aimed at climate change resilience and adaptation.

10.4.1 Early Efforts

President Corazon Aquino issued Presidential Order No. 2020 in 1991. This order created the Inter-Agency Committee on Climate Change (IACCC), a committee that was tasked with coordinating climate change activities of various government agencies and civil society groups, formulating policy, and shaping national positions in international climate change negotiations (Center for Environmental Concern Philippines, 2011).

A National Action Plan on Climate Change (NAP) was developed in 1997 to provide guidance to various agencies (such as the Department of Energy and the Department of Agriculture) on mitigation and adaptations activities (Department of Environment and Natural Resources, 2014b).

Between 1998 and 2001 the Philippines government and US aid agency USAID developed the Philippine Climate Change Mitigation Program, primarily aimed at reducing emissions through fuel switching and improved efficiency and electricity transmission (Center for Environmental Concern Philippines, 2011).

10.4.2 Mainstreaming Climate Change

The Gloria Macapagal-Arroyo administration, which was elected in 2000, implemented the Medium-Term Philippine Development Plan (MTPDP) in 2004, which called for forest management as an adaptation and mitigation strategy, and increased liberalization of the energy sector to improve deployment of renewables, particularly hydropower and geothermal. However, the MTPDP also called for greater exploitation of indigenous fossil fuel resources to promote energy independence, potentially negating some of the mitigation benefits of the plan (The National Economic and Development Authority, 2010).

In 2009, both houses approved the Republic Act 9729, creating the Climate Change Commission (CCC), and President Arroyo, of the centre-right Lakas-CMD party, signed it into law. This Commission is the sole climate policy-making body in the Philippines, and is in charge of coordinating, monitoring, and evaluating all climate change programmes and action plans (Republic of the Philippines, 2009).

The Commission was set up as an autonomous body attached to the office of the President in an attempt to avoid the institutional and bureaucratic issues that had impeded climate change policy and programme development under the Commission's predecessor, the IACCC (Center for Environmental Concern Philippines, 2011).

The Commission consists of a chairperson (a position held by the president) and three commissioners appointed by the chairperson/president. The Commissioners must have a background in climate change (defined as 10 years of experience), and serve for no more than two terms of six years. The Commission receives input from an advisory board consisting of Secretaries from various departments (agriculture, energy, foreign affairs and others), representatives from business, NGOs, and the academy, as well as representatives of local government. Additionally, a panel of technical experts advises the commission. On the subnational level, Local Government Units (LGUs) act as "frontline agencies in the formulation, planning and implementation of climate change action plans" assisted by the Department of Interior and Local Governance (Republic of the Philippines, 2009).

A Climate Change Office (CCO) was created under the Department of Environment and Natural Resources (DENR) to serve as the administrative arm of the CCC, and consists of an executive director (a position filled by the vice chairperson of the CCC), a deputy executive director, as well as other officials and staff (Republic of the Philippines, 2009). The CCO also acts as the coordinating mechanism among the offices of the DENR, other government agencies, NGOs, and LGUs (Department of Environment and Natural Resources, 2014a).

The Act also called for the development of a National Framework Strategy on Climate Change (NFSCC), which was released in early 2010 and outlined the general strategy and "Key Result Areas" for mitigation and adaptation. These areas include energy efficiency, conservation, and renewables, transport, and forests ("National REDD+ Strategy"). The NFSCC also called for the "appropriate management and institutional arrangements and coordination mechanisms at the national, sub-national, and local levels," (Climate Change Commission, 2009).

In early 2011 the National Climate Change Action Plan (NCCAP) was issued. This plan, which is to be carried out in three six-year phases, outlines the agenda for adaptation and mitigation activities from 2011 to 2028, focusing on seven main areas. The majority of these focus areas are primarily aimed at promoting adaptation measures and climate resilience, with few aimed at mitigation strategies or containing mitigation as a co-benefit of adaptation measures. The NCCAP points to promoting renewable energy and carbon sequestration (through enhancing forest and ocean carbon sinks) as primary areas for mitigation, and specifies quantified targets for installed capacity of renewables through 2030 (Climate Change Commission, 2011).

At the local level, LGUs are to design (with input and guidance from the CCC) Local Climate Change Action Plans (LCCAPs). Although these plans have mitigation components, they are primarily aimed at "climate proofing" (Climate Change Commission, 2011).

The Philippine Development Plan (PDP), which outlines the country's development objectives, was drafted at the same time the NCCAP was being developed. Therefore, there are overlapping elements between the two documents, signalling the mainstreaming of climate strategy into development planning. The PDP calls for an annual GDP growth of 7-8% year in a "climate resilient manner" (Shrivastava, 2013). However, like the NCCAP, the PDP frames climate change primarily in terms of developing climate resilience in agriculture, infrastructure, energy, and others areas, and not in terms of mitigation (The National Economic and Development Authority, 2011).

10.4.3 Recent Developments

In 2010 President Arroyo, who had signed Republic Act 9729, lost the presidential election to Benigno "Noynoy" Aquino III, who had helped draft the Act while serving as a senator. However, climate change has not been a priority during Aquino's first term, with none of his State of the Nation addresses mentioning climate change. However, as of 2014, 137 climate change policies had been "issued, updated, or disseminated" (Department of Budget and Management, 2014).

President Aquino also issued an executive order to create cabinet clusters, including the Climate Change Adaptation and Mitigation Cluster (CCAMC). A cabinet is the highest-policy making body of the executive branch, and this reorganization and creation of clusters is an attempt to better coordinate government activities in line with development goals. The CCAMC is tasked with "adopting climate change adaptation and mitigation measures by local government units and their respective communities, national government agencies, and the general public; and ensure that these are incorporated in their annual work plans and budgets, where applicable." The CCAMC is chaired by the Secretary of the Department of Energy and Natural Resources, with the CCC serving as secretariat and carrying out coordinating and administrative duties. Officials from a number of departments, such as the departments of energy, agriculture, and national defence, serve as members of the CCAMC (Republic of the Philippines, 2011).

The Philippines recently announced a new energy plan which would increase the amount of natural gas in its energy fuel mix by up to 30 percent over the next 16 years (Reuters, 2014a). This is in addition to plans for increasing installed renewables by 15,304.3 MW by 2030 from 5,438 MW in 2010 (Department of Energy of the Philippines, 2008).

At the UN Climate Summit, held in September in New York, President Aquino spoke about the countries adaptation and climate resilience efforts and touted current low carbon development policies, but did not put forward any statement on intended nationally determined contributions or additional pledges.

On the heels of the Summit, the climate activists and civil society groups began a 38 day march from the capital in Manila to Tacloban, the site of the most extreme damage from the 2013 typhoon Haiyan. Naderev Saño, the country's climate commissioner, also joined the march.

10.4.4 REDD+

The Philippines is pursuing mitigation, adaptation, and rural development through a variety of forestry activities under REDD+. In 2010, the DENR and a group of NGOs drafted the Philippines National REDD-Plus Strategy in order to prepare land-holders and government agencies to develop REDD+ projects, as well as to develop the necessary technical capacity and enabling policies. Although a total mitigation potential from forestry activities is given, along with an estimate of future potential avoided deforestation, no specific targets for REDD+ activities are provided in the strategy document (Department of Environment and Natural Resources, 2010).

10.4.5 Challenges

While some financing for mitigation and adaptation is to come from public funds and favourable loans from the government, the NCCAP and NFSCC call for activities to be financed by private finance and ODA where possible. It is unclear how activities will be financed if private sources of funding are not forthcoming (Climate Change Commission, 2009, 2011).

Some policies that aim to increase climate resilience may also be exacerbating climate change by increasing the Philippines emissions. For example, the liberalization of the energy and mining sectors, which has been expanded under the 2011-2016 MTPDP, may support economic security and improving infrastructure, and by extension climate resilience, but also contribute to greater national emissions (Lofts & Kenny, 2012).

10.5 Historical and Current International Climate Policy Positions

The Philippines was among the first countries to sign and then ratify the UNFCCC, as well as one of the first to sign the Kyoto Protocol (in 1998, followed by ratification in 2003). As a developing country, the Philippines was classified as a non-Annex I party with no binding commitments to reduce emissions. A number of factors – developing country status, low historic and current emissions, high rates of deforestation, and vulnerability to the impacts of climate change – have guided the negotiating position of the Philippines.

10.5.1 Alliances and Negotiating Blocs

These factors, and in particular it's developing country status, have also determined the negotiating blocs that the Philippines has allied itself with. The Philippines has long been a vocal member of the G77+China in the UNFCCC process, either authoring or signing submissions from this group. They have also begun negotiating as part of the group of Like Minded Developing Countries (LMDCs), who negotiate around "equity and Common But Differentiated Responsibilities (CBDR) principles; increasing developed countries' mitigation commitments; the provision of the means of implementation to developing countries from developed countries, such as finance and technology transfer; adaptation; the use of non-market approaches; establishment of a loss and damage mechanism; and the economic and social consequences of response measures" (International Institute of Sustainable Development Reporting Services, 2013).

The Philippines also negotiate with the Association of South East Asian Nations (ASEAN), consisting of the Philippines and other nations in the region, particularly Vietnam, Indonesia, and Thailand. Submissions from the ASEAN group have primarily dealt with LULUCF, REDD+, and forestry under the Kyoto Protocol.

With each of these groups, CBDR has been an important defining principle. The Philippines, particularly as part of G77+China and the LMDCs, has repeatedly affirmed in discussions on mitigation that non-Annex I countries should not be subject to new commitments. More recently, the Philippines, with the LMDCs, asserted that outcomes of the Durban Platform on Enhanced Action should be "fully in accordance with the principles of the Convention," particularly CBDR and equity (Like-Minded Developing Countries, 2012).

In 2009 the Philippines announced a voluntary, non-binding pledge to reduce emissions 5% from 1990 levels by 2012 "utilizing similar mechanisms found under the Kyoto Protocol but adapted to Philippine developing country-setting" (UNFCCC, 2009). However, it has emphasized that any enhanced ambition on the part of it, or other developing countries, must be accompanied by the "scaled-up provision of new and additional, adequate and predictable financial resources, including for the transfer of technology."

The Philippines, because of its vulnerability to climate change impacts, has consistently stressed the importance of adaptation in its negotiating positions, calling adaptation a "national priority". The Philippines has called for financing of adaptation activities through the Green Climate Fund, and has stated that adaptation should be addressed in the 2015 agreement (Like-Minded Developing Countries, 2012). The Philippines also backed the establishment of the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts (L&D mechanism), and has strongly urged parties to operationalize the mechanism. They have stated that mitigation and adaptation should be given equal attention under the Convention, and have cautioned against moving any elements of the Convention outside of the UNFCCC multilateral process, worrying that bilateral or multilateral agreements on mitigation could undermine adaptation support for developing countries.

10.5.2 REDD+ and Finance

High rates of deforestation have contributed to the Philippines seeking the adoption of a mechanism to finance forestry activities through REDD. The Philippines, individually, as well as with G77+China and particularly with ASEAN, have submitted position papers and submissions to the UNFCCC, calling for financing through REDD+ from both fund- and market-based approaches, as well as flexibility in eligible types of forest-related mitigation activities (ASEAN, 2008).

The position of the Philippines has remained relatively unchanged over the course of UNFCCC negotiations. A recent "conference room paper" with the LMDCs stated that although the 2015 agreement would be applicable to all, it would not be uniform in its applicability, and should reflect "responsibilities for historical emissions." They also called for equal treatment of "mitigation, adaptation, finance, technology transfer, capacity building, and transparency of action and support" under a 2015 agreement (Like-Minded Developing Countries, 2014b).

The Philippines (with the LMDCs) asserted that Annex I parties should take the lead in mitigating emissions, and commit to emission reduction goals that are comparable to current targets, while non-Annex I parties should submit "nationally-determined NAMAs subject to (…) and supported by finance, technology development and transfer, and capacity building from Annex I parties" (Like-Minded Developing Countries, 2014b).

10.6 Conclusions

Effort sharing approaches indicate that the mitigation potential is greater than the mitigation responsibility. This matches the Philippines' negotiation position which underlines responsibilities of developing countries to mitigate climate change and calls for the provision of finance and technology transfer for enhanced mitigation.

Effort sharing proposals suggest that the Philippines should stabilise emissions roughly at today's levels or slightly above to be considered within their fair share of emissions under most effort sharing approaches. According to our calculations, the Philippines could potentially pursue low cost measures without international support.

While adapting to climate change remains the focus of the country's climate policy, some institutional structures have been created which also support mitigation of climate change. The public is aware of the issue of climate change. This could build the basis for unilateral actions on climate change mitigation, potentially focusing on measures which hold important benefits for the country, such as energy security or climate smart agriculture. Enhanced mitigation at higher cost should follow, however, according to our analysis, these measures should be supported by international finance.

11. Russia

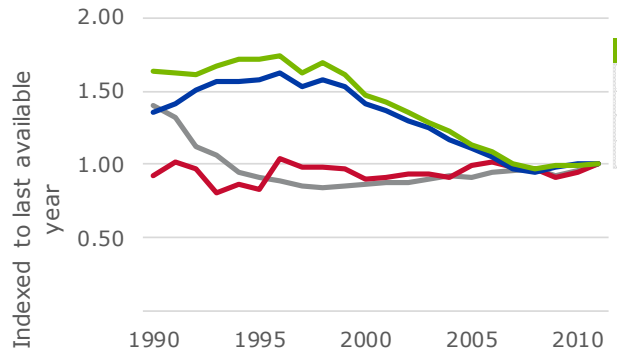
11.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	142.960	mln cap	2011
GDP	9.5E+11	US$ (2005)	2011
Air pollution index	33	ug/m3, mear	2009

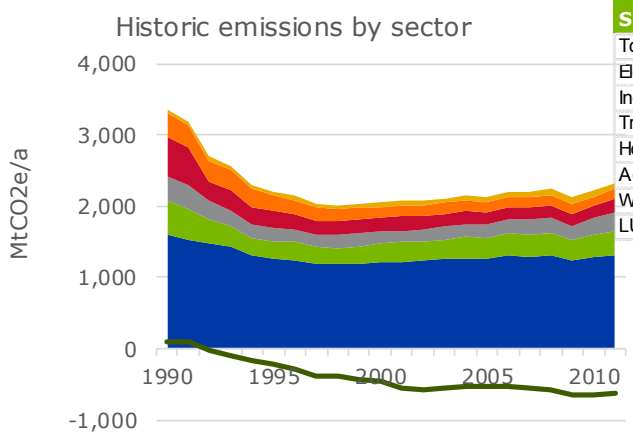
Indicator	Value	Unit	Year
Vulnerability	0.29	-	2011
HDI	0.78	-	2011
Electrification rate	n.a.	%	n.a.

Past trends of decarbonisation indicators



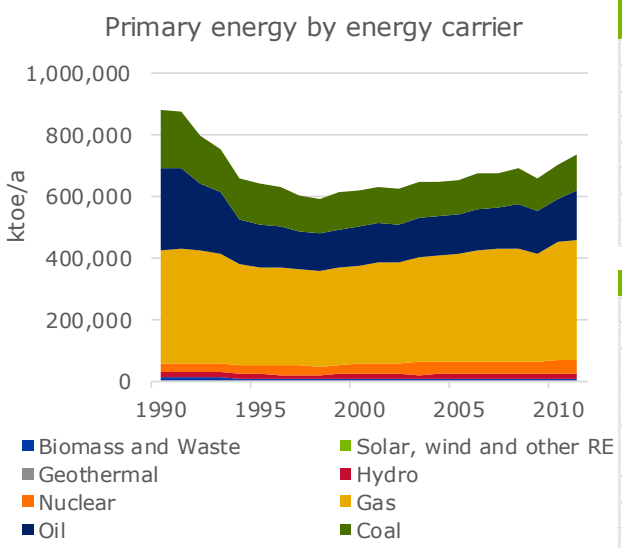
Indicator	Value	Unit	Year
Per capita emissions	16.23	tCO2e/ cap	2011
Emission intensity of electricity	437.3508	tCO2/kWh	2011
Emission intensity of economy	2.45	tCO2e/ USD	2011
Energy intensity of economy	0.77	ktoe/ million	2011

National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	1692.4	MtCO2e/a	100%
Electricity_and_Heat	1317.4	MtCO2e/a	78%
Industry	321.4	MtCO2e/a	19%
Transport	283.6	MtCO2e/a	17%
Households_and_services	173.6	MtCO2e/a	10%
Agriculture	144.0	MtCO2e/a	9%
Waste	80.9	MtCO2e/a	5%
LULUCF	-628.4	MtCO2e/a	-37%

Energy mix



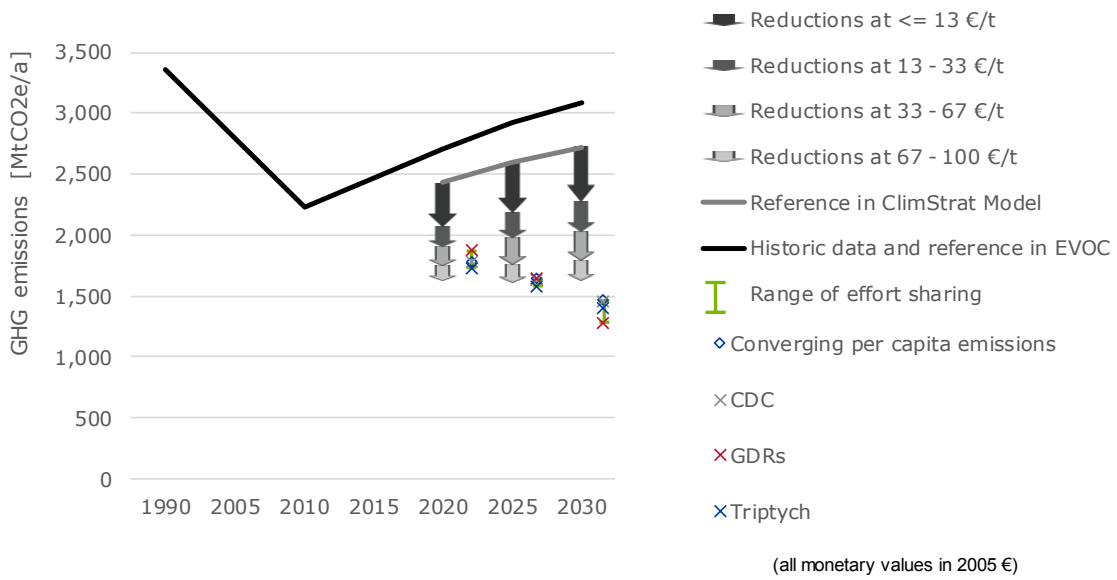
Fuel	Value	Unit	Share in 2011
Biomass_w aste	7088	ktoe	1%
Solar_w ind_other	0	ktoe	0%
Geothermal	449	ktoe	0%
Hydro	14263	ktoe	2%
Nuclear	45439	ktoe	6%
Gas	391213	ktoe	53%
Oil	158523	ktoe	22%
Coal	115604	ktoe	16%

Indicator	Value	Unit	Year
Share of global emissions	5.0	%	2010
Domestic fossil fuel production	1,247,634	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	95	%	2011
Economic relevance of fossil fuel imports	0.2	% of GDP	2011
Fossil fuel subsidies	40.15	Billion USD	2011
Fuel import dependence	-80	% of imports	2011
Fuel import bill	5.72	Billion USD	2011

11.2 Mitigation Potential and Effort Sharing Allocations

Figure 6 illustrates a potential fair share of emission reductions for Russia and mitigation potential for the years 2020, 2025 and 2030. The reductions required by effort sharing approaches go significantly below today's level and will be difficult to reach through domestic action only.

Figure 22: Results of Effort Sharing Calculations and Mitigation Costs for Russia



Effort sharing calculations foresee substantial reductions for Russia in order to be on track to meet the 2°C target. The effort sharing calculations for Russia are quite harmonised and do not show large variations between the different approaches. For 2020, allocations range from about 1,750 to about 1,860 Mt CO_2eq. This would mean a significant reduction from the reference emissions level for that year, which the EVOC model calculates to be about 2,580 Mt CO_2-eq. Russia's 15%-25% reduction target is hence around 1000 Mt CO_2-eq above their fair share in 2020.

For 2025, the range of effort-sharing allocations is minimal, all moving around 1,600 Mt CO_2-eq., 150 Mt lower than for 2020. Allocations for 2030 range from 1,271 with the GDRs approach to 1,455 Mt CO_2-eq. with the converging per capita emissions approach.

Russia's potential for emission reductions with economic benefits is quite high. According to ClimStrat calculations, the country could reduce as much as 362 Mt CO_2-eq. in 2020 purely with cost-neutral measures. In 2025 and 2030, this number increases to 418 and 436 Mt CO_2-eq., respectively. Reaching emissions levels consistent with the median of effort sharing approaches would imply reduction measures at costs up to 67 €/t CO_2 in 2020. In 2025, reaching the level indicated by effort sharing approaches requires measures at costs up to 100 €/t and in 2030, Russia's fair share is as much as 200 Mt CO_2-eq below the reduction level achieved when reduction measures at costs up to 100 €/t CO_2 are implemented.

Table 22: Results of Effort Sharing Calculations for Russia

Effort Sharing Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	1.771	1.632	1.455	-47%	-51%	-57%	-21%	-27%	-35%
CDC	1.768	1.624	1.440	-47%	-52%	-57%	-21%	-27%	-35%
GDRs	1.867	1.633	1.271	-44%	-51%	-62%	-16%	-27%	-43%
Triptych	1.719	1.570	1.386	-49%	-53%	-59%	-23%	-30%	-38%

Median	1.769	1.618	1.414	-47%	-52%	-58%	-21%	-27%	-37%

11.3 Political System

Russia's 1993 constitution formally established a federal semi-presidential republic, in which presidential powers are checked by parliament. The President of the Russian Federation, who is elected every six years, holds primary power. With the ascent of Vladimir Putin to the Russian presidency in 2000, the country's political system became increasingly centralised and presidential powers were strengthened.

According to Russia's 1993 constitution, the country's parliament, the Federal Assembly, is made up of a lower house called State Duma and an upper house known as the Federation Council. As of 2011, the 450 Duma deputies are elected every five years based on a mixed electoral system.[44] The 168 members of the Federation Council are the heads and deputy heads of the local legislatures in Russia's 83 regions.

Since its formation in 2001, Russia's political landscape has been dominated by *United Russia,* the so-called government party. Following the Putin administration's restoration of state-control over major Russian tv-channels in the early 2000s,[45] *United Russia* has been able to influence public opinion to its favour, which also found its expression in election results. In the 2003 Duma elections, the party already received more than one third of seats, and in 2007, they gained a two-third majority, which enabled them to pass constitutional amendments. Although suffering a loss in the 2011 vote, they currently still hold a simple majority in the Duma.

The regular legislative process for passing a federal law in Russia involves both houses of parliament and the President. Initially, a draft law[46] has to go through three hearings in the Duma. Upon adoption, it is passed to the Federation Council for review. It is considered passed by the Council and subsequently sent for approval and signature to the President, if it has been approved by more than half of the Council's members, or if it has not been considered within fourteen days. Russia's parliament can override a presidential veto with a two-third majority in both houses. However, parliamentary control over state finances is substantially limited as draft laws dealing with revenues or expenditures require governmental consent.

In addition to Federal Laws, the President and the government, represented by the prime minister, have the power to issue legally binding decrees with the force of law, as long as they are within their competencies and do not contradict existing laws of higher precedence. Policy-related presidential decrees tend to address under-regulated policy fields – such as climate policy – and can be superseded by federal laws. Governmental orders and resolutions are issued to implement and administer the requirements set out by federal laws or presidential decrees.

11.4 Historical and Current Domestic Climate Policy and Politics

In Russia's public and political debate, environmental issues have traditionally fared low. Only since 2009, the Russian government has a proper climate policy in place, although its drivers and motivations have been acknowledged to differ from those of other leading economies (Kokorin & Korppoo, 2013).

In the Soviet era, Moscow deliberately depoliticised environmental issues in general and climate change in particular (Sikolov, Jager, & Pisarev, 2001). The abundance of natural resources facilitated the provision of cheap energy for the country's large industrial enterprises – the backbone of the USSR's state-owned economy. But low energy prices also encouraged the inefficient use of energy and

[44] Half of the seats are allocated directly through Single Mandate Districts, while the other half is filled through party lists.

[45] In the 1990s, media tycoons Vladimir Gusinsky and Boris Berezovsky dominated Russia's media landscape. Following Putin's election to the Russian presidency in March 2000, both were forced to sell their shares in leading Russian tv channels: Gusinsky passed his share in NTV to the state-owned gas company Gazprom, and Berezovsky sold his stake in ORT (now Channel One) to Putin confidant oligarch Roman Abramovich.

[46] Draft laws may be initiated by either legislative chamber, or be submitted by the President, the government, local legislatures and the Supreme Court, the Constitutional Court, or the Superior Court of Arbitration within their respective competences.

– alongside pollution caused by the Russian military and the country's oil industry – considerably contributed to massive environmental degradation. Being the main perpetrator of large-scale pollution, the Soviet government had a genuine interest to keep environmental problems secret (Robinson, 1988). Only in the wake of Gorbachev's reforms in the late 1980s, the Government launched first ecological and energy efficiency initiatives. In 1988, the State Committee for Nature *Goskompriroda* was founded, which by 1991 evolved into the Ministry of Nature Use and Environmental Protection.

In light of the deep economic crisis following the disintegration of the USSR, climate issues continued to rank low in Russian politics. Although the government joined the UNFCCC and participated in the negotiations on the Kyoto Protocol, Russian politicians did not place climate change on their political agenda, because the issue contradicted the interests of Russia's political and economic elite. At a time when global warming ranked high on the domestic agendas of Western politicians, climate change for a number of reasons failed to make it to the Russian agenda:

- First, Russia's small community of climate scientists, grouped around Russia's Hydrometeorological Monitoring Service *Roshydromet*, the state agency that represented Russia in UNFCCC negotiations, did not unambiguously identify climate change as threat. Whilst acknowledging the dangers associated with the melting of Russia's permafrost, they, for instance, also predicted a positive effect for Russian agriculture (Kundzewicz, Schellnhuber, & Svirejeva-Hopkins, 2004) (Miller & Pearce, 1989)(Izrael, 2005).
- Second, environmental NGOs that could have raised awareness among the Russian public were and still are criminalised by the Russian leadership, who feared that the uncovering of environmental grievances could cause a societal uproar (Henry, 2010)(Badkhen, 1999)(Brown, 2013).
- Third, the climate problem was also not taken up by the Russian media, which in the 1990s were largely controlled by the media tycoons Boris Berezovsky and Vladimir Gusinsky. Arguably, they abstained from championing the dangers of climate change on Russian tv-screens to avert damage to the Russian leadership's public image.[47]
- Finally, following the rise of the oil price in the late 1990s, Russian oil companies started to increasingly invest in climate-hostile lobbying activities. From their perspective, stricter international GHG emission targets would negatively affect their export activities (Kokorin & Korppoo, 2013), while global warming facilitates access to oil reserves under the Arctic continental shelf (Yenikeyeff & Krysiek, 2007).

Although Russia in 2004 ratified the Kyoto Protocol and, thus allowed the agreement to enter into force, Moscow, in contrast to most of the other parties, did not act to satisfy a domestic climate lobby, but to gain recognition as an international player and certain advantages in the international community, including membership in the World Trade Organisation (WTO) and a friendship treaty with the EU. With the entry into force of the Protocol, however, a gradual process started that introduced climate policy as a new policy field to Russia from abroad (Westphal, 2010)(Nikitina, 2001).

A first significant step towards the formation of Russia's climate policy was the publication of a report by Roshydromet in 2005, which explicitly confirmed that climate change was an anthropogenic phenomenon (Roshydromet, 2005). Albeit also listing a number of positive effects that climate change would have for Russia,[48] the report explicitly identified global warming as threat to Russia's national

[47] In early 1996, Berezovsky and Gusinsky formed an alliance with five other oligarchs to support president Yeltsin's re-election, as his devastating public rating made a Communist victory in the 1996 presidential elections likely. ##source?

[48] Those include: access to the Arctic continental shelf, expansion of trade due to longer use of the Northern route due to ice free ports, shorter heating periods in the winter, longer growing seasons, and increase in arable land, and the cultivation of new crops

security[49] and urged the government to take action to mitigate the negative consequences of climate change.

Yet, it took another four years until first policy action within parts of the government could be observed (Korppoo, 2009). Only in April 2009, former Prime Minster Putin announced plans to develop a climate doctrine (BBCMFSU, 2009a). This change of heart was linked to the outbreak of the world financial crisis in Autumn 2008, by which Russia was particularly affected. The government and the economic elite suddenly discovered the economic potential arising from Russia's membership in the Kyoto protocol, leading policymakers to establish the linkage between climate change and energy efficiency. In January 2009, the government passed a decree aiming to increase the share of renewable energy in power generation excluding large hydro power to up to 4.5% by 2020(Government of the Russian Federation, 2009a). In April 2013, the Government adopted a reduced target of 2.5% by 2020 in the State Program for Energy Efficiency and the Development of the Energy Sector(Government of the Russian Federation, 2013). Advocated by Russia's state-controlled energy companies Gazprom and RAO UES, the Russian-German Energy Agency RuDEA was launched in July 2009 to support the development of efficient and environmentally friendly energy generation (Interfax, 2009). In August the same year, the Russian Energy Ministry introduced a new energy strategy for the period until 2030 (BBCMFSU, 2009b), which the government approved a few months later in November 2009 (RIA Novosti, 2009a). In 2014, Russia is still without a functioning support scheme that could stimulate the large-scale deployment of clean energy sources. As a result, investors in the renewable energy sector face various obstacles relating to the remaining regulatory gaps, high protectionist barriers and insufficient financial incentives to level the playing field with conventional electricity and heat generation (Boute, 2014).

Energy efficiency was to become the backbone of Russia's modernisation and climate policy was to play a major part in it (Giddens, 2010)(Henry & Sundstrom, 2012)(Charap & Safonov, 2010). In his manifesto article entitled "Go Russia", President Medvedev in September 2009 identified the "efficiency of production, transportation and use of energy" as the first of five priorities to modernise Russia (Medvedev, 2009). The same year, the Russian government made an unprecedented effort to enhance their scientific knowledge of climate change, when employing various research institutions to test climate change projections (Istomin, 2010). During the Copenhagen climate conference, the Russian President eventually adopted the awaited climate doctrine (President of Russia, 2009).

This document identifies climate change as one of the major elements with long-term consequences for Russia's security and acknowledges that mitigation policies will have a net economic benefit for the country. The doctrine further calls for the early development of a comprehensive and balanced public approach to climate problems based on scientific research and suggests the following four areas on which Russia's climate policy should focus:

- To establish legal and regulatory frameworks and government regulations in the area of climate change;
- To develop economic mechanisms related to the implementation of measures aimed to adapt to and mitigate human impact on climate;
- To provide scientific, information and personnel support for the development and implementation of adaptation and mitigation measures;
- To cooperate internationally regarding the development and implementation of adaptation and mitigation measures.

Following the ratification of the Kyoto protocol, a climate coalition was established by civil society, business and local authorities that has been able to exert limited influence over Russian policymakers

[49] The projected negative consequences justifying this judgement are the flooding of large areas of St. Petersburg and the Yamal peninsula, infrastructure damage to the country's infrastructure -including its pipeline and road network - due to melting permafrost, longer drought periods, and extreme precipitation.

(Kokorin & Korppoo, 2013)(Chepurina, 2012). This coalition brought together the following three interest groups, who for various reasons lobbied the government to adopt climate-friendly policies:

- Ecological NGOs – first among them the WWF Russia, Greenpeace, the Russian Social and Ecological Union (RSEU), Environment Defence and Bellona – who champion environmental protection and raising ecological awareness in their missions.
- Big businesses with an interest to invest in renewable energies – often represented by the environmental committees of Russia's major business associations RSPP and Delovaya Rossiya – who seek to benefit from foreign investments in the framework of the Joint Implementation Programme under the Kyoto Protocol (Horowitz, 2007)
- Politicians in some Russian regions – including Volga, Ural, St. Petersburg and the Leningrad region, Tomsk, Sverdlovsk, and Murmansk amongst others – who also conceive of the opportunities opened by the Kyoto Protocol as a chance to attract foreign investment to develop new technologies and modernise their out-dated energy infrastructure.

The 2009 climate doctrine nominally strengthened the domestic climate coalition as it endorsed critical climate science and education, conceded a role to NGOs and the mass media and encouraged economic actors to engage in projects aimed at improving energy efficiency. Although Russia's leading business newspapers *Kommersant* and *Vedomosti* have reported on climate change issues, the coalition has not launched large-scale awareness-raising campaigns in the mass media (Kokorin & Korppoo, 2013). This has been attributed to their limited funds.

Considering, however, that – with the exception of the NGOs – the members of the coalition pursue economic goals, it comes to no surprise that their primary interest is not directed towards reaching the public. To realise their aims, the stakeholders instead need to reach policymakers at the federal level. The fact that the climate coalition does not include members of the federal government complicates this endeavour. In contrast, climate-hostile managers of energy-intensive, but profitable, state-controlled enterprises – for instance in the arms, metal, chemical and oil industry – can be expected to have comparatively easier access to policymakers. Russia's small climate coalition has, nevertheless, been able to successfully lobby for limited climate action.

Firstly, they achieved that the government made use of the opportunities arising for Russian enterprises under the Kyoto Protocol's Joint Implementation (JI) mechanism. With the start of the Kyoto Protocol's first commitment period at the beginning of 2008, Russia became eligible to benefit from foreign investments by Annex B parties[50] into projects that reduce emissions by sources, or enhance their removal by sinks.

While bureaucratic hurdles initially partly thwarted the efforts of Russian companies to apply for JI projects, the government in the context of the financial crisis started to realise the KP mechanisms' potential for modernising the Russian economy. Only in late October 2009, the government adopted a decree on the implementation of Article 6 of the KP (Government of the Russian Federation, 2009b). And in July 2010, they eventually approved the first fifteen JI projects, which also included initiatives by Russia's state-controlled gas and oil companies Gazprom and Rosneft, which according to a research by the U.S. Climate Mitigation Services are among the ninety companies worldwide "responsible" for climate change (Heede, 2013).

Due to protests from the business association RSPP claiming that the Russian government regulated market access to JI projects (BBCMFSU, 2011), large scale approvals for JI projects only followed in 2011 and 2012,[51] with 150 projects gaining approval in 2012 alone. The opportunities arising from Russia's need to replace its out-dated infrastructure led experts to argue that Russia could become the leader in the third industrial revolution, which will be driven by smart energy, clean technology and

[50] Annex B of the Kyoto Protocol lists member countries with an emission reduction or limitation commitment.
[51] For examples see: http://ji.unfccc.int/JI_Parties/DB/6DRH120BQZA26Q78VQ5FDCS7FTPQIU/viewDFP

the Internet (Vaandrager, 2012). For instance Gazprom alone was able to cut their GHG emissions in 2012 by 3.8 million tons compared to the previous year through the implementation of JI projects (RSEU, 2014). However, Russia's climate coalition failed to convince policymakers to take on any quantitative obligations in the second Kyoto commitment period from 2013 to 2020. As the first commitment period expired end of 2012, Russia was no longer formally entitled to the privileges and duties of the Kyoto Protocol and Russian companies from 2013 on, lost access to the Kyoto mechanisms.

A second success for Russia's climate lobby was the government's adoption of the Comprehensive Implementation Plan on 25 April 2011 (Government of the Russian Federation, 2011), which transformed the 2009 climate doctrine into action and provided a benchmark for forecasts and the development of programmes for Russian regions and businesses. The preparation of the document had taken one and a half years, due to resistance by industrial interest groups (Shapovalov, 2011). The plan lists 31 measures that are assigned to various executive agents at the federal level and tagged with a rough timeframe for their delivery. These 31 items are listed under the following five sections:

1. Strengthen and develop informational, scientific, social and personnel policies in the climate field
2. Develop and implement operative and long-term adaptation measures
3. Develop and implement operative mitigation measures
4. International cooperation in the field of climate change
5. Control the implementation of the comprehensive implementation plan

The document, which does not include any details on financing of the measures, has been taken as sign that the then-Russian Prime Minister, Vladimir Putin, finally had embraced the concept of anthropogenic climate change (Shapovalov, 2011).

Apart from Russia's climate coalition and the general recognition that more efficient use of energy is key to modernising the country's infrastructure, the government's rising climate awareness can also be attributed to an increase in extreme weather events[52] (Korsunskaya, 2010), and Russian obligations to reduce energy subsidies for industrial consumers in line with Russia's accession to the WTO in 2004 (McGregor, 2004) (Henderson, 2011).

With respect to the reduction of energy subsidies, progress has been slow. While Russia joined the WTO in 2012, the government until today obliges Gazprom to subsidise gas prices for private and industrial consumers. In 2013, they decided to slow down the process of increasing domestic gas prices, leading Gazprom to complain that the lack of revenues neither allowed them to invest in the construction of new production, transmission and storage facilities, nor to maintain the existing ones (Gazprom, 2014).

The most recent developments (at the time of writing – October 2014) in Russian climate policy are related to President Putin's long-awaited decree of September 2013; "On the Reduction of Greenhouse Gas Emission Volumes". The decree announces that Russia's domestic GHG emission reduction target for 2020 is to reduce emissions by 25% compared to the 1990 level (President of Russia, 2013). Experts have judged this target to be in line with business-as-usual projections (Kokorin & Korpoo, 2014). The EVOC BAU scenario projects that emissions in 2020 would be 19% below the 1990-level without any particular efforts, and is therefore quite high compared to more recent projections, which envisages emissions to remain at 25 – 30% of 1990-level from 2020 until 2030. On 2 April 2014, the government approved an action plan prepared by the Ministry of Economics, identifying different measures to achieve the 25% reduction target. The plan lists 17 measures, their reporting require-

[52] In the summer of 2010, Russia was hit by the worst heat wave on record, which killed 54 people in forest fires, destroyed a quarter of the grain crop and has caused an estimated economic loss of at least US$14 billion.

ments and time frame as well as agents responsible for their implementation. The measures fall into the following three areas:

1. Formation of a system to record GHG emissions on the level of enterprises
2. Estimation and forecast of GHG emission volumes until 2020 and 2030 including a sectorial assessment
3. Regulation of GHG emission volumes by the state

In autumn 2014, the Russian government is expected to adopt a general MRV-concept.

11.5 Historical and Current International Climate Policy Positions

In 1992, Russia signed the United Nations Framework Convention on Climate Change (UNFCCC), and in 2004 the country ratified the Kyoto Protocol (KP) to the Convention. Under the KP, Russia committed to reduce GHG-emissions to 1990-levels during the first commitment period (from 2008-2012). As legal successor of the USSR, it was unimaginable for Russia to be included in the same category as the developing countries (Istomin, 2010). Despite its comparatively poor economic record, Russia therefore joined the group of developed countries and committed to limiting emissions. In light of the collapse of the Soviet economy in the 1990s, however, it was already clear by the time the KP was signed that Russia would face no difficulties in limiting emissions to 1990-levels, and, accordingly, would not face an additional financial burden. After KP-negotiators introduced the possibility to trade surplus emissions allowances, Russian policymakers, to the contrary, could hope to actually gain from their participation to the Protocol.

Following the U.S.'s decision in March 2001 not to ratify the Kyoto Protocol, the Russian government gained a unique negotiation position as the KP's entering into force was now entirely dependent on Russia's ratification. Russia and a number of other large emitters, first of all Australia, Japan and Canada, used this situation to extract concessions from the other Annex I countries, most of whom where EU member states. During the Bonn climate negotiations in July 2001, these large emitters demanded that when calculating their national emissions, forests and croplands should be given much greater consideration as carbon sinks. In effect, Russia could declare 17.6 Mt CO2/year as sinks, which NGOs judged would already considerably compromise the KP targets (AFP, 2001a)(Baer & Athanasiou, 2001). At COP7 in Marrakech, later the same year, Russia then eventually achieved that its already high quota for sinks was near to doubled to 33 Mt CO2/year, which promised Moscow to be able to sell even more emissions entitlements on the world's future carbon market (AFP, 2001b). This is what has later been called the "hot air" surplus: The selling of emissions rights based on emissions reductions that would have happened anyway.

Despite these concessions, the Russian leadership for more than two years held up ratification of the KP, before eventually approving it in late October 2004. The delay has been attributed to the loss of Russia's principal prospective buyer of excess emissions, climate-sceptic government advisors and a climate-unknowledgeable Russian public (Afionis & Chatzopoulos, 2009). The sudden ratification in 2004, however, was completely unrelated to climate issues, but to prospective benefits in other policy areas mentioned above (Turkowski, 2012)(Henry & Sundstrom, 2007).

Once the KP had entered into force and the debate on a post-Kyoto climate agreement started, the Russian government advocated two major points in its negotiating position, which all primarily concerned mitigation issues: 1. The need for mitigation commitments by all major emitters, and 2. the due acknowledgement of Russian forests as carbon sinks.

At CMP-1 in late 2005, Russia already questioned the effectiveness of the KP, as it failed to bind those Parties contributing most to GHG emissions – namely the U.S. and China. They argued that a necessary prerequisite for constructive negotiations would be a decision on establishing a mechanism that would allow non-Annex I Parties willing to take voluntary commitments to do so (Russian Federation, 2006a)(AFP, 2005). At COP12 in Nairobi in December 2006, Russia then submitted its first ever proposal to amend the UNFCCC with a view to simplify the procedure to access Annex I to the Convention

and Annex B to the Protocol, and to elaborate provisions recognising voluntary mitigation actions by non-Annex I Parties (Russian Federation, 2006b)(Cutajar, 2007)(Korpoo, 2007). These proposals encountered strong opposition from the G77/China, who feared that this sooner or later might force developing countries to take on binding targets with the concomitant obligations (Müller, 2007). Thereupon, Moscow argued that they considered the grouping of countries by Annex I and non-Annex I countries "obsolete and irrelative to present-day realities" and called for a new more effective and fairer climate regime (Russian Federation, 2008). At COP15 in Copenhagen President Medvedev urged to develop a new comprehensive legally binding agreement already before the end of the first commitment period in 2012 (Russian Federation, 2010d).

Despite the generous carbon allowances Moscow secured in 2001, another Russian criticism voiced by President Putin as early as 2006 was that the Kyoto Protocol did not duly take into account the size and potential of Russian forests as carbon sinks (RIA Novosti, 2006). Holding almost 50% of the Northern hemisphere's terrestrial carbon (Goodal, Apps, & Birdsey, 2002), Russia's natural forest resources are known to play an integral role in global carbon cycling and in limiting global warming. Yet, Russia only started to actively seek recognition for its forests after developing countries had initiated a lively debate on REDD+ in Bali in 2007. From 2009 onwards, they increasingly engaged in activities under the AWG-KP relating to the application of definitions, modalities, rules and guidelines for the treatment of Land Use, Land-Use Change and Forestry (LULUCF) (Russian Federation, 2009a) (Russian Federation, 2009b) (Russian Federation, 2009c)(Russian Federation, 2010b)(Russian Federation, 2010c) (Russian Federation, 2011a)(Russian Federation, 2011a). Ahead of COP15, then-Prime Minister Putin declared as one of the country's key demands for a new climate agreement was that all Russian forests were recognised as carbon sinks and that all states participated (Global Insight, 2009). This was presumed to yield credits of 5-10% of Russian CO2 emissions starting in 1990, and would allow Russia to essentially "buy its way out" of emissions reduction commitments or to significantly soften announced reduction targets (Westphal, 2010).

At COP15 in Copenhagen in December 2009, Russia committed to reduce GHG emissions in 2020 by 15-25% compared to 1990, and President Medvedev stated that Russia would adhere to the 25% emission reduction target, even if no legally binding document was adopted then (RIA Novosti, 2009b). After the Copenhagen Accord failed to provide the foundation for a new global legally binding treaty on climate change that would replace the KP already by 2013, Russia conditioned its 2020-pledge, first, on the undertaking by all major emitters to take legally binding mitigation obligations and, second, on the appropriate accounting of the mitigation potential of Russia's forests (Russian Federation, 2010a). At COP16 in Cancun in December 2010, the Russian delegation then first announced that it would not make any quantitative commitments during the second commitment period of the KP (2013-2020), but that it would participate in a new globally binding climate agreement (Russian Federation, 2010d).

Regarding negotiations on a post-2020 agreement, two issues are of particular importance for Moscow: 1. Whether and how it will be possible to carry over surplus carbon allowances from the previous Kyoto Protocol, and 2. To introduce more flexibility regarding the classification of countries under the UNFCCC Annexes (see below).

Russia hoped to bank its Kyoto surplus, estimated to amount to 5.5billion Assigned Amount Units (AAU) worth $58billion, to give room for economic development (Morales, 2008). Already in 2009, the Russian delegation warned that it might reject a deal from Copenhagen that did not allow it to carry-over its unused carbon credits (Chazan & Gronholt-Pedersen, 2009). At COP18 in Doha, the issue eventually broke into an open conflict as the Chairman of the Conference did not give Russia the floor during the adoption of measures preventing "hot air" (AFP, 2012)(Friedman, 2012). Thereupon, Russia blocked further negotiations during the subsequent Bonn session, objecting to how the consensus rule was interpreted by the Chair and demanding to change the agenda of the meeting to discuss the rules on how UNFCCC decisions are reached at (B. E. King, 2015).

Regarding the classification of countries under the UNFCCC, the Russian delegation has proposed to periodically review Annexes I and II of the Convention in order to account for changes in the economic and technological development of member countries. In May 2011, it handed in a submission which proposes to amend Article 4 II (f) UNFCCC accordingly (Russian Federation, 2011c).

In addition to these two points, the Russian government has voiced more general demands towards a new climate deal in the context of the ADP (Russian Federation, 2011b)(Russian Federation, 2013)(Russian Federation, 2014). From Moscow's point of view, the agreement should:

- Be aimed at holding the increase in global average temperature below 2°C above pre-industrial levels
- be a single legally binding document that sets commitments for all countries, including the biggest emitters
- build on the principles of the UNFCCC, but the categorisation of countries should be based on objective, scientific information und decision-making should be based on clearly-defined rules: monitoring, reporting, verification and compliance
- take 1990 as base year and be in force for 10 years to allow for countries to implement needed socio-economic measures and introduce relevant technologies
- create incentives for all countries and, thus, allow countries to set their own commitments. The sector of land use and forestry should be duly accounted for when setting targets.
- comprise thematic blocks on mitigation commitments, adaptation, finance, technology transfer, financial-technical cooperation, the use of market mechanisms and sectoral approaches, MRV and compliance with obligations

At the UNFCCC conference in Warsaw in November 2013, the Russian delegation stressed that the 2020-pledge of 25% should be achieved by domestic measures. While no reference was made to potentially accounting for the Kyoto surplus, Russian officials made it clear that the target does not account for managed forests, as they were discussed separately (Kokorin & Korpoo, 2014).

Although being a developed country Party, the Russian Federation has no obligations under the Convention to provide financial assistance to developing countries to support their mitigation and adaptation actions because it is not included in Annex II of the UNFCCC.[53] However, the Russian Federation has been a voluntary contributor to the financial mechanism of the Convention, inter alia recently providing USD 10 million to the latest replenishment of the Global Environment Facility (GEF 2014a). The country is also a member of the developed countries' constituency on the Board of the Green Climate Fund (GCF). At the same time Russia is one of the few developed countries that accesses resources of the GEF. Since 1992 the Russian Federation has received USD 154.4 million in grants from the GEF through a total of 22 projects, of which the latest has been approved in May 2014 (Global Environment Facility, 2014).

Russia stated that it is committed to consider options of its contribution to climate finance but that any commitments need to be based on the principle of voluntariness (Submission to the UNFCCC, 27 April 2011). In the context of the negotiations on the 2015 agreement, officials also stated that they consider making a contribution to the GCF, stressing that these have to be on a voluntary, not legally binding basis (Bloomberg news, 2014). Recently Russia, jointly with Brazil, China India and South Africa, launched the New Development Bank (or BRICS Bank), which will initially be capitalized with USD 100 billion and inter alia fund sustainable development projects in developing countries (BRICS, 2014).

[53] According to Article 4.3 of the UNFCCC, developed country Parties included in Annex II to the Convention have the obligation to provide financial support to developing countries to support their mitigation and adaptation actions. Annex II is a subset of Annex I, which includes those Annex I Parties that were member states of the Organisation for Economic Cooperation and Development (OECD) in 1992.

11.6 Conclusions

Climate policy is and has not been a high priority of the Russian Federation. Instead, the country's policy has been dominated by the interests of large energy companies and energy intensive industries, which favours weak GHG emissions targets and regulations. The low priority given by policy makers has also been supported by certain Russian scientists and institutes, who have highlighted the positive impacts climate change could have for the country's economy. The trend is also in line with the general treatment of environmental issues in Russia. Already in the former USSSR, the issue of environmental problems was deliberately depoliticised and information withhold from the public. After the disintegration of the Soviet Union, environmental activists have continued to experience criminalisation and persecution by the public authorities.

However, following the ratification of the Kyoto Protocol in 2004, a climate coalition was established by civil society, business and local authorities that has been able to exert limited influence over Russian policymakers. The coalition has been able to successfully lobby for limited climate action. It achieved that the government made use of the opportunities arising for Russian enterprises under the Kyoto Protocol's Joint Implementation (JI) mechanism. Another success was the government's adoption of the Comprehensive Implementation Plan on 25 April 2011, which lists 31 measures for climate action assigned to various executive agents at the federal level and tagged with a rough timeframe for their delivery.

Still, climate policy operates under difficult conditions in practice. In April 2013, the Government reduced the target for renewable energy from 4.5% by 2020 to 2.5% in the State Program for Energy Efficiency and the Development of the Energy Sector. In 2014, Russia is still without a functioning support scheme that could stimulate the large-scale deployment of clean energy sources and investors in the renewable energy sector face various obstacles preventing renewable energy deployment.

The overall focus of the country's climate strategy is rather on promoting energy efficiency, but this is also not followed up by concrete policies and measures. It seems as if most of the energy efficiency initiatives have been carried out through JI projects and not as a consequence of national policies. Russia's sixth national communication to the UNFCCC does not point out any policies and targets for emissions reduction apart from the renewable energy target and a decree on gas flaring from 2009. This situation might be explained by the fact that the Russian emissions reduction target for 2020 is actually not a reduction target, but foresees the possibility to increase emissions up from current levels.

Russia's international climate policy reflects their national endeavours. In the past, Russia has rather acted as an obstructer in the processes to achieve an international agreement. It eventually ratified the Kyoto Protocol in 2004 after being promised certain advantages from the international political community and has been able to profit economically from the treaty due to the possibility to sell surplus emissions allowances. At COP15 in Copenhagen in December 2009, Russia committed to a 15-25% reduction target compared to 1990-levels. Seen in the light of other Annex I countries'current commitment levels, a 25% emissions reduction by 2020 to 1990-levels is not among the least ambitious. However, given that the country's emissions are currently around 30% below the 1990 level, it would mean that Russia is allowed to increase its emissions by 5-15% over the next five years.

The Russian contribution in the framework of a new climate treaty will probably not deviate much from earlier positions. Russia demands a revision of the current classification of countries into annex I and non-annex I, and insists on a comprehensive accounting of forests and land-use as carbon sinks and emissions when calculating the emissions targets. Russia does support the 2C target, however, their current emissions reduction target of 15-25% reduction by 2020 excluding LULUCF is unlikely to be strengthened much.

In a global context, the Russian contribution is inadequate, especially given the country's current emissions situation. According to the analysis of effort-sharing approaches made for this study, a fair contribution made by Russia would be to reduce emissions by as much as 52% in 2025 and 58% in 2030, compared to 1990-levels. This would nevertheless not be possible without substantial costs: To

achieve the 2025 reduction level would require emission reduction measures at costs up to 100 €/t CO2. The 2030 reduction would require reduction measures at even higher costs, so Russia would probably need to support for emission reductions in other countries in order to meet its fair share target.

12. Saudi Arabia

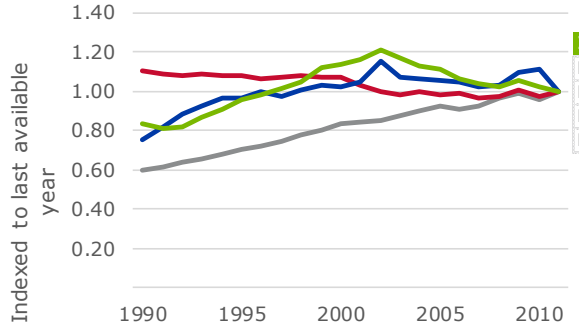
12.1 Drivers for Decarbonisation and Additional Background Statistics

Genera evelopment data

Indicator	Value	Unit	Year
Population	27.762	mln cap	2011
GDP	4.7E+11	US$ (2005)	2011
Air pollution index	87	ug/m3, mear	2011

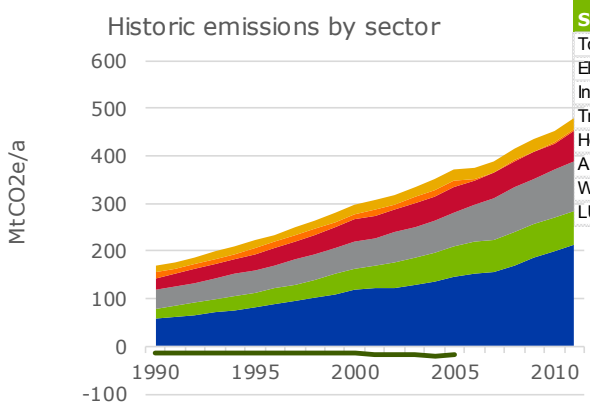
Indicator	Value	Unit	Year
Vulnerability	0.34	-	2011
HDI	0.83	-	2011
Electrification rate	99	%	2011

Past trends of decarbonisation indicators



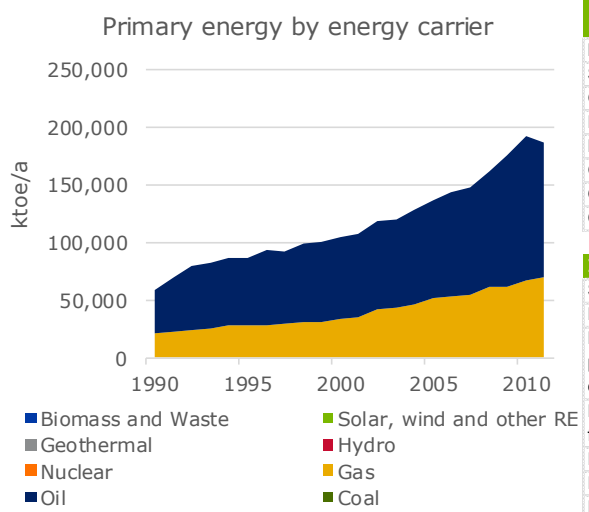
Indicator	Value	Unit	Year
Per capita emissions	17.32	tCO2e/ cap	2011
Emission intensity of electricity	754.4047	tCO2/kWh	2011
Emission intensity of economy	1.02	tCO2e/ USD	2011
Energy intensity of economy	0.40	ktoe/ million	2011

National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	213.7	MtCO2e/a	n.a.
Industry	71.1	MtCO2e/a	n.a.
Transport	104.5	MtCO2e/a	n.a.
Households_and_services	64.0	MtCO2e/a	n.a.
Agriculture	2.0	MtCO2e/a	n.a.
Waste	25.5	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Energy mix



Fuel	Value	Unit	Share in 2011
Biomass_w aste	4	ktoe	0%
Solar_w ind_other	0	ktoe	0%
Geothermal	0	ktoe	0%
Hydro	0	ktoe	0%
Nuclear	0	ktoe	0%
Gas	70036	ktoe	37%
Oil	117029	ktoe	63%
Coal	0	ktoe	0%

Indicator	Value	Unit	Year
Share of global emissions	1.0	%	2010
Domestic fossil fuel production	601,724	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	100	%	2011
Economic relevance of fossil fuel imports	0.0	% of GDP	2011
Fossil fuel subsidies	60.94	Billion USD	2011
Fuel import dependence	-222	% of imports	2011
Fuel import bill	0.37	Billion USD	2011

Saudi Arabia is one of the highest-income countries in the world, with per-capita GDP surpassing even most industrialised countries (World Bank, 2014b), and a Human Development Index approaching that of the European Union.

Due to its vast oil reserves, Saudi Arabia relies strongly on oil (and gas to a lesser degree) as an energy source. Consequently, Saudi Arabia's emission intensity for electricity generation is exceptionally high, and per capita emissions are the second highest of countries within this study (USA), and air pollution is almost as high as in China.

Oil is also the single most important export commodity of the country. Therefore, while its domestic share is only 1% of global emissions, Saudi Arabia could be seen as a strong driver of climate change due to fuel use elsewhere. Anyhow, this also means that reduced fuel combustion in other parts of the world would strongly impact Saudi Arabia's economy.

12.2 Mitigation Potential and Effort Sharing Allocations

According to different effort sharing approaches, Saudi Arabia would need to decrease emissions below today's levels already by 2020 and further thereafter to meet its fair share. These reductions go beyond domestic potentials at low costs.

Figure 6 displays emission targets that Saudi Arabia should take on according to four effort sharing proposals: Converging Per Capita Emissions (CPE), Common but Differentiated Convergence (CDC), Greenhouse Development Rights (GDRs), and Triptych. In addition, the figure displays the results of the ClimStrat model on the question of which reduction levels could be achieved at four levels of mitigation costs: Costs below 13€ per tonne CO_2-eq., costs between 13 and 33 €/t, costs between 33 and 67 €/t and costs between 67 and 100 €/t. These costs are calculated on the basis of purely domestic efforts.

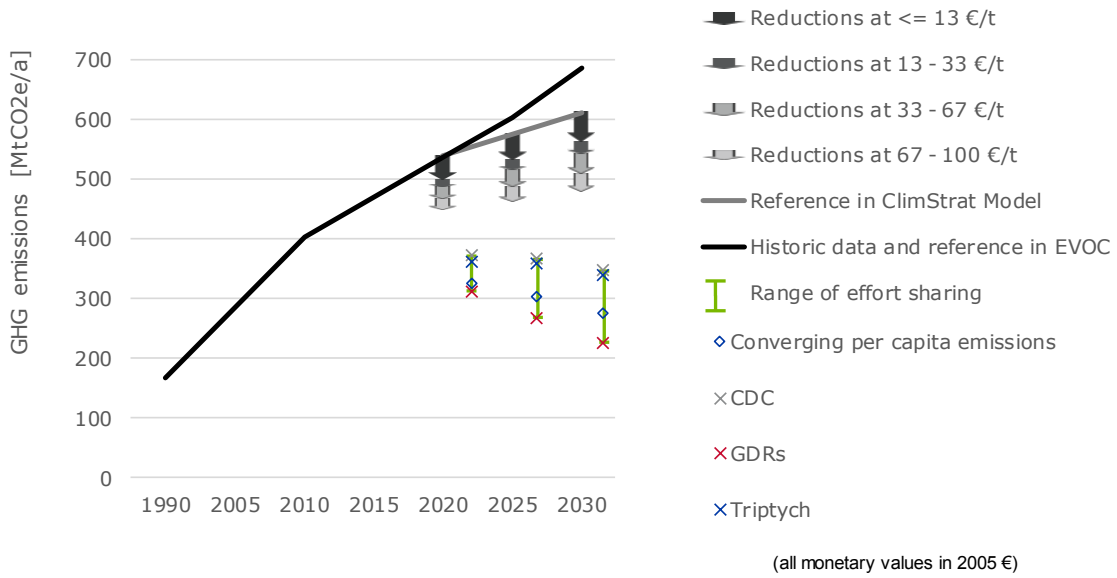
Allocations for 2020 range from about 310 to about 370 Mt CO_2-eq. Compared to 1990 levels (168 Mt), the allocations range from +85% to +120%. The median lies at about 340 Mt, a doubling of 1990 levels. Still, this would mean a significant deviation from the ClimStrat reference emissions path, which would lead to emission levels of about 561 Mt CO_2-eq.

Allocations for 2025 range from about 265 to about 365 Mt CO_2-eq. Compared to 1990 levels, the allocations range from +58% to +117%. The median lies at about 330 Mt, 10 Mt lower than for 2020. Reference emissions, on the other hand, would continue to climb to levels of ca. 655 Mt CO_2-eq. in 2025.

Allocations for 2030 range from 224 to 345 Mt CO_2-eq. Compared to 1990 levels, these range from +33% to +105%. The median lies at about 306 Mt, +82% compared to 1990 levels. For the reference scenario, emissions would follow a growth trend, to about 773 Mt CO_2-eq. in 2030.

The graph includes two reference curves against which possible reductions are plotted: The black curve represents a reference scenario without further domestic actions, calculated by the EVOC model. The grey curve represents the ClimStrat reference scenario, which is a hypothetical scenario based on the assumption that all current and planned (as of mid 2013) mitigation policies and measures will be implemented. It bears noting that the calculation model did not include Saudi Arabia's long-term renewable energy plans.

Figure 23: Results of Effort Sharing Calculations and Mitigation Costs for Saudi Arabia



According to the analysis done in this project, there is a significant low-cost reduction potential, with around 50 Mt CO_2-eq. each year between 2020 and 2030 at the lowest calculated cost level, and further reduction opportunities of between 50 and 80 Mt/year at at costs of up to 100€/t. Saudi Arabia would nonetheless need to invest significantly, with average costs of over 200 €/t CO_2-eq in order to achieve the median reduction range of effort sharing approaches for the target years.

This would suggest that the country may consider cost-effective mitigation options beyond state borders. As noted above, these costs were calculated assuming purely domestic efforts. Use of international emission trading would tend to lower the cost of achieving a given target. Also, the calculations do not account for Saudi Arabia's plans for renewable energy expansion (see chapter 12.4). Actual additional cost for reaching the effort sharing range will therefore be significantly lower.

Table 23: Results of Effort Sharing Calculations for Saudi Arabia

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	324	302	274	93%	80%	63%	-20%	-25%	-32%
CDC	370	365	345	120%	117%	105%	-8%	-10%	-15%
GDRs	310	265	224	84%	58%	33%	-23%	-34%	-44%
Triptych	358	357	337	113%	112%	101%	-11%	-12%	-17%
Median	341	330	306	103%	96%	82%	-15%	-18%	-24%

12.3 Political System

The Kingdom of Saudi Arabia (KSA) is a hereditary monarchy currently headed by King Abdullah bin Abdulaziz Al Saud. It is an Islamic state, with a judicial system based on Islamic law (Shari'ah). With two of the most holy places in Islam (Mecca and Medina), Saudi Arabia has great importance in the Islam religion (Obaid, 1999).

The executive branch consists of 22 specialised ministries, whose ministers are appointed by the King every four years. The Ministry of Petroleum and Mineral Resources (MPMR) heads negotiations within the UNFCCC and other multilateral fora (Darfaoui & Al Assiri, 2010). The ministry has been in the hands of Mr Al-Naimi since 1995.

A Consultative Council (also known as Shura Council), with 150 members appointed by the King every four years, advises the king in the law-making procedure. However, the king retains all rights to accept or reject any proposals made by the Council (Ansary, 2008). The Shura Council's 12 committees advise the King on legislative issues in human rights, education, culture, information, health and social affairs,

services and public utilities, foreign affairs, security, administration, Islamic affairs, economy and industry, and finance. Since 2011, women may be appointed to the Shura Council, with 30 women appointed by the King in 2013. Saudi Arabia is further divided into 13 provinces, each with a governor and deputy governor, and its own council.

While a statement of intent to hold elections on parts of the Council and its local and regional assemblies was made in 2003, there have been none so far. Municipal elections were held for the first time in 2005, for four-year terms. For the elections to be held in 2015, the King announced that women would be allowed vote and be elected for the first time (Ziegler, 2014).

Environmental and energy policy making in Saudi Arabia is fragmented, with the Ministry of Petroleum and Mineral Resources (MPMR) directing fossil fuel production policy, the Ministry of Water and Electricity (MWE) directing electricity production, distribution and planning. The recent creation of the King Abdullah City for Atomic and Renewable Energy (KACARE) in 2010 (described in more detail below) may help improve coordination, with part of its mandate to act as an unofficial, de facto Ministry of Energy, and oversee the introduction of new energy capacity. KACARE includes representatives from the MPMR and MWE, as well as other government and private-sector stakeholders serving on its board (Lahn & Stevens, 2011).

12.4 Historical and Current Domestic Climate Policy and Politics

Saudi Arabia is the largest exporter of oil in the world, which forms the basis of its economy and wealth. It is host to a rapidly growing economy[54] with an ever-increasing energy demand of about 7% per year (Lahn & Stevens, 2011). The growth in domestic energy consumption is so great that it may even put Saudi Arabia's capability to export to the international oil market at risk (ibid.). At the same time, Saudi Arabia is highly vulnerable to climate change due to its extreme water scarcity and limited arable land. Growing demands for water are met by desalination of seawater, which also contributes to growing electricity demand (Nachmany et al., 2014). Saudi Arabia may also severely suffer from rising food commodity prices due to changing climates elsewhere, as the country imports 80% of required foods from abroad (Taha, 2014).

Publicly available information on domestic debates on climate change and energy issues is very scarce. Climate change as such seems to have never played a prominent role in domestic policy making and public debate (Khan, 2014) , even though polls have shown an increasing awareness to climate change both of the general public and political institutions ((Darfaoui & Al Assiri, 2010). Due to Saudi Arabia's decision-making system, which is mainly limited to consultations among the royal family and a small number of influential individuals, the motivation and process of any decisions is highly unclear (see e.g. Obaid, 1999). Outcomes of consultations are not reported in Saudi Arabian press, so public information is extremely limited.

The government's main focus has traditionally been on the security of water, agricultural, and energy resources. In recent years, there has been a notable uptake in public initiatives to tackle the rising energy demand, and to diversify energy generation beyond fossil fuels.

One of the main steps to decrease energy consumption has been the introduction of KSA's National Energy Efficiency Program (NEEP) in 2008. Among others, the NEEP strives to decrease electricity intensity by 30% between 2005 and 2030, and to reduce peak demands for electricity by 50% as compared to 2000-2005 increases. Other public organisations dealing with energy demand are the Saudi Energy Efficiency Centre (SECC), and the Energy Conservation and Awareness Department of the Ministry of Water and Electricity (Nachmany et al., 2014). Until 2020, energy intensity shall be in the range of the global average (World Energy Council, 2014).

In 2010, the King Abdullah City for Atomic and Renewable Energy (KACARE) was created by royal decree. KACARE conducts research for KSA's future energy mix, and is charged with development and

[54] Average GDP growth over the last ten years was ca 6.5% (World Bank 2014)

implementation of the country's nuclear and renewable energy policy. KACARE has launched an ambitious renewables programme for Saudi Arabia in 2012: by 2020, installed renewable energy capacity is to rise from currently negligible levels to 23.9GW, and to 54 GW by 2032, which would be at around a third of KSA's energy mix. Solar power alone is to contribute 41GW. The massive scope of KSA's solar programme is mirrored by its planned investment budget of 109bn USD (Murray, 2012).

Saudi Arabia is also pursuing an expansion into nuclear energy generation. There is currently no installed nuclear capacity within the country. KACARE's plan for energy diversification includes the construction of up to 17 nuclear reactors, which would cost the Kingdom an estimate 100bn USD (ibid.).

Saudi Arabia's move towards a more diversified energy mix may also serve to make possible a removal of its heavy subsidies for oil-based electricity generation, which are estimated at 33bn USD per year (Akhonbay, 2012). A stronger focus on renewable (and nuclear) energy generation would also free more of the country's oil reserves to export to the global market.

12.5 Historical and Current International Climate Policy Positions

Due to its dependence on oil exports, Saudi Arabia has consistently been present and vocal in the international deliberations within the UNFCCC climate regime. Traditionally, the Ministry of Petroleum and Mineral Resources has led the negotiations, reflecting Saudi Arabia's economic interest in the matter. Since the outset of the climate negotiations, KSA's strongest concern has been that a global reduction of fossil fuel consumption due to mitigation efforts would have a strong negative impact on the country's main source of income. Saudi Arabia has been called out as one of the main obstructers to progress towards an effective climate regime by various sources (see (Depledge, 2008) for a detailed analysis).

Saudi Arabia is a member of the Organisation of Petroleum Exporting Countries (OPEC), and also the Gulf Cooperation Council, a similar interest group that is generally supportive of Saudi Arabian positions within the climate regime (Depledge, 2008).

It is also a member of the G77, the developing countries' negotiating group. Saudi Arabia has at various times held a coordinating position for the G77. Saudi Arabia is also part of a more recent, smaller and loose grouping within the G77 called Like-Minded Developing Countries (LMDC). Its members include many OPEC countries as well as large developing countries like China and India (Harvey, 2013).

Within the realm of the UNFCCC negotiations, the Saudi Arabian delegation is most widely known for its insistence that the climate regime needs to take into account potentially adverse effects of climate policies on countries relying on fossil fuel exports, which would imply financial and/or technical compensation for the loss of revenue of oil-exporting countries due to greenhouse gas mitigation measures elsewhere . The Convention text recognises that countries may be adversely affected, among others, if they are highly dependent on income from fossil fuels (see UNFCCC Art. 4.8h). Saudi Arabia has successfully injected the topic into the negotiations, including the Bali Action Plan in 2007. Negotiations on "Adverse Effects" are now carried out within the Subsidiary Bodies, under the heading of "Response Measures" (UNFCCC, 2014b).

In the past, the Saudi Arabian delegation has received ample criticism, including numerous "Fossils of the Day"[55] by the NGO Climate Action Network, for blocking progress on other items on a summit's negotiation agenda if they felt that Response Measures were not dealt with adequately (Depledge, 2008). They have been reportedly using a range of different tactics to obstruct progress of the UN climate regime, though this has at times backfired: For example, the Saudi delegation has been accused of misrepresenting G77 positions (ibid.).

More recently, and especially in the run-up to the negotiation round in Qatar in 2012, Saudi Arabia has been more vocal on the pro-active steps taken within their country to fight climate change. Most prom-

[55] The "Fossil of the Day" is rewarded every day to delegations that are deemed to block progress at the UNFCCC negotiations by the Climate Action Network (see http://www.climatenetwork.org/fossil-of-the-day).

inently, the Saudi Arabian solar programme was launched directly before the COP (Murray, 2012). Nonetheless, Saudi Arabia has thus far not submitted a 2020 pledge.

In the deliberations within the ADP, Saudi Arabia among others strongly pushes for the continuation of the traditional UNFCCC Annex division, in line with the LMDC group. In Warsaw, the LMDC also rejected a reference to a possible equity reference framework, as proposed by the African Group (Wolfgang Sterk et al., 2013). In its most recent "submission on the elements of the 2015 agreed outcome", the LMDC makes clear that while equity should be a central element of the ADP, it is already defined in the original Convention text, and should not be open to new interpretation (see submission by(see Like-Minded Developing Countries, 2014c).) This would mean that any obligation for mitigation would lie with the original Annex I countries. Any mitigation actions of Non-Annex I countries would be non-binding, and dependent on Annex I financial, technical, and capacity support.

12.6 Conclusions

Saudi Arabia's emissions have grown rapidly in the past, and will continue to rise almost unabated if the country does not take very decisive steps.

While there is a significant low-cost reduction potential within the country with 40-50 Mt CO_2-eq. each year between 2020 and 2030 at low cost, and further reduction opportunities of between 50 and 80 Mt/year at at costs of up to 100€/t, this would be too little by far to reach reduction levels that fall in line with the range of the effort-sharing models. The median of the models lies at 306 Mt CO_2-eq., or less than half reference emissions. Thus, the country would need to invest significantly in order to achieve the median reduction range of effort sharing approaches for the target years. Average costs for the reductions needed to reach the effort sharing targets surpass 200 €/t CO_2-eq., suggesting that a emissions trading may be beneficial for Saudi Arabia. It needs to be highlighted that the country's renewable energy expansion plans have not been factored into the calculations, suggesting that additional costs beyond the one already factored in by the country government will not be as high.

Saudi Arabia is a special case in the climate regime. Its economic reliance on oil exports creates a strong vested interest in protecting this market and resistance to domestic and international policies that would reduce demand. The country has no strong inherent interest in international mitigation efforts. Decreasing the importance of oil as an energy source would weaken its position within the international community (cf. (Al-Tamimi, n.d.).

So while it will make sense for Saudi Arabia to lower its domestic oil consumption by diversifying its energy sources towards a greater use of renewable energies, it seems inconceivable that the Kingdom will champion any kind of ambitious agreement in Paris. Unsurprisingly, Saudi Arabia has not come forward with any kind of mitigation pledge for 2020. Given enough pressure, especially by other, more ambitious developing countries, a pledge for post-2020 may be in the cards. However, given the high costs as calculated in this study, any kind of emissions reduction target in line with ranges indicated by effort sharing approaches seems highly improbable. Instead of an emissions target, Saudi Arabia might opt for energy efficiency, renewable energy and other targets mirroring the country's current energy plans.

13. South Africa

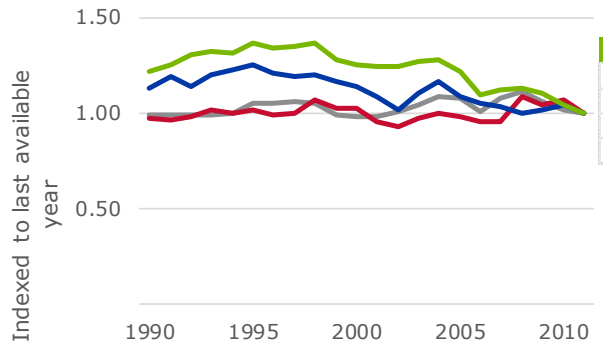
13.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	50.587	mln cap	2011
GDP	3E+11	US$ (2005)	2011
Air pollution index	56	ug/m3, mear	2012

Indicator	Value	Unit	Year
Vulnerability	0.62	-	2011
HDI	0.65	-	2011
Electrification rate	84.7	%	2011

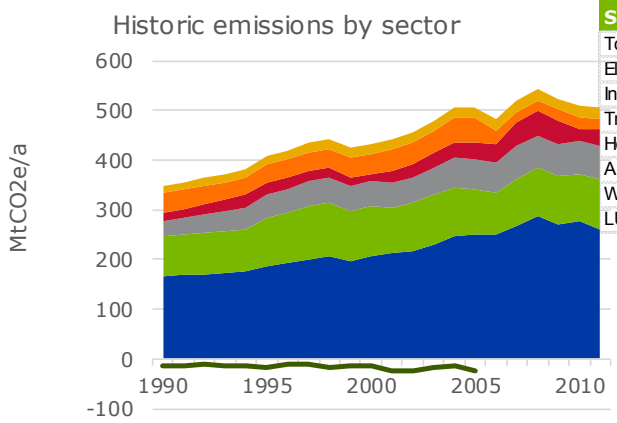
Past trends of decarbonisation indicators



Indicator	Value	Unit	Year
Per capita emissions	10.00	tCO2e/ cap	2011
Emission intensity of electricity	869.456	tCO2/kWh	2011
Emission intensity of economy	1.68	tCO2e/ USD	2011
Energy intensity of economy	0.47	ktoe/ million	2011

Per_capita_emissions
Electricity_intensity
Energy_intensity
Emission_intensity

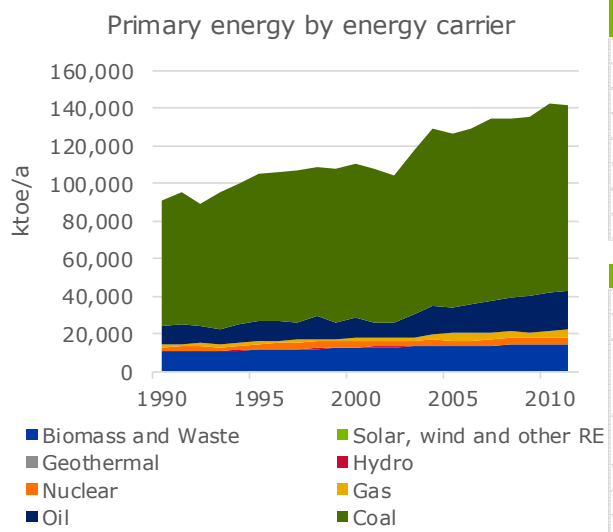
National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	260.8	MtCO2e/a	n.a.
Industry	99.1	MtCO2e/a	n.a.
Transport	70.5	MtCO2e/a	n.a.
Households_and_services	31.3	MtCO2e/a	n.a.
Agriculture	21.6	MtCO2e/a	n.a.
Waste	22.5	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Electricity_and_Heat
Industry
Transport
Households_and_services
Agriculture
Waste
LULUCF

Energy mix



Fuel	Value	Unit	Share in 2011
Biomass_waste	14526	ktoe	10%
Solar_wind_other	82	ktoe	0%
Geothermal	0	ktoe	0%
Hydro	177	ktoe	0%
Nuclear	3519	ktoe	2%
Gas	3794	ktoe	3%
Oil	21061	ktoe	15%
Coal	98477	ktoe	70%

Indicator	Value	Unit	Year
Share of global emissions	0.8	%	2010
Domestic fossil fuel production	144,000	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	89	%	2011
Economic relevance of fossil fuel imports	4.2	% of GDP	2011
Fossil fuel subsidies	1.38	Billion USD	2011
Fuel import dependence	-15	% of imports	2011
Fuel import bill	26.04	Billion USD	2011

South Africa is a country of extremes: it has one of the most unequal income distributions in the world (CIA (Central Intelligence Agency), 2014c). There is a stark contrast between a rich, upper class and the majority of society who is lacking the resources to cover basic needs. Even 20 years after the end of

Apartheid, the country is still struggling with this legacy, which divides the country in many ways beyond mere economic factors. South Africa on one hand shows many aspects of an African developing country and at the same time, it is very different from all other African countries – a striving emerging economy with highly skilled experts in industry and science. On average, the country ranks in the middle range of the Human Development Index. However, it faces a high unemployment rate of 25% (World Energy Council, 2014) and still suffers from a massive brain drain as many skilled white workers left the country after 1994.

In terms of GHG emissions, South Africa is not only the largest emitter on the African continent, but is also among the top 10 polluters globally. With a per capita emission of 10 tons CO_2-eq/year it is in the top 60 range, emitting slightly less than Germany. What is striking, however, is the South African economy's high emission intensity of 1.68 tCO_2-eq/USD.

South Africa's emissions are dominated by the use of abundant domestic coal: in 2011, a total 70% of the prime energy demand was covered by coal. Coal is used to produce synthetic fuels for transport as well as in key economic sectors such as energy intensive mining and downstream industries like aluminum smelters or steel production.

With respect to future energy demand the largest growth is expected in the transport sector: total final energy demand is expected to triple between 2010 and 2050, increasing the relative share of energy use in transport from 34% in 2010 to 44% in 2050 (DoE, 2013a).

13.2 Mitigation Potential and Effort Sharing Allocations

South Africa's GHG emissions have grown rapidly in the last decades and will continue to rise unless massive mitigation measures are taken. In the carbon intensive industries large low cost (or even negative cost) mitigation potentials exist, which have not been explored due to very low and partly subsidised energy costs in the past. Furthermore, South Africa has a large potential for renewables like wind and hydro. The country has been interested to enlarge its nuclear power production and make use of CCS to reduce CO_2 emissions as well.

If South Africa implements all current and planned measures (including those referred to in its National Climate Change Response White Paper, see 13.4) emissions will almost levelise at 660 Mt CO_2-eq/a in 2030. Compared to other countries analysed in this study the effort sharing range is rather narrow. A fair contribution to the necessary global mitigation efforts (median of the emission targets from the four effort sharing models we analysed) could be reached with average abatement costs well below 100 €/tCO_2-eq. up to both 2020 and 2030. Even considering the effort sharing model which requires most ambitious actions for South Africa (CPE), marginal abatement costs would hardly exceed 100 €/tCO_2-eq. Thus, South Africa is capable to reduce its emissions to a globally sustainable level at costs lower than most OECD countries.

The emission reduction target pledged by South Africa in 2009 in Copenhagen (see section 0 for details) gives a median target of 500 $MtCO_2$-eq/a in 2025, which would be only 10% above the median of the effort sharing approaches we have analysed.

Figure 24: Results of Effort Sharing Calculations and Mitigation Costs for South Africa

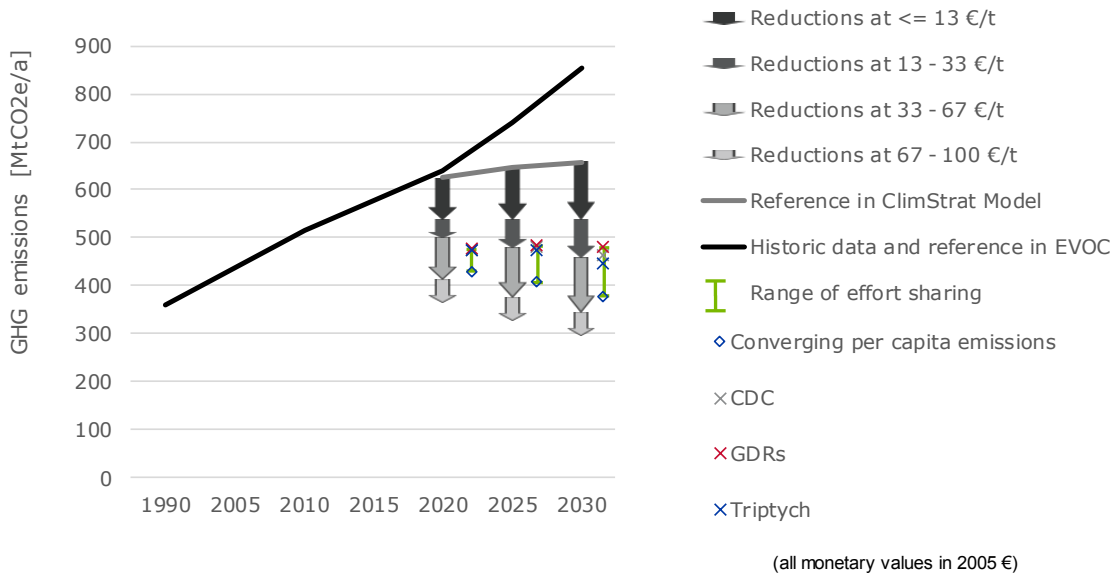


Table 24: Results of Effort Sharing Calculations for South Africa

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	426	405	376	18%	12%	4%	-17%	-21%	-27%
CDC	472	477	462	31%	32%	28%	-9%	-8%	-10%
GDRs	474	481	478	31%	34%	33%	-8%	-7%	-7%
Triptych	470	470	445	30%	30%	23%	-9%	-9%	-14%
Median	466	465	443	29%	29%	23%	-10%	-10%	-14%

13.3 Political System

13.3.1 ANC Dominates Political Agenda

Since the end of Apartheid, South Africa's political system has been dominated by the African National Congress (ANC). The ANC still holds a strong majority (> 60%) in the national elections. Only one province (Western Cape) is governed by the Democratic Alliance (DA) (Electoral Commission of South Africa, 2014). Thus the ANC has a majority in both houses of Parlament - the National Assembly and the National Council of Provinces. The ANC has been a symbol of liberation for many, especially for black South Africans, despite increasing critique regarding inefficiency and corruption charges against high government officials. The ANC holds strong ties to the labour movement and trade unions (Essa, 2014). With respect to climate policy this is of high relevance as many low-skilled workers are employed in carbon intensive industries and the mining sector.

13.3.2 Climate Relevant Institutions

There is a clear lead agency - the Department of Environmental Affairs (DEA) for national and international climate policy. However, for the implementation of domestic climate-relevant strategies, the Department of Energy (DoE), which is in charge of South Africa's energy policy, has an important role to play. Emissions from energy use are the highest source of greenhouse gases in the country. Thus, decisions on energy are highly relevant for the country's overall approach to mitigating climate change.

More than 20 governmental departments are involved in climate change issues in South Africa. To coordinate climate relevant activities, the Intergovernmental Committee on Climate Change (IGCCC) has been established. It serves as "a *de facto* steering committee for climate change-related projects that impact on, or require the active involvement of, more than one of the IGCCC members" (DEA,

2011c). Members of the IGCCC are all ministerial departments relevant for climate change regulation, and all provincial environmental departments.

13.3.3 Stakeholder-Driven Strategy Processes

South Africa's policy cycle is based on a strongly consultative process implying the involvement of various stakeholders (Townshend et al., 2013). The National Climate Change Response Strategy has been developed in a policy process with several rounds of extensive stakeholder participation over many years. Similarly, the Integrated Resource Plan (IRP), which is the key strategy document for electricity planning was heavily adapted after extensive stakeholder consultations in 2010/2011, including an adjustment according to further price scenarios and policies already in place, leading to a differentiated strategy for the development of the energy sector in South Africa up to 2030 (DoE, 2011). For the climate strategy a National Committee on Climate Change, with multi-stakeholder participation from key sectors and civil society, has been set up (DEA, 2010b). Participating stakeholders include business and industry representatives, national government departments, provincial environmental departments, local governments, public entities and NGOs. In general, such a strong stakeholder involvement tends to slow down policy processes, but creates greater common ownership of the strategies developed (Schalk, 2011).

13.4 Historical and Current Domestic Climate Policy and Politics

13.4.1 South Africa's Political Agenda

South Africa's domestic policy agenda is dominated by many post-apartheid issues such as equity, income and job generation for underprivileged parts of society. Job creation and economic growth as means to address poverty alleviation are key policy objectives addressed e.g. in the New Growth Path Framework (EDD, 2011) or the National Planning Commission's "Vision for 2030" (NPC, 2011) (Boyd, Coetzee, & Boulle, 2014). South Africa has implemented massive infrastructure programs to compensate the Apartheid legacy, e.g. a massive public housing program, which are, however, still largely insufficient to overcome the unequal distribution of resources. One of the key policy objectives in the first decade after the end of Apartheid in 1994 was the provision of electricity for all. It is one of the areas where the new political system has become most "visible" – electric light is not a privilege of a white upper class anymore but now can be accessed by larger parts of the population. The electrification rate has increased from 36% in 1994 to over 80% today (World Energy Council, 2014). However, government and administration are under massive implementation pressures. Quantity of infrastructure is often more important than quality - leaving little room for ecologically sound solutions (ibid.).

13.4.2 Cracks in a Coal-Based Economy

In 2008, the South African Energy System was hit by a crisis: The national utility Eskom was forced to schedule rolling black-outs (so called loadshedding) in several provinces (OECD & IEA, 2013b). Electricity supply could not keep up with raising demands. This was due to a number of reasons, one of them being that politically the focus was on extending the electricity grid, but not enough investments were made to increase the power supply adequately. Decreasing demand in industry due to the economic crisis reduced the mismatch after 2008. However, loadsheddings were necessary in 2014 again (Maxwell, 2014).

The crisis brought about major paradigm shifts in South Africa's energy system. Historically, South Africa's energy sector has been dominated by large companies, which formerly had strong ties to the Apartheid government – and heavily rely on domestic coal: Sasol started producing synthetic oil from coal as a reaction to international sanctions against the Apartheid regime and continues to produce synthetic fuels technologies today. Eskom is the state-owned power utility with mainly coal fired power plants (and one nuclear reactor). For a long time electricity prices have been subsidised. For end-users energy has been almost synomous with electricity – apart from transport, electricity is the key energy source, even for room heating in buildings (Fekete et al. 2013).

With the shortage of electricity supply provoked by Eskom's loadshedding, there was a sudden openness to explore energy efficiency and demand-side management options as well as renewables to increase the stable provision of energy. Compact fluorescent light (CFL) bulbs and water saving shower heads were handed out for free to bring down electricity demand. Massive solar water heater programmes were planned, assuming that solar water heaters could be built faster than coal or nuclear power plants (Eskom, 2011). However, the factual implementation of alternative, low-carbon technologies in many cases fell short of the early, very ambitious expectations. But even though the electricity crisis has largely eased off and the immediate window of opportunity has closed somewhat – low-carbon alternatives are on the agenda in South Africa, beyond the top level climate change strategy documents.

Other processes have mutually enforced this trend. Historically, energy has not been on the political agenda of the provinces, but they were called to coordinate and support activities at the municipal level. Consequently from 2008 on, provinces started to develop energy strategies. The province of Gauteng, the country's economic hub and responsible for 25% of South Africa's GHG emissions (Tomaschek, Haasz, Dobbins, & Fahl, 2012), started developing the Gauteng Integrated Energy Strategy in 2010 (DLGH, 2010) and the Gauteng Climate Change Response Strategy and Action Plan in 2012 (GDARD, 2012). Other provinces and municipalities have similarly engaged in energy and low-carbon plans. The UNFCCC negotiations held in Durban in 2011 led to strong attention and subsequent commitment to mitigation activities in South Africa, such as the South African Renewables Initiative (SARI) (H. Fekete, Vieweg, & Mersmann, 2013).

Currently South Africa is ramping up its renewables power generation base. By June 2014, 650MW were connected to the grid funded through South Africa's Renewable Energy Independent Power Producer Program (REIPPP) (DoE, 2014). Additionally, South Africa intends to introduce a carbon tax. In the long-term perspective, South Africa is planning to heavily invest in nuclear power reactors. However, financial details are quite unclear still (Burkhardt, 2014).

13.4.3 Peak, Plateau, Decline - South Africa's Mitigation Strategy

The current national climate legislation is based on the National Climate Change Response Strategy developed in 2004, which encompasses both adaptation and mitigation. In 2006, the Cabinet commissioned the Long-Term Mitigation Scenario (LTMS) study (Winkler, 2007) to provide a scientific, sound basis for the government's climate policy. The LTMS was used as an input to a large public consultation process with government, civil society and the private sector. A climate change Green Paper was developed, discussed and reviewed. Finally, in 2011 the Nation Climate Change Response Policy (NCCRP) was adopted by the cabinet as a White Paper (DEA, 2011c), highlighting the short and long-term climate strategy of the government but which needs to be broken down further into concrete legislation and actions.

South Africa's mitigation strategy is based on two key pillars:

- a long-term vision for South Africa's GHG emission trajectory: emissions should peak between 2020 and 2025; they should be held constant up to 2035 (plateau) and significantly decline thereafter.
- eight "near-term priority flagship programmes", which cover both adaptation and mitigation priorities in key sectors. With respect to mitigation this includes renewables, energy efficiency, transport and CCS, but also addresses public works, water and waste. The flagship programmes are still in early stages of preparation.

It is noteworthy that "Job Creation" is explicitly included as a specific section in the climate strategy White Paper, indicating that climate change policies are framed as an economic opportunity for the country (DEA, 2011c).

13.4.4 The Implementation Lag

From the above, one could assume that South Africa seems to be on a direct route to a low-carbon paradigm shift: an ambitious, long-term climate strategy combined with a wide variety of actions on the ground. However, so far South Africa heavily lags behind in implementation. Even if political will is apparent at the level of the national government, local governments are slow to adopt ambitious climate change policies (Never, 2011). Tyler et al. lament "the present bias against implementation overall" (Tyler, Boyd, Coetzee, & Winkler, 2013).

Many of the key mitigation measures have suffered severe delays, for example the planned carbon tax has repeatedly been postponed. Announced to be introduced in 2015 with an effective carbon tax of 2,9 € (40 Rand) / ton in 2015 increasing gradually to 3,3 € (47 Rand) / ton in 2019 (DoE, 2013b), the introduction of the tax was again shifted to 2016. The postponement of the tax was appreciated by voices from the energy intensive industry (Donnelly, 2014) and one may assume the interests from this lobby group may be one key obstacle in implementing South Africa's climate policy.

There has also been a long history of efforts in supporting renewables to supply grid-based electricity. The various support/feed-in tariff schemes were not successful though, partly due to regulatory difficulties (Eberhard, Kolker, & Leigland, 2014), which could also be interpreted as reluctance of the state-owned utility ESKOM to really embark on renewables. Only the REIPPP scheme launched in 2011 seems to pick up speed finally.

In the transport sector, South Africa is struggling (like many countries) to reduce emissions. Key activities are taxation of vehicles with high energy use and the introduction of public transport systems in cities. The overall reduction potential seems limited and hard to access. However, the measures in place do not match the drastic growth of energy demand which is expected in this sector in the coming years and decades (H. Fekete et al., 2013).

Cooperation and alignment of activities of different departments and stakeholders is still weak at the implementation stage. Even though a top level strategy is in place with a responsibility for the Department of Environmental Affairs (DEA) to address climate related issues and a National Committee on Climate Change was institutionalised, the picture remains one of a largely uncoordinated mix of government departments, NGOs, the donor community, academia, and the private sector (Boyd et al., 2014). Even on a strategic level there has been a mismatch between the targets proclaimed in the climate strategy NCCR formulated by the DEA (DEA, 2011c) and the 2010 Integrated Resource Plan IRP (DoE, 2011), despite efforts to reduce this through the subsequent adjustment. The IRP was developed mainly by the Department of Energy and Eskom and is factually the guiding document for energy planning. The mismatch has been further reduced in the 2013 update of the IRP (DoE, 2013b). However, lacking stronger coordination between governmental departments, the scenarios given still fall slightly short of the proclaimed mitigation strategy.

In consequence, South Africa's overall GHG emissions have not yet parted from its former BAU growth path (DEA, 2011a). With massive capacity expansion of coal fired power plants, it seems unlikely that this will be the case in the near future (World Energy Council, 2014).

In conclusion, South Africa shows a mixed picture: compared to South Africa's history and existing infrastructure as a *coal country* it has set a far reaching long-term agenda of a paradigm shift towards a low-carbon development. Implementation on the ground has been picking up speed in recent years, partly due to a strong climate agenda but largely due to a crisis and structural changes in South Africa's energy system. However, up to today implementation falls short of the country's ambition, partly due to strong industry opposition (as in the case of the carbon tax), but possibly also due to shortfalls in vertical and horizontal policy integration.

13.5 Historical and Current International Climate Policy Positions

South Africa has become an active participant in the UNFCCC process and a recognised bridge-builder with a well-regarded negotiations team - even well before COP 17 in Durban (Raubenheimer, 2011),

(CDKN Africa, 2011). Its role as an emerging economy is reflected by the fact that, on the one hand, South Africa stresses the responsibility of developed countries in mitigation and even more in climate finance – on the other hand South Africa has very actively explored different types of commitments and contributions for different UNFCCC Parties. South Africa has been active in the G77 (which it will chair in 2015), BASIC and the African group, but also informal groups and processes, which try to raise the mitigation ambition and bridge the Annex 1 / Non-Annex 1 divide (e.g. the Cartagena Dialogue for Progressive Action, the International Partnership on Mitigation and MRV (International Partnership on Mitigation and MRV, 2014)).

13.5.1 South Africa's Copenhagen Pledge

South Africa has made a conditional pledge to reduce its GHG emissions below the BAU emission development by approximately 34% by 2020 (and 42% by 2025). The target was announced during the Copenhagen negations and submitted to the UNFCCC Secretariat on 29 January 2010 (DEA, 2010a). South Africa stresses that the extent to which these emission reductions will be achieved is conditional "on the provision of financial resources, the transfer of technology and capacity building support by developed countries" (DEA, 2010a).

This pledge relative to BAU was specified later on by the South African government, specifying aspirational GHG emissions up to the year 2050 (DEA, 2011b). This emission trajectory quantifies the "peak" (up to 2025), "plateau" (2025 - 2035) "and decline" (2035 - 2050) target, referred to in the national climate strategy (DEA, 2011c). However, this pledge is weakened by the fact that South Africa defines an upper and a lower boundary. The reason given to introduce such a range is that the BAU forecast is characterised by uncertainty, thus the BAU should be considered a range. However, no indication is given under which conditions the lower or the upper range of the pledge should be applicable. The lower range lies at 398 Mt CO_2-eq/a, which can be considered very ambitious and would be below any target resulting from the effort sharing proposals analysed in this study (see section 13.2). The upper limit of 614 Mt CO_2-eq/a, is significantly above all effort sharing allocations (maximum target would result from GDRs with 480 Mt CO_2-eq/a in 2025). The median of South Africa's pledged range (506 Mt CO_2-eq/a) would only fall short by 10% off the median of effort sharing allocations (443 Mt CO_2-eq/a).

However one may interpret the range of the target, South Africa's mitigation pledge is remarkable because it was offered without great pressure internally, nor through peers or negotiation. It has therefore been interpreted as an expression of the country's ambition to play a constructive role in building bridges between the developing and the industrialised world (CDKN Africa, 2011).

13.5.2 Positions in UNFCCC Diplomacy

Possibly driven by its long-standing isolation, South Africa is very keen on having a good reputation on the international level, though in the climate negotiations there has been a certain amount of unpredictability because of sometimes divergent interests of the various country groupings South Africa is a member of. In particular, the BASIC group and the African Group have often been at odds (e.g. on equity issues), and South Africa has not consistently acted on one of the groups' behalf (ibid.).

In 2011, South Africa hosted COP 17 in Durban. This summit is seen by many as bringing the UNFCCC process back on track after the breakdown in Copenhagen in 2009. South Africa's presidency was highly influential in the agreement of the Durban Platform on Enhanced Action that is the basis for the current negotiations under the ADP for an agreement in Paris. South Africa's introduction of so-called "Indabas", informal talking rounds, quintessentially dissolved positions of mistrust between negotiating parties, and paved the way for agreement (Wolfgang Sterk, Arens, Mersmann, et al., 2011).

13.5.3 Visions for a Post-2020 Agreement

In the process of the ADP, South Africa has been very proactive and seems to be highly interested in reaching an ambitious agreement in Paris. In various submissions, South Africa has stressed its view that the Paris agreement should take on the form of a protocol to the Convention, similar to the Kyoto Protocol. The agreement should require all signatories to take on "commitments that would limit av-

erage global temperature increase to well below 2°C above pre-industrial levels" (Government of South Africa, 2014). The submission calls for a global goal to halve 1990 emissions by 2050, and for a mid-term target on that trajectory.

All Parties would have to formulate and implement mitigation commitments. Developed countries would have to commit to absolute emission reductions, with pathways to peak emissions in 2015, and to reach zero carbon emissions by 2050. Developing countries would be allowed to formulate relative targets, with a view to strengthening them into absolute ones at a later point in time (ibid.).

South Africa further calls for a review process of goals and commitments in 2025, in order to assess the adequacy of goals, based on science and equity. The country also proposes to include an incremental adjustment process of goals and commitments for all Parties, which would make a periodic strengthening of commitments (e.g. every 10 years) mandatory (ibid.).

13.5.4 Call for Equity and International Support

South Africa has repeatedly stressed that international support for both mitigation and adaptation for developing countries is absolutely vital (DEA, 2014; Government of India, 2014d; Government of South Africa, 2014). In this context, South Africa has been calling for a clear set of rules for fair and equitable effort sharing. In its submission to the ADP, South Africa very specifically proposes an "agreement on an assessed contribution arrangement based on an agreed percentage formula (GDP, income or other) for calculating Annex I country contributions and differentiating developing country contributions" (Government of South Africa, 2014).

13.6 Conclusions

Many actors of South Africa's civil society are strongly engaging in the country's climate policy and the stakeholder oriented policy processes provide ample room to do so. Representatives of high carbon industry are obviously an obstacle to ambitious mitigation targets. However, South Africa also has a large number of very knowledgeable experts from academia or NGOs who have actively been shaping the country's climate strategy in the past – and can be expected to continue doing so in the future.

South Africa is among the top 10 polluters globally with relatively high per capita emission of 10 tons CO_2-eq/year and high emission intensity of 1.68 CO_2-eq/USD. Emissions mainly come from domestic coal, which has been used for power generation, in industry and to produce synthetic fuels for transport.

Against this background, South Africa's Copenhagen Pledge (34% below BAU by 2020 and 42% by 2025) as well as it national climate change strategy (emission peak between 2020 and 2025, plateau up to 2035 and decline up to 2050) can be considered a major paradigm shift. One may expect that South Africa will submit the targets from its climate strategy as its INDC, as targets for various target years can be largely quantified from the Peak, Plateau, Decline scenario.

On average, the target range South Africa has pledged is merely 10% above the median of the effort sharing approaches considered in this study. If the country moves to the more ambitious end of its target range, emissions will be well below the range of the effort sharing approaches considered here. Implementation of mitigation actions has been lagging behind this ambition but is slowly picking up speed. Especially the electricity sector is starting to progress, as a supply shortage makes policy makers turn to energy efficiency and renewables for reasons beyond their climate benefits.

In the UNFCCC negotiations, South Africa has been an active Party. In its submissions it tries to conceptualise what both developed and developing countries' contributions to emission reductions and adaptation could look like. For almost all areas touched in South Africa's submission to the ADP there is a section on commitments and responsibilities for Non-Annex I countries and a subsequent section with (more ambitious) proposals for Annex I countries. South Africa's long-term perspective is particularly remarkable. In line with the time frame of its own national climate strategy, South Africa calls for "contributions for periods from 2030" which should "be an integral part of the 2015 agreement"

(Government of South Africa, 2014). South Africa furthermore proposes “a long-term global goal for emission reductions in the form of a global trajectory to reach 50% below 1990 levels by 2050" (ibid.).

South Africa calls for a "rule-based [...], inclusive [...], fair [...], effective [...] and adequate" agreement. In the negotiations the country has been in favour of measures which increase transparancy. Specifically with respect to equity, South Africa is proposing in its ADP submission to formalise a reference framework for fairness considerations based on indicators like GDP or income (ibid.).

14. United States of America

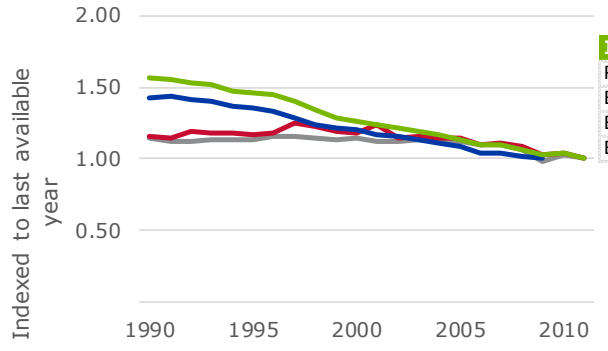
14.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	311.588	mln cap	2011
GDP	1.4E+13	US$ (2005)	2011
Air pollution index	20	ug/m3, mear	2012

Indicator	Value	Unit	Year
Vulnerability	0.20	-	2011
HDI	0.91	-	2011
Electrification rate	100	%	2005

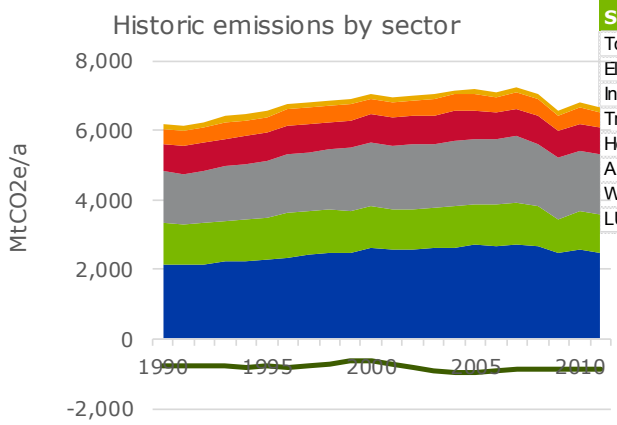
Past trends of decarbonisation indicators



Indicator	Value	Unit	Year
Per capita emissions	21.75	tCO2e/ cap	2011
Emission intensity of electricity	503.0795	tCO2/kWh	2011
Emission intensity of economy	0.49	tCO2e/ USD	2011
Energy intensity of economy	0.16	ktoe/ million	2009

Per_capita_emissions
Electricity_intensity
Energy_intensity
Emission_intensity

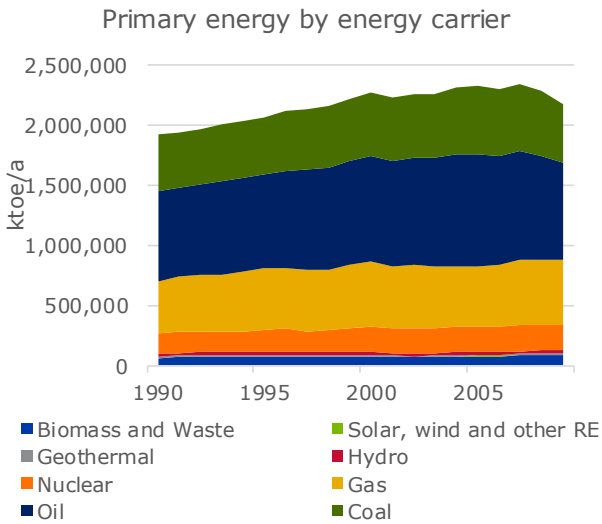
National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	5797.3	MtCO2e/a	100%
Electricity_and_Heat	2453.9	MtCO2e/a	42%
Industry	1110.0	MtCO2e/a	19%
Transport	1743.7	MtCO2e/a	30%
Households_and_services	769.0	MtCO2e/a	13%
Agriculture	461.5	MtCO2e/a	8%
Waste	127.7	MtCO2e/a	2%
LULUCF	-868.4	MtCO2e/a	-15%

Electricity_and_Heat
Industry
Transport
Households_and_services
Agriculture
Waste
LULUCF

Energy mix



Fuel	Value	Unit	Share in 2009
Biomass_waste	82304.205	ktoe	4%
Solar_wind_other	12484	ktoe	1%
Geothermal	8554	ktoe	0%
Hydro	27669	ktoe	1%
Nuclear	214063	ktoe	10%
Gas	568727	ktoe	26%
Oil	786034	ktoe	36%
Coal	479002	ktoe	22%

Indicator	Value	Unit	Year
Share of global emissions	13.4	%	2010
Domestic fossil fuel production	1,428,036	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	80	%	2011
Economic relevance of fossil fuel imports	3.0	% of GDP	2011
Fossil fuel subsidies	n.a.	Billion USD	n.a.
Fuel import dependence	19	% of imports	2011
Fuel import bill	467.28	Billion USD	2011

The USA has the world's largest economy and was for a long time the world's largest GHG emitter. China is overtaking the USA in terms of total emissions but remains much lower on a per capita basis (21.75 vs. 7.08 tCO_2-eq./a). The USA is a major producer of fossil fuels, and domestic production ac-

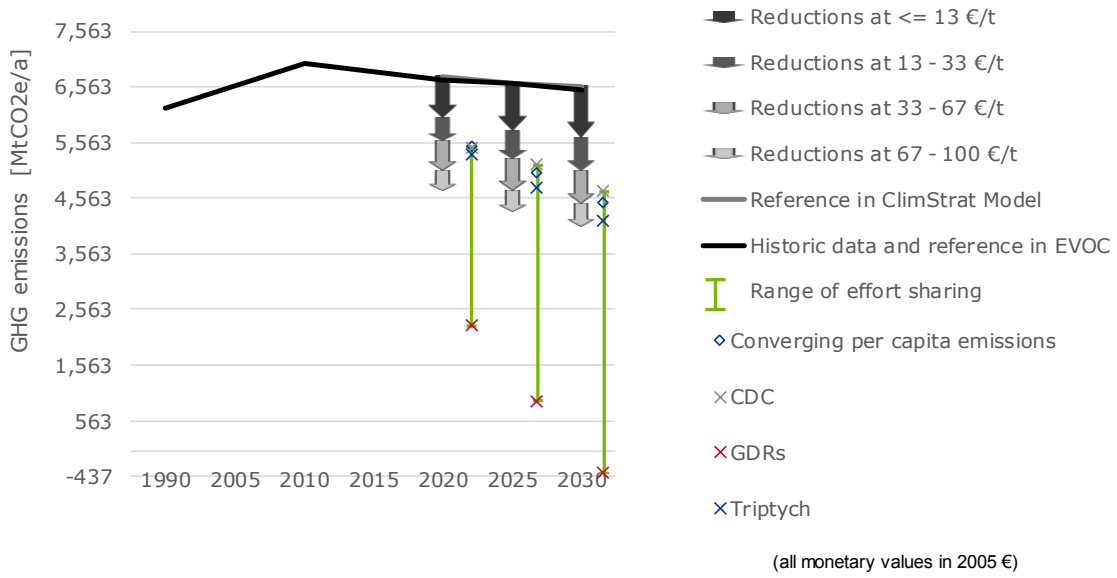
counts for about 4/5 of energy consumption. The USA nonetheless needs to pay about half a trillion USD annually for fossil fuel imports. The future outlook of domestic fossil fuel production is unclear. While the U.S. Energy Information Administration sees the country on a path to energy independence due to shale oil and gas, renewables and energy efficiency (Koch, 2012) other analysts are more sceptical about the durability of the shale boom (see section 14.4).

While being a major emitter and producer of fossil fuels, the USA is also highly vulnerable to and already suffering from climate impacts. For instance, California and the Southwest have in recent years suffered severe droughts, which are projected to increase sharply over the course of the century. Further key impacts include sea-level rise, increases in tropical and extra-tropical storms, floods, wildfires and other extreme weather events throughout the country (U.S. Global Change Research Program, 2014).

14.2 Mitigation Potential and Effort Sharing Allocations

The four effort sharing proposals considered in this study yield strongly varying results for the USA, ranging from 12-64% below 1990 levels in 2020 to 25-106% below 1990 levels in 2030. While CPE and CDC are based on globally converging per capita emissions starting from current levels, Triptych is based on convergence of sectoral indicators irrespective of countries' development status. These approaches therefore do not include aspects of historical responsibility and economic capability. By contrast, the GDR proposal focuses on historical responsibility and economic capability and thus yields strongly different results, suggesting a target beyond 100% in 2030.

Figure 25: Results of Effort Sharing Calculations and Mitigation Costs for the USA



Mitigation costs to achieve the high end of the range are around 50 €/t CO2-eq. in 2020 and 2025 while for 2030 costs would increase to around 100 €/t CO2-eq. By contrast, achieving the low end of the range would incur much higher costs. As noted above, these calculations are based on the assumption of purely domestic efforts, so the use of international emissions trading would tend to lower these costs. A target as suggested by the GDRs proposal would in practice only be feasible through financing large quantities of emission reductions outside the USA's borders.

Table 25: Results of Effort Sharing Calculations for the USA

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	5.467	5.011	4.449	-12%	-19%	-28%	-22%	-28%	-36%
CDC	5.453	5.141	4.662	-12%	-17%	-25%	-22%	-26%	-33%
GDRs	2.253	894	-397	-64%	-86%	-106%	-68%	-87%	-106%
Triptych	5.326	4.746	4.132	-14%	-23%	-33%	-24%	-32%	-41%
Median	5.390	4.878	4.290	-13%	-21%	-31%	-23%	-30%	-39%

14.3 Political System

The United States of America (USA) is a federal republic, with the states playing a significant role in overall energy and climate policy. The USA has a presidential system of government, with the president being elected indirectly on a state by state basis by the US citizens. The legislative branch consists of the two houses of Congress: the Senate, which has 100 members, two from each of the 50 states, and the House of Representatives, which has 435 members, with each member representing a single congressional district. Each of the two chambers of Congress has the authority to initiate legislation. A bill needs to achieve a majority in both the House and the Senate in order to pass. The legislation needs to be signed by the president to become effective. The president may veto legislation. Congress may override a presidential veto by 2/3 majorities in House and Senate (US Constitution, Art. I).

International treaties need to obtain a 2/3 majority in the Senate for ratification. The House is not involved in the ratification process (US Constitution, Art. II, Section 2). The need for a 2/3 majority presents a very high hurdle for international treaties to pass the Senate. Purvis (2009) counts 45 international treaties being on hold (i.e. not being put to vote), "some of these dating back to the 1940s" (Purvis, 2009).

However, the United States have two other ways to enter into a legally binding international agreement. For one, the United States president may conclude agreements under his independent constitutional authority. However, this option is only used very sparingly. Another option is to enter international agreements through a congressional-executive agreement, involving a statute by single majority of both houses (though in reality sixty votes in the Senate, see below), of Congress and signature by the president. Statutes may be given both *ex-ante*, giving the executive the right to negotiate, and *ex-post*, authorising the already-negotiated agreement (Koh, 2012). Especially the latter are very widely used in US-American international legal practice, "and represent eighty-five to ninety percent of all international agreements today" (Purvis, 2009).

Domestic legislation also has a high hurdle to overcome in the Senate as most decisions effectively require 60 votes due to the so-called filibuster. Senate rules allow a senator, or a series of senators, to speak for as long as they wish and on any topic they choose, unless 3/5 of the Senators “duly chosen and sworn" vote to close the debate (cloture) (US Senate Website, 2014). In current practice, any individual Senator can merely threaten to filibuster a bill, so that 60 votes are needed for anything that is even remotely controversial (Wikipedia, 2014c). As a result, in the current political climate (see section 14.4) most legislation requires 60 votes.

Control of the government’s branches is currently divided between the two large political parties of the USA, the centre-left Democratic Party and the conservative Republican Party. President Obama is a Democrat and the Democrats have a majority in the Senate, with 53 Democrat Senators against 45 Republicans and 2 Independents (Wikipedia, 2014f), while the Republicans have a majority in the House of Representatives, with 234 Republicans against 199 Democrats and 2 seats currently being vacant (Wikipedia, 2014e). However, party affiliation does not universally correlate with voting behaviour, as factors such as state origin and others also weigh heavily in individual voting decisions. For example, Members from states with strong fossil fuel production are often inclined to vote against climate regulation, irrespective of political party affiliation.

Existing legislation offers the administration substantial scope to take climate-related actions without further Congressional approval. Most importantly, the administration may use the Clean Air Act of 1963 (as amended subsequently, especially in the 1970s and in 1990) as the basis for executive authority. The US Environment Protection Agency (EPA) in 2009 adopted an "endangerment finding" stipulating that GHGs threaten the public health and welfare of current and future generations and thus fall under the scope of the act. About 54% of US emissions fall under the scope of the Clean Air Act, including electricity generation, industry and large non-agricultural methane sources (N. M. Bianco et al., 2013; Nachmany et al., 2014).

14.4 Historical and Current Domestic Climate Policy and Politics

14.4.1 General Setup of US Climate Politics and Failure of the 2009/2010 Climate Legislation

Being a major producer of fossil fuels, the USA has strong vested interests in limiting the impacts of climate policy on its domestic fossil fuel industry. The USA consequently has a long history of sharp divisions and see-sawing back and forth on energy and climate policy. For instance, as a result of heavy reliance on oil from the Middle East and the oil-price shocks of the 1970s, Democratic President Carter initiated a concerted push into energy efficiency and renewable energy technologies, aiming at sourcing 20% of all US energy use from renewable sources by 2000. However, the subsequent Republican Reagan administration cut the respective funding by 7/8s and iconically also took down the solar panels President Carter had installed on the White House (Hoffman, 2014; Parry, 2012). Another example is the renewables production tax credit (PTC), which provides a tax credit for renewables. The PTC was established by the 1992 Energy Policy Act but the provisions have always had only a limited duration and Congress has allowed the PTC to expire five times, the last time at the end of 2013. The result has been a recurrent boom-bust cycle of the US renewables industry (UCS Website, 2014).

Prospects for a new beginning of US climate policy seemed promising after the 2008 election, as President Obama had made climate change one of the landmark issues of his 2008 election campaign and numbered it among the key priorities of his first term (BBC News Website, 2009). In addition, the Democrats had achieved a landslide victory in the parallel Congressional elections, so that the Democrats controlled the Presidency, the Senate and the House of Representatives. The House did indeed approve comprehensive climate legislation, the American Clean Energy and Security Act (often referred to as Waxman-Markey bill according to its sponsors), in June 2009. Waxman-Markey would have established an emission trading system covering about ¾ of US emissions with a cap through to 2050, as well as other programmes to promote emission reductions. However, only a few Republicans supported the bill and there were also serious concerns among the Democrats. In the Senate, discussions on the companion Kerry-Graham-Lieberman bill subsequently stalled and eventually died in 2010 as the bill's supporters were not able to garner the necessary 60 votes. Some observers assigned a large share of the blame for the failure of the climate bill to the White House, arguing that President Obama did not follow through on his campaign rhetoric and did not invest nearly as much effort as he could have (Lizza, 2010).

However, the main issue is the deep polarisation of current US politics and the strong radicalisation of the Republicans, in particular since the emergence of the radical "Tea Party" tendency within the Republican Party. Emission trading was initially an instrument championed by conservative Republicans in the late 1980's, against resistance from left-leaning groups (Conniff, 2009). However, by 2010 the concept had become abandoned and even demonized by large parts of the same party that had launched it. According to political scientist Theda Skocpol, the climate bill's proponents failed to take the changing position of the Republican Party into account and assumed that it was the party of business and that it would hence be possible to win Republican votes by forging alliances with businesses, for example through the US Climate Action Partnership. Skocpol opines that the bill's proponents failed to appreciate the increasing radicalisation of the Republican Party. For instance, the voting record of Senator John McCain, who had previously co-sponsored cap-and-trade legislation, sharply plunged in the latter half of the last decade (Plumer, 2013b).

Similarly, the 2012 Republican Presidential candidate Mitt Romney was in favour of tackling climate change while governor of Massachusetts, but in the Presidential election campaign he publicly doubted climate science and called for removing the US EPA's authority to regulate GHG emissions (Banerjee, 2012). Climate scepticism is widespread among Republican members of Congress. For example, Senator James Inhofe, the senior member of the Senate Environment and Public Works (EPW) Committee, has called climate change "the greatest hoax ever perpetrated on the American people" and even written a book titled "The Greatest Hoax: How the Global Warming Conspiracy Threatens Your Future" (Inhofe, 2012; NNDB Website, 2014).

Notably, the radicalisation of the Republican Party relates not only to climate change but to any number of issues. Observers for instance noted that Obama's landmark health care legislation was essentially the same as the system Romney had introduced in Massachusetts some years earlier, the basics of which had been developed by the conservative Heritage Foundation. The Republicans nonetheless mounted an all-out campaign against the adoption and subsequent implementation of Obama's health care legislation (Krugman, 2011, 2012).

Some Republican members of Congress claim that they are personally concerned about climate change but nonetheless toe the party line out of fear of getting ousted by more radical challengers in the next Republican primaries. This fate actually befell Representative Bob Inglis, who had been an outspoken advocate of tackling climate change. In his own view, his stance on climate change was the main reason why he was defeated by a challenger from the Tea Party in the 2010 Republican primary (Adragna, 2014; npr, 2011).

In consequence, Republicans rarely support climate change legislation in Congress. Only 8 Republican House members voted in favour of Waxman-Markey. The problem of getting pro-climate majorities in Congress is further compounded by many Democrats coming from areas that strongly rely on coal or manufacturing. Despite the Democrats' landslide victory in the 2008 elections, Waxman-Markey passed by only 219-212 votes, with 44 Democrats voting against (Broder, 2009).

Some analysts also point to the strong role of private money in US politics as being a factor holding up US climate policy as it amplifies the political weight of fossil fuel-based incumbent industries. At the federal level, the presidency is the only office for which public financing is available to candidates while candidates for Congress fully rely on private finance. And as taking federal funding precludes using private funds, Obama declined federal funding in the 2008 election, and both Obama and Romney declined in 2012 (Wikipedia, 2014a). In 2012, both candidates raised around US$1 billion in campaign donations (New York Times, 2012). Funding from the energy industry has historically outspent funding from the environmental movement by a factor of 20-30 to 1. House members who voted against Waxman-Markey received three times more funding from the oil, gas, coal mining, and nuclear energy industries than members who voted in favour (on average USD 37,700 vs. USD 11,304) (Carmichael, 2011). In addition to direct campaign finance, independent political expenditures by interest groups also play a key role in US elections and politics generally. The volume of such spending has increased substantially since the Supreme Court struck down federal restrictions in its Citizens United decision in 2010 (Wikipedia, 2014b). In 2013, The Guardian newspaper uncovered a network of anonymous billionaires donating USD 120 million to more than 100 think tanks and activist groups questioning climate science (Goldenberg, 2013).

14.4.2 From Legislation to Executive Action

While the initiative to adopt comprehensive climate legislation failed, the US was able to make some progress on reducing emissions through the 2009 economic stimulus package – which contained USD 94 billion for renewable energy technologies, energy efficiency, low-carbon vehicles, smart grids and mass transit – and executive action. Using its Clean Air Act authority, the administration strengthened fuel economy and GHG emission standards for passenger vehicles and introduced the first-ever such standards for heavy-duty vehicles. The administration also took initiatives to promote electricity effi-

ciency, for example through setting new appliances efficiency standards for about 40 products (Nachmany et al., 2014; US Department of State, 2014).

US CO_2 emissions in effect fell by 12% between 2005 and 2012. Conventional wisdom holds that this development has been mainly due to the impacts of the financial crisis and the squeezing out of coal by shale gas made possible by fracking. Several analysts have calculated, however, that coal-to-gas fuel switches accounted for at best half of the emission reduction and that at least half of the emission reduction was due to energy efficiency in transport, buildings and industry (Afsah & Salcity, 2013; Wilson, 2013). The future prospects of the shale gas boom are uncertain. Some analysts argue that fracking fields get depleted much faster than conventional gas fields and that, while reserves are far from being run down, the era of cheap gas may therefore be rather short and come to an end within the next several years (Ahmed, 2013; EurActiv, 2013; Heutte, 2014). Gas prices increased somewhat in 2013 already, contributing to a rebound of coal firing and energy-related CO_2 emissions, which increased by 2% compared to 2012. Coal firing increased further in the first half of 2014 and was 16.5% above 2012 levels while gas firing was 14.9% lower (Gerke, 2014; Plumer, 2013a).

Climate change was largely absent from President Obama's re-election campaign in 2012, but in his inaugural address on 12 February 2013 he announced that he was going to take further executive action if Congress failed to act soon (Nachmany et al., 2014). He also made John Kerry, a strong supporter of tackling climate change and co-sponsor of the 2010 Senate climate bill, Secretary of State (Davenport, 2012).

On 25 June 2013, President Obama laid out a climate action plan based on executive action. Among its elements are the establishment of GHG standards for both new and existing power plants under the Clean Air Act; establishing new fuel efficiency and GHG emission standards for heavy-duty vehicles; a goal to double electricity generation from wind and solar by 2020; promotion of energy efficiency in appliances, homes, buildings, and industries; reducing emissions of hydrofluorocarbons (HFCs); establishing a methane emissions reduction strategy; and actions to protect US forests and other landscapes. The administration projects that the climate action plan has the potential to achieve the US pledge to reduce emissions 17% below 2005 levels by 2020 (US Department of State, 2014). The US EPA expects that the power plant standard it has proposed would reduce power sector emissions 30% below 2005 levels by 2030 (US EPA Website, 2014).

However, whether implementation of the plan will be able to go forward as intended is not yet clear. About a dozen states have launched two lawsuits against the plan's centrepiece, the power plant standards. A further avalanche of legal action is expected once the final power plant rule is adopted (Atkin, 2014a, 2014b). In addition, the Republican-controlled House of Representatives has passed numerous bills to restrict the EPA's authority to regulate GHG emissions and to expand production of fossil fuels. The Democrat-controlled Senate has so far taken up none of these bills and President Obama has declared that he would veto any legislation limiting EPA authority. However, climate funding was strongly affected by the recent controversy about the federal budget, which brought the US to the brink of default and a temporary shutdown of the federal government. As part of the final compromise, the EPA's budget as well as international climate finance were sharply reduced (Nachmany et al., 2014).

The profile of the Obama administration's policy is not fully green, either. While President Obama pledged to take action on climate change in his second inauguration address, he also pledged to further speed up the issuance of oil and gas exploration permits as part of an "all of the above" energy strategy promoting the expansion of all sources of energy (Obama, 2013).

14.4.3 Initiatives by Individual States, Businesses and Civil Society

Given the sharp polarisation of US politics, some opine that the USA is not yet ready for a comprehensive national solution and that the real battles are now at the state and local levels. According to Roberts "the necessary pro-climate constituency will be built programme by programme." (Roberts, 2013)

Significant action is indeed taking place in many of the individual states. California adopted a comprehensive "Global Warming Solutions Act" in 2006, which requires to return emissions to 1990 levels by 2020, a reduction of about 15% below business as usual (California Air Resources Board Website, 2014). California as well as a collection of nine north eastern states have established emission trading systems. While the north-eastern system, the Regional Greenhouse Gas Initiative (RGGI), covers only the power sector, the Californian system covers nearly the entire economy, except waste and land-use. 37 states have established renewable portfolio standards or renewable goals (US EPA Website, 2914). 27 states have energy efficiency standards or goals (DSIRE Website, 2014), 3 states have GHG emission standards for power plants (US Department of State, 2014). The RGGI system was initially beset by problems very similar to those of the EU ETS, substantial oversupply and very low carbon prices. However, in contrast to the EU the RGGI states recently agreed to cut the cap by 45% (McGarrity, 2014).

There also is increasingly strong mobilisation among US civil society. The campaign organisation 350.org has organised hundreds of events and launched a quickly growing campaign to persuade universities and other investors to divest from fossil fuel companies (350.org, 2014). The divestment campaign has made some notable marks, such as the decision of the Rockefeller heirs to have the charitable Rockefeller Brothers Fund divest from fossil fuel companies and shift to renewable energy investments (Schwartz, 2014). A climate march on the occasion of the Ban Ki-Moon climate summit drew an estimated 310,000 participants (Goldberg & Sheriff, 2014).

There is also generally increasing attention to renewables, helped by their rapidly improving economics (Bianco et al., 2014). Billionaire Warren Buffett recently announced that he would double his current investments in renewables from $15 to $30 billion (Buhayar & Polson, 2014). A study by investment bank Lazard found that wind and solar are increasingly cost competitive with conventional energy sources even without subsidies (Lazard, 2014).

However, state-level politics have seen similarly sharp divisions and a similar back-and-forth as national politics. For example, New Jersey's Republican governor withdrew his state from RGGI in 2011 (Wikipedia, 2014d). The Western Climate Initiative in 2010 numbered seven US states as partners, but all except California withdrew subsequent to changes of government after the 2010 election (environmental LEADER website, 2011). Other state-level programmes are also constantly under pressure. For instance, the American Legislative Exchange Council (ALEC), a network of business interests and conservative lawmakers, in 2013 coordinated the launch of 70 bills in 37 states to weaken or dismantle renewable energy and other emission reduction programmes. However, almost all of these initiatives were defeated and there has been a significant public backlash against ALEC and its supporters, resulting in several prominent corporate members such as Facebook, Google, Yahoo and Yelp leaving ALEC (Hernandez, 2014; Trabish, 2014).

14.4.4 Whither US Climate Policy?

Overall, the domestic outlook has improved in recent years due to a stronger focus by the administration and initiatives by various frontrunner states. The policy ranking in the 2014 Climate Change Performance Index by Germanwatch and CAN Europe is 12 positions higher than one year earlier. However, the overall setting is still weak due to the current impossibility of adopting comprehensive legislation in Congress. The index therefore ranks the overall performance of the USA only in 43rd place (Burck, Marten, & Bals, 2014).

The future outlook seems unclear. On the one hand, the administration and a large number of federal states are increasingly taking steps to reduce emissions, and low-carbon investments as well as civil society mobilisation are growing. On the other hand, US emissions recently reversed their years-long downward trend. Fossil-fuel based incumbent industries continue to have a strong hold on US politics, amplified by politicians' need for private campaign finance. The deep-seated opposition of large parts of the Republican Party to climate policy shows no signs of abating and a sizable number of Democrats from states with strong fossil fuel industries hold similar positions. Therefore, US climate policy will

for the foreseeable future likely continue to be characterised by sequences of small steps, with the threat of reversal always looming near.

14.5 Historical and Current International Climate Policy Positions

14.5.1 From Kyoto to Copenhagen

The domestic see-sawing of US politics has been mirrored at the international level. The Clinton administration signed the Kyoto Protocol, despite the passage of the Byrd-Hagel resolution in the Senate, which basically repudiated the Berlin Mandate because it exempted developing countries from emission reduction commitments, with 95-0 votes (Oberthür & Ott, 1999). The Clinton administration never submitted the Kyoto Protocol to the Senate for ratification and the George W. Bush administration subsequently withdrew the US signature. The Bush administration also long held out against launching any meaningful process on the further development of the climate regime that might involve a stronger US contribution (Arens, Watanabe, Mersmann, Ott, & Sterk, 2008).

While re-engaging with the UNFCCC process after the election of President Obama in 2008, the Obama administration relaunched the "pledge and review" concept the Clinton administration had initially championed in the 1990s (Oberthür & Ott, 1999). Instead of first setting a global goal and then breaking this goal down into individual country targets as favoured by the EU and developing countries, the USA suggested that each country should basically determine its own level of ambition and the international system would mainly serve as a notary to collect and regularly review the implementation of these pledges. The USA also insisted that the degree of bindingness must be the same for all the major emitters – a demand that was vehemently rejected by developing countries (W. Sterk et al., 2013).

In Copenhagen, the USA pledged to reduce emissions 17% below 2005 levels by 2020. Stigson et al. consider that this represented the least common denominator of what seemed possible domestically. The debate on US climate legislation was still ongoing when the Copenhagen conference took place and the administration considered that there was little point in going beyond what they thought they could pass in Congress. The level of ambition was also strongly negatively affected by the financial crisis which made politicians wary of adopting anything that might worsen the economic situation (Stigson et al., 2013a). In addition to the 2020 target, the US pledge also noted that the pending legislation (Waxman-Markey) also envisaged reducing emissions by 83% by 2050, with milestones of a 30% reduction by 2025 and a 42% reduction by 2030 (UNFCCC, 2011a). However, the Obama administration never strongly backed Waxman-Markey and ceased to seek federal climate-energy legislation after its demise.

14.5.2 Durban Platform Negotiations

Due to the inability of UNFCCC parties to come to a binding agreement in Copenhagen and the following conferences, the pledge and review approach preferred by the US became the automatic baseline and was encapsulated in the Cancún Agreements. Going into the subsequent conference in Durban, developing countries were explicit that their top priority was securing a continuation of the Kyoto Protocol, and the EU adopted a position according to which they would be open to a second Kyoto commitment period if there was agreement on a mandate or roadmap to negotiate a new legally binding treaty for all countries by 2015 in exchange. The USA initially took the position that they did not believe the conditions were ripe for such a mandate, and that "we would be better served" by focusing on implementing existing agreements and scaling up actions. The USA in the end agreed to the adoption of the Durban Platform, but adamantly refused to include any reference to the Convention's principle of common but differentiated responsibilities, again insisting on legal parity between all major emitters (W. Sterk et al., 2013).

After becoming Secretary of State, John Kerry substantially increased the profile of climate change and pushed for mainstreaming it into all operations of the State Department. Observers consider that Kerry has a strong ambition to "become the lead broker of a global climate treaty in 2015 that will commit the United States and other nations to historic reductions in fossil fuel pollution." (Davenport, 2014)

The US position in the UNFCCC negotiations has, however, remained essentially the same. The USA has continued to insist that all countries, developed and developing, should be on the same legal footing in the new agreement and conform to the same requirements in terms of timeframe and transparency. The USA therefore emphasises the language in the Durban Platform that the new climate agreement is to be "applicable to all Parties." The USA stipulates that there is no question that the principles of the UNFCCC continue to apply, the question is their meaning for post-2020 and beyond. The USA maintains that they would not support a "bifurcated approach to the new agreement, particularly one based on groupings that may have made sense in 1992 but that are clearly not rational or workable in the post-2020 era." (Stern, 2013)

The USA has proposed a "flexible" approach to balance the needs and circumstances of a broad range of countries. According to the USA, each country should design its contribution by itself, allowing countries to "self-differentiate". While proposed contributions would be assessed and consulted on internationally, they would not be negotiated. The USA argues that countries are more likely to participate if they can design their contributions themselves and are also more likely to actually implement their commitments if they have designed them themselves. The USA considers that such a nationally determined approach to contributions should satisfy the purpose of the CBDR principle to alleviate developing countries' concerns about constraining their development potential as each country would be able to determine its contribution by itself consistent with its circumstances and capabilities (Stern, 2013).

On finance, the USA expects "that Parties taking ambitious actions in the context of effective enabling environments will continue to attract support." However, in the US view a country's contribution should not be conditional on external support (USA, 2014, p. 3).

Requirements for each Party to maintain a specific commitment, provide clarifying information, report on implementation, follow accounting provisions, and subject implementation of the commitment to review by others should in the US view be internationally legally binding for all Parties. By contrast, the USA sees the question of whether the content of the contributions should also be internationally legally binding as a matter for further discussion (USA, 2014, p. 7).

14.6 Conclusions

The future of US climate policy continues to be highly disputed. On the one hand, the administration and a large numbers of federal states are increasingly taking steps to reduce emissions, and low-carbon investments as well as civil society mobilisation are growing. On the other hand, US emissions recently reversed their years-long downward trend. Fossil-fuel based incumbent industries continue to have a strong hold on US politics, amplified by politicians' need for private campaign finance. Large parts of the Republican Party take radical positions not only on climate policy but on any number of issues. Mann and Ornstein comment, "When one party moves this far from the mainstream, it makes it nearly impossible for the political system to deal constructively with the country's challenges." (Mann & Ornstein, 2012) In addition, substantial parts of the Democrats can also not be counted on to support stronger climate policy due to their states' heavy reliance on coal or manufacturing or their personal opinions. Therefore, US climate policy will for the foreseeable future likely continue to be characterised by sequences of small steps, with the threat of reversal always looming near.

As in Copenhagen, what the US will be able to offer for the 2015 agreement will therefore be severely constrained by its domestic politics and the supermajority requirements in the Senate. Jacoby and Chen consider that "the U.S. Senate is an impassable barrier on the horizon of COP-21 negotiations" (Jacoby & Chen, 2014, p. 4). To get around this problem, the USA proposes that the requirements for each country to maintain a specific commitment, provide clarifying information, report on implementation, follow accounting provisions, and subject implementation of the commitment to review by others should be internationally legally binding, but not the content of the commitment. However, it is not clear why such an approach would face less of a domestic hurdle than an agreement also containing the content of the commitment in legally binding form.

Framing the post-2020 agreement in Paris as a congressional-executive agreement would significantly lessen the constaints that arise from the supermajority requirements, and present a way around the political barrier erected by the 1997 Byrd-Hagel resolution. However, this would mean that the USA would have to innovate their current way of dealing with treaties around international organisations, which have traditionally been agreed in the form of Article-II treaties. It may also mean to withstand significant internal political pressure, if Congress does not approve of this legal route (cf. Koh, 2012).

There is so far no information on what level of ambition the USA may submit for the 2015 agreement. As noted above, the ultimately unsuccessful Waxman-Markey bill envisaged reductions of 30% below 2005 levels by 2025 and 42% by 2030. Compared to 1990 levels, this translates to about 19% and 33% respectively.

While the US Copenhagen pledge is about 8% lower than even the least stringent of the effort sharing proposals considered in this study, for post-2020 the targets envisaged by Waxman-Markey are within the range suggested by the proposals that focus on converging per capita emissions and sector indicators irrespective of historical responsibility and development status (CPE, CDC and Triptych) (see table below). According to the calculations in this study, such targets could be achieved at marginal costs below 100 €/t CO_2-eq. On the other hand, the GDRs proposal, which focuses on historical responsibility and economic capability, would impose much more stringent targets on the US. Such a target would incur very high costs.

However, the figures envisaged in Waxman-Markey were part of a comprehensive bill that would have established a cap-and-trade system as well as other emission reduction policies. The administration will for the foreseeable future have to rely on executive action, which limits the level of emission reductions the USA can achieve. It would therefore not come as a surprise if its post-2020 offer was less ambitious than the reductions envisaged in Waxman-Markey. According to a study by the World Resources Institute, the most ambitious pathway achievable without additional Congressional action, the "Go-Getter scenario"would lead to a reduction of 26% below 2005 levels in 2025 and 33% in 2030 (Bianco et al., 2013). This translates to 14% and 25% below 1990 levels. This is significantly less than the reductions envisaged by Waxman-Markey and at the very low end the range suggested by the effort-sharing proposals considered in this study.

Table 26: Effort Sharing Calculations and the Reductions Envisaged by Waxman-Markey and the World Resources Institute

Approach	Reduction below 1990		
	2020	2025	2030
CPE	-12%	-19%	-28%
CDC	-12%	-17%	-25%
GDRs	-64%	-86%	-106%
Triptych	-14%	-23%	-33%
Median	-13%	-21%	-31%
Waxman-Markey	-4%	-19%	-33%
WRI "Go-Getter" Scenario	-4%	-14%	-25%

15. Venezuela

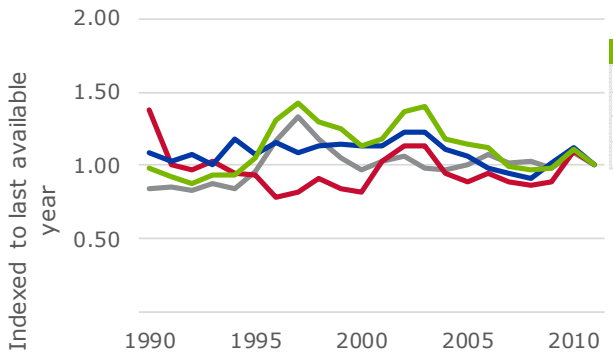
15.1 Drivers for Decarbonisation and Additional Background Statistics

General development data

Indicator	Value	Unit	Year
Population	29.501	mln cap	2011
GDP	1.8E+11	US$ (2005)	2011
Air pollution index	n.a.	ug/m3, mear	n.a.

Indicator	Value	Unit	Year
Vulnerability	0.28	-	2011
HDI	0.76	-	2011
Electrification rate	99.6	%	2011

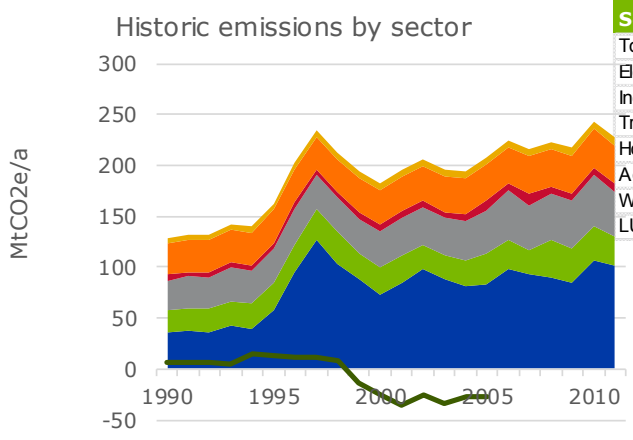
Past trends of decarbonisation indicators



Indicator	Value	Unit	Year
Per capita emissions	7.71	tCO2e/ cap	2011
Emission intensity of electricity	234.3547	tCO2/kWh	2011
Emission intensity of economy	1.25	tCO2e/ USD	2011
Energy intensity of economy	0.39	ktoe/ million	2011

Per_capita_emissions
Electricity_intensity
Energy_intensity
Emission_intensity

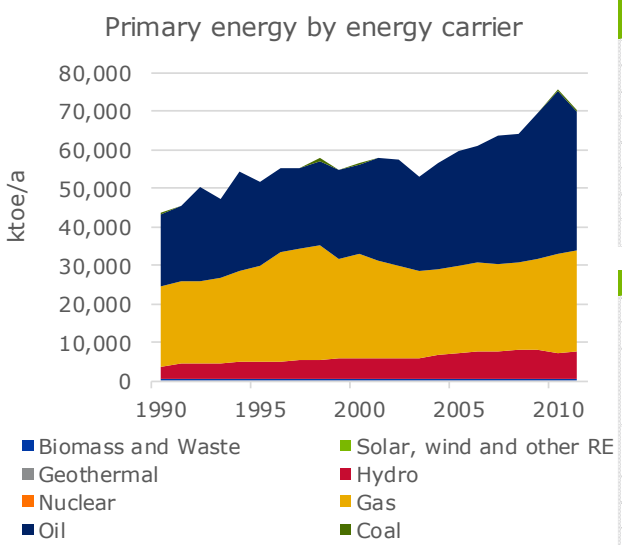
National GHG emission indicators



Sector	Value	Unit	Share in 2011
Total	n.a.	MtCO2e/a	n.a.
Electricity_and_Heat	101.9	MtCO2e/a	n.a.
Industry	28.7	MtCO2e/a	n.a.
Transport	44.1	MtCO2e/a	n.a.
Households_and_services	7.0	MtCO2e/a	n.a.
Agriculture	38.5	MtCO2e/a	n.a.
Waste	7.3	MtCO2e/a	n.a.
LULUCF	n.a.	MtCO2e/a	n.a.

Electricity_and_Heat
Industry
Transport
Households_and_services
Agriculture
Waste
LULUCF

Energy mix



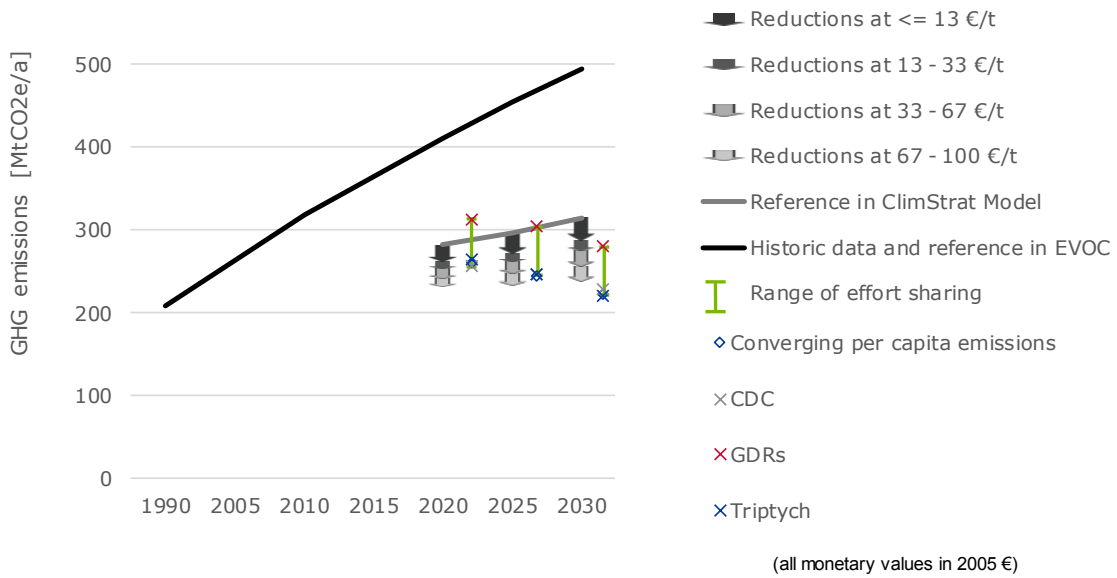
Fuel	Value	Unit	Share in 2011
Biomass_w aste	651	ktoe	1%
Solar_w ind_other	0	ktoe	0%
Geothermal	0	ktoe	0%
Hydro	7196	ktoe	10%
Nuclear	0	ktoe	0%
Gas	25960	ktoe	37%
Oil	36207	ktoe	52%
Coal	205	ktoe	0%

Indicator	Value	Unit	Year
Share of global emissions	0.6	%	2010
Domestic fossil fuel production	192,912	ktoe/a	2011
Domestic fossil fuel production (share of total energy)	96	%	2011
Economic relevance of fossil fuel imports	0.1	% of GDP	2011
Fossil fuel subsidies	27.08	Billion USD	2011
Fuel import dependence	-186	% of imports	2011
Fuel import bill	0.43	Billion USD	2011

15.2 Mitigation Potential and Effort Sharing Allocations

According to this analysis, Venezuela's GHG emissions in 2010 were approximately 320 Mt CO2e/a. The BAU scenario described by the model foresees a development where GHG emissions will increase to almost 500 MtCO2e by 2030, emission levels required by effort sharing is substantially below that. Mitigation potential is available to achieve such emission levels domestically.

Figure 26: Results of Effort Sharing Calculations and Mitigation Costs for Venezuela



The table below displays the figures for the range of the effort sharing results, the range of the marginal abatement costs of achieving the respective effort sharing targets, the marginal cost of achieving the median reduction target, the range of the average costs of achieving the effort sharing targets and the average cost of achieving the median reduction target, each for the years 2020, 2025 and 2030.

Table 27: Results of Effort Sharing Calculations for Venezuela

Approach	Absolute Emissions			Reduction below 1990			Reduction below 2010		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
CPE	260	244	222	25%	17%	7%	-18%	-23%	-30%
CDC	254	244	227	22%	18%	9%	-20%	-23%	-29%
GDRs	312	303	279	50%	45%	34%	-2%	-5%	-12%
Triptych	263	244	219	26%	17%	5%	-17%	-23%	-31%
Median	261	245	225	26%	18%	8%	-18%	-23%	-29%

The effort sharing calculations for Venezuela display a range of options, where most of the effort sharing options (including converging per capita emissions, CDC and triptych) suggest that emissions should decrease to around 260 MtCO2e in 2020. The GDRs approach allows for a development above the ClimStrat model BAU to 312 MtCO2e in 2020. All effort-sharing approaches expect a gradual decrease in GHG emissions from 2020 to 2030, in contrast to the BAU scenarios. The median of all effort-sharing allocations assessed here is an emissions level 18% above 1990-levels in 2025 and 8% above 1990-levels in 2030.

According to the calculations made by the ClimStrat model, it will be possible to reach this median effort-sharing level at costs below 100€/t CO2 in 2020 and 2025. In 2030, the cost for achieving the fair share emissions reduction exceeds 100€/t.

15.3 Political System

Venezuela is a federal state consisting of 23 regions and the Federal District Caracas. Following the election of Hugo Chávez Frías in 1999, the country's 1961 constitution was replaced in December

1999, through the Constitution of the Bolivarian Republic, which characterises Venezuela as presidential republic with a unicameral parliament called National Assembly (National Constituent Assembly of Venezuela, 1999). Venezuela's political system is ranked as partly free[56](Freedom House, 2013), not the least as Chávez 14-year rule took on personalist features, which remain present in most governmental statements even after his death on 5 March 2013. According to Chávez' dictum of Bolivarian Socialism, the government needs to impose a strong state with a politico-economic system which provides a wide range of public services, actively intervenes in the economy, especially with respect to prices, income distribution and concentration of property (Chávez Frías, 1996).

As in almost all Latin American countries, the president enjoys a particularly wide range of powers, so, for instance, the right to initiate legislation (Orozco Henriquez, 2011). Under the 1999 constitution, the president is elected directly for a period of six years (as opposed to 5 years in the past). In the general elections on 31 July 2000, Chávez successfully ran for re- election for a full six-year term under the new constitution, and was re-elected in in December 2006. Thereafter, Chávez sought to lift the presidential two-term limit imposed by the 1999 constitution. While Venezuelans initially rejected respective constitutional amendments in a 2007 referendum, another constitutional referendum in February 2009 eventually abolished presidential term limits. Accordingly, Chávez was able to compete in the October 2012 presidential elections, but died shortly after the start of his third term. Subsequently, a new presidential vote was held from which Chávez designated successor Nicolás Maduro emerged as winner with a narrow margin of 1.5% (National Electoral Council Venezuela, 2013).

Venezuela's parliament is elected every five years by popular vote. Of the 165 seats, 110 are elected through a first-past-the post system, 52 from lists and 3 are reserved for indigenous people and are subject to separate electoral rules. Following Chávez ascent to the presidency, the National Assembly has been dominated by the presidential party. The Fifth Republic Movement, which supported Chávez candidacy in 1999, won 91 seats in the 2000, and 114 in the 2005 legislative elections. After his re-election in 2006, Chávez announced plans to dissolve the Movement in order to co-opt other loyalist parties into the new United Socialist Party (PSUV)[57]. In the 2010 parliamentary vote, the PSUV obtained 96 of 165 seats, with the oppositionist Democratic Unity Table (MUD)[58] still gaining 64 (National Electoral Council Venezuela, 2010)(National Assambly of Venezuela, 2014).

Venezuela's legislative process follows seven steps: initiative, debate, voting, passing, sanction, enactment, and publication. Although, on paper, legislation can be initiated by a wide range of actors, in practice almost all legislation is initiated by the executive branch. Before being debated in parliament, initiatives are submitted for analysis to the National Assembly's responsible standing committee. Once the Assembly has passed a draft law, the president has ten days to consider it. In effect, he may sanction the bill, propose amendments to it, or ask parliament to reconsider any of its provisions. However, the Assembly can override a presidential objection, or veto with a simple majority, thus, turning a bill into law. Only when the president bases his objection upon a charge of unconstitutionality, he can request the Supreme Court to make a respective ruling. In case the Court neither makes a ruling within fifteen days, nor rejects the president's charge, the law is enacted (Ramirez, 2006). Considering the executive's leverage over legislative initiative, and the presidential party's dominance over parliamentary decision-making, the government is capable of pushing through its policy line.

However, by the time of Chávez death, criticism of the Bolivarian Revolution was already bulging in society, in particular among the middle-class and supported by MUD. In February 2014, nationwide protests erupted, leaving several dead, and leading to the arrest of more than 3,000 protestors inducing opposition politicians (BBC News, 2014)(Ultimas Noticias, 2014)(Wallace, 2014)(UN News Center, 2014).

[56] Venezuela's political rights and civil liberties scores were both at 5 on a scale from 1 to 7 (with 1 being most, and 7 least democratic).

[57] Partido Socialista Unido de Venezuela.

[58] Mesa de la Unidad Democrática.

15.4 Historical and Current Domestic Climate Policy and Politics

Venezuela's domestic climate policy has to be interpreted in light of the fact that, following the Bolivarian Revolution, the government's legitimacy increasingly depended on revenues from the export of oil. While Venezuela has the largest proven oil reserves in the world, most oil exploration projects used to be run by private companies. By 2005, however, Chavèz' government was in the process of re-establishing state-control over the country's oil industry and reinvested the rising revenues from the export into social programmes. Currently, oil revenues account for appr. 95% of Venezuela's export earnings, 50% of federal budget revenues and 30% of the country's gross domestic product. As cuts in social spending would have political consequences for the government (Schipan & Rathbone, 2014), it has not been in their interest to develop a coherent response to climate change, so that Venezuela's domestic climate policy has not been a national priority (Edwards 2013).

The Ministry of Environment (MINAMB) has long been Venezuela's national authority on the environment, also overseeing the country's commitments to UNFCCC, and other climate change related actions. Since the Ministry's controversial merger with the Ministry of Housing and Habitat in September 2014, however, the new Ministry of Housing, Habitat and Ecosocialism is the principal institution in charge of climate policy (El Universal, 2014). In general, there is very little institutional capacity on climate change either on mitigation or adaptation in government.

Interestingly, the government's obligation to mitigate climate change is anchored in Venezuela's 1999 constitution. According to chapter IX art. 127 II, the state has the obligation to guarantee that the population can develop within an environment that is free from contamination and in which the air, the water, the soil, the coasts, and the climate are specifically protected (National Constituent Assembly of Venezuela, 1999). In its first national communication to UNFCCC; the government has interpreted this provision as an obligation of the state to control GHG emissions (Ministry of Environment and Natural Resources, 2005)

Overall, Venezuela's climate policy is part of the government's policies to achieve sustainable development and, accordingly, mitigation measures are mostly communicated to the public as socioeconomic achievements. As climate change mitigation is treated as a secondary objective next to other targets such as access to water or energy saving, Venezuela lacks specific climate-related legislation. Nevertheless, the government has adopted a number climate-related policies, largely due to the insight hat deforestation and low energy efficiency are posing a problems for society.

Half Venezuela's territory (roughly 47 million hectares) is covered with forests. But between 1990 and 2000, the country lost an average of 287,500 hectares (0.6%) of forest annually (Mongabay.com, 2005). To counter this trend, the government in June 2006, launched the Mission Tree[59] programme aimed at reforestation, sustainable agro-forestry, and the promotion of socio-productive alternatives for the country's rural population, whose agricultural activities can have damaging impacts on the environment (Embassy of the Bolivarian Republic of Venezuela to the United States, 2010). Under the programme .31,266 hectares have been afforested between 2006 and 2012 (Embassy of the Bolivarian Republic of Venezuela to the United States, 2012). In 2012, the government announced to have cut its deforestation rate by 47.3% over the past ten years and attributed the success to programmes like Tree Mission (Government of Venezuela, 2012).

In addition to afforestation programmes, the government has undertaken implicit mitigation efforts in the wake of its strive to improve energy efficiency. Relying on water for more than 70% of its electricity generation, Venezuela's energy consumers are particularly affected by droughts (Romero, 2009). In reaction to a massive drought in 2007, leading to nationwide blackouts, the Ministry of Electric Energy

[59] Misión Arbol.

passed five resolutions to regulate electricity consumption in the residential, commercial and industrial sectors[60] (Ministry of Electric Energy, 2011).

Subsequently, the government launched the Spreading Light Programme[61] which led to the installation of more than 3,000 devices for electricity generation from renewable sources (solar, wind and hybrids) in rural areas during a period of six years (FUNDELEC, 2012). Also, the government initiated a programme, which by today has replaced 155 million inefficient light bulbs with newly developed eco-friendly ones (Garrido, 2014). A program to replace other household appliances with more eco-friendly ones is in the works.

Further, in 2011, the government passed a Law on the Rational and Efficient Use of Energy which contained provisions for the different ministries to include energy efficiency goals and measures within their respective sectorial plans, the establishment of an energy efficiency certification scheme for buildings and equipment, measures of education and awareness-raising, and the possibility to incentivise the rational and efficient use of energy (Government of Venezuela, 2011).

However, the law was less rigorous than the respective draft law previously discussed in parliament (National Assembly of Venezuela, 2011). In addition to an analysis and a catalogue of energy efficiency measures for the entire chain of energy supply and demand, the proposal envisaged the creation of a governing body in charge of coordinating the Plan's implementation and regular revision, and the introduction of sanctioning mechanisms in case of non-compliance.

Only in 2013, the government addressed climate change as part of their Second Socialist Plan for the Economic and Social Development of the Nation 2013–2019 (Government of Venezuela, 2013). The plan depicts climate change as a direct consequence of the "predatory capitalist" economic and societal model and lists the preservation of life on the planet and the survival of the human species as one of five historical goals for Venezuela. Subsequently, It outlines a number of mitigation policies and programmes, which include the expansion of electricity generation from renewable sources, the development of a national programme for energy efficiency, programmes to improve land use management, and the implementation of waste management plans. However, none of the policies and programmes intended for the industrial, agriculture, transport and housing sectors are related to climate change policy or environmental protection

Despite the emissions reduction efforts described above, the Venezuelan government also pursues a number of policies that contradict mitigation. One critical point undermining the energy savings plan is the government's heavy subsidisation of petrol prices over the past fifteen years. This not only resulted in the large-scale smuggling of petrol at the border with Columbia (Telesur, 2014), but also in second[62] highest per capita emissions in Latin America of appr. 6 tonnes per year due to the high consumption of petrol and the fuel inefficiency of the country's vehicle stock (Márquez, 2012)(Vicuña, 2013).

But Venezuela's current emissions pale in significance compared to what is at stake if the country fully developed its oil reserves. A worrying trend here, is related to the considerable rise in Venezuela's oil production, since China became a major source of finance to Venezuela. As of 2014, Venezuela owes China an appr. US$50 billion, which it is paying back largely in oil (Edwards & Roberts, 2014). In this context, the government in 2013 stated plans to almost double oil production from 3.3 million barrels

[60] Resolution 73 prohibits the use of non-efficient light bulbs for commercial neon signs and restricts the use of these signs to the time between 6pm and midnight. Resolution 74 determines that households whose electricity consumption increased over the previous year should pay a fine, while those whose consumption reduced were to receive a discount on their electricity bill. Resolution 76 fines companies with a power demand of more than 200 kVA that did not reduce their consumption by at least 10% over the previous year. Resolution 77 obliges public authorities to implement measures for the rational and efficient use of electricity.

[61] Sembrando Luz.

[62] Trinidad and Tobago rank first.

per day in 2014, to 6 million in 2019 (Government of Venezuela, 2013). Yet, while experts judged that the death of Hugo Chávez might enable the country to make a positive contribution to climate change mitigation both nationally and internationally (Edwards & Mage, 2013), the administration did not seize this window of opportunity until the time of writing.

15.5 Historical and Current International Climate Policy Positions

Venezuela does not treat climate change as a main priority on their political agenda. Its overall position in the international negotiations is dominated by the demand for maintaining the firewall between developed and developing countries. As part of the ALBA group, they also insist on the right to develop for developing countries.

In 1994, Venezuela ratified the UNFCCC. In 1999, it published its first and so far only national emissions inventory. And in 2005, Venezuela submitted its First National Communication on climate change (Ministry of Environment and Natural Resources, 2005), and ratified as only OPEC-member the Kyoto Protocol.

In the UNFCCC negotiations, Venezuela is part of the Group of 77 (G77)[63], the Bolivarian Alliance for the Peoples of Our America (ALBA) and the group of Like-Minded Developing Countries on Climate Change (LMDC). The G77 represents 77 of the world's developing countries. ALBA was founded by Venezuela and Cuba in 2004, and is made up of nine Latin American and Caribbean countries, of which Bolivia, Cuba, Ecuador, Nicaragua, and Venezuela are the most important ones. And the LMDC unites Bolivia, China, Cuba, Ecuador, Egypt, India, Malaysia, Mali, Nicaragua, Pakistan, Philippines, Saudi Arabia and Thailand.

In the UNFCCC negotiations, Venezuela so far has not delivered any submissions independently of the LMDC Group, whose main position on mitigation is that it should be undertaken on the basis of equity, and the common but differentiated responsibilities (CBDR) principle (Like-Minded Developing Countries, 2013b, 2014d). Most of the Group's submissions stress the need for developed countries to take action, and advocate that developing countries should be exempted from such obligations to be able to focus on development and poverty eradication. Also, parties should work effectively to avoid or minimise the effects of mitigation response measures on developing countries (Like-Minded Developing Countries, 2014a).

This was also reflected in Venezuela's 2006 decision to reject the Clean Development Mechanism (CDM), on grounds that the CDM maintained capitalism without changing production and consumption patterns and that it endorsed contamination by industrialised countries (Agencia Bolivariana de Noticias, 2006).

Developed countries should take the lead on mitigation under the Convention and commit themselves to quantified and comparable economy-wide targets. Non-annex I countries will implement nationally-determined NAMAs "subject to, enabled, and supported by finance, technology development and transfer, and capacity building from Annex II Parties"(Like-Minded Developing Countries, 2014a, 2014d). A new treaty which envisages mitigation commitments for developing countries is not acceptable: "Any framework which seeks to determine for developing countries what they should contribute in any future regime is ab initio not acceptable and goes against the principle of equity and common but differentiated responsibilities based on historical responsibility." (Like-Minded Developing Countries, 2013a)

During the 2009 Climate Change Conference in Copenhagen, president Chávez summed up Venezuela's position on global climate change in one statement: "Change the system, not the climate"(Janicke, 2009). Alongside other ALBA countries, Venezuela rejected the Copenhagen Accord, because it was produced by a limited number of Parties behind closed doors and excluded participation from most members of the UNFCCC. As a consequence, the group refrained from submitting their nationally ap-

[63] A full list of member countries can be found here: http://www.g77.org/doc/members.html (retrieved 12.11.2014)

propriate mitigation actions to the appendix II of the accord, so that Venezuela has not make a voluntary emissions reduction pledge for 2020 (UNFCCC, 2010).

Reflecting the country's political ideology, the government considers the current resource-heavy development model to be the main reason for global warming (Embassy of the Bolivarian Republic of Venezuela to the United States, 2010). Due to the developed countries' emissions history, the industrialised capitalist countries are the ones mainly responsible for climate action. In addition, the predominant opinion of the Venezuelan government is that a country that only emits 0.48% of global GHG cannot make a significant contribution to climate change mitigation (Government of Venezuela, n.d.).

According to the submission made in Warsaw 2013, "Social and economic developments and poverty eradication are still the first and overriding priorities of developing countries. As Article 3.1 states, equity lies in developed countries taking "the lead in combating climate change and the adverse effects thereof", safeguarding and guaranteeing sustainable development and poverty eradication of developing countries; and differentiated mitigation commitments in the context of Article 4.7 of the Convention." (Like-Minded Developing Countries, 2013a)

As part of the Like-Minded Developing Countries group (LMDC) Venezuela has been putting particular emphasis on the aspect of climate finance flows from developed to developing countries. The LMDC group has been stressing the fact that the provision of climate finance to developing countries constitutes an obligation of Annex I countries under the Convention and that any burden sharing should apply to developed countries only, as part of their concern to maintain the "firewall" between the Convention annexes. They further emphasise that the levels of finance provided should be commensurate to the needs of non-Annex I Parties with an increasing trend over time. The LMDC group proposes to include a list with commitments to the Green Climate Fund (GCF) by Annex 1 countries in the new agreement specifying their absolute commitments or relative share of a global commitment (Like-Minded Developing Countries, 2014d). LMDCs also advocate for the inclusion of a clear aggregate of developed country Parties' public climate financing commitment of USD70 billion per year by 2016 rising to USD100 billion per year by 2020 as a floor of accounting, and leading to further increased commitments on the provision of financial support for the post-2020 period(Like-Minded Developing Countries, 2014a). Venezuela in particular has been criticising developed countries for attaching too many conditions to the provision of climate finance which developed countries would be entitled to receive under the Convention.[64] The LMDC group takes a cautious approach to private finance stressing the complementary nature of these flows while they see scaled-up financial flows primarily in the form of public budgetary transfers by developed countries.

The government's diversionary emphasis on framing global warming as a struggle between capitalism and socialism has in recent years been reflected in their efforts to style themselves as leader of a new social movement on climate action hosted in order to raise the volume of civil society demands in UN discussions on climate change. Most recently, the government, in preparation of the Pre-COP in Venezuela's capital Caracas in November 2014, undertook a UN-backed effort to invite 130 green activist groups to Venezuela, which was the first time that civil society has been invited to participate with the UN at this scale at international climate talks (Yeo, 2014b)

15.6 Conclusions

Venezuela's climate change policy is dominated by the overall political vision of the country, the interests of its strong energy sector and the oil and gas producing industry in particular. The country holds the capitalist developed country of the world responsible for climate change, and is therefore reluctant to undertake action on its own. In addition, huge oil and gas resources – of which most of them are heavy crude oil – dominate the country's federal budget revenues and export capacity.

[64] Venezuela: Climate finance is a form of blackmail http://www.rtcc.org/2012/12/06/venezuela-climate-finance-is-a-form-of-blackmail/

The Second Socialist Plan for the Economic and Social Development of the Nation 2013 – 2019 sets as one of five historical goals for Venezuela to "preserve life on the planet and save the human species". This goal calls for the country to mitigate climate change, which is perceived as a direct consequence of the "predatory capitalist" economic and societal model. The plan lists a number of concrete objectives to achieve this goal, including to develop sustainable tourism, run campaigns to raise awareness to reduce waste, promote energy efficient devices, increase generation of electricity from wind and solar technology and promote an eco-socialist culture. Furthermore, it foresees to design a mitigation plan, with the objective to reduce GHG emissions from producing sectors and from energy production and agriculture, in particular.

Despite the constitutional obligation and the prominence of the topic within the Development Plan, actual climate policy in Venezuela is meagre. The main reasons for this are the predominant perception that responsibility for climate change lies with the elites of the industrialized capitalist countries, which principally caused it, together with the enormous national revenues adherent with the country's oil and gas production. The country does not have a particular legislation for climate change and most programs related to climate change focus on adaptation. Climate change mitigation is mainly treated as a secondary objective next to other targets such as access to water or energy saving.

In the UNFCCC negotiations, Venezuela is part of the negotiation groups G77, ALBA and the LMDCs. Their main demand in the negotiations is that developed countries should continue to take the lead regarding mitigation action and developed countries' action would be "subject to, enabled, and supported by finance, technology development and transfer, and capacity building from Annex II Parties".

The LMDC group has been stressing the fact that the provision of climate finance to developing countries constitutes an obligation of Annex II countries under the Convention and that any burden sharing should apply to developed countries only, as part of their concern to maintain the "firewall" between the Convention annexes. They further emphasise that the levels of finance provided should be commensurate to the needs of non-Annex I Parties with an increasing trend over time.

It is therefore rather unlikely that Venezuela will present an INDC or a target in line with the median effort-sharing allocations carried out for this analysis, which envisages an emissions reduction of 46% below the EVOC BAU scenario in 2025 and of 55% below the EVOC BAU in 2030. However, according to this analysis, mitigation costs would be relatively low compared to other countries, below 100€/t for most effort sharing approaches even in 2030.

Annex 2 - Method for calculation of "fair shares"

1. Description of effort sharing approaches

Based on the categorisation suggested by Höhne et al. (2014) and further considerations as illustrated by (Vieweg et al., 2014), we choose effort sharing approaches which cover the dimensions of "equality", "capability", "responsibility" and "cost-effectiveness" to some extent[65]. The following approaches are used in the report and described in more detail in the following sections:

- Converging per capita emissions (CPE)
- Greenhouse Development Rights (GDRs)
- Common but Differentiated Convergence (CDC)
- Triptych

While the "Converging Per Capita Emissions" approach focuses on equality, with converging per capita emissions for all countries, the "Greenhouse Gas Development Rights (GDRs)" approach focuses on responsibility, capability and needs. CDC and Triptych address more than one dimension or take into account that with on-going development, countries may shift to different categories and thus are allocated emission rights differently. The CDC focuses on converging per capita emissions after reaching a threshold and Triptych focuses on exploiting different sectoral potentials depending on country grouping, also considering differentiation throughout time.

1.1. Converging Per Capita Emissions (CPE)

Under Converging Per capita Emissions (CPE) (see also e.g. (Agarwal and Narain, 1998)), all countries participate in the mitigation effort sharing with quantified emission targets. As a first step, all countries agree on a path of future global emissions that leads to an agreed long-term stabilisation level for greenhouse gas concentrations. Subsequently the targets for individual countries are set in such a way that per capita emission allowances converge from the countries' current levels to a level equal for all countries within a given period. The convergence level is calculated at a level that resulting global emissions follow the agreed global emission path.

As current per-capita emissions differ greatly between countries, at least initially some developing countries with very low per capita emissions, (e.g. India, Indonesia or the Philippines) could be allocated more emission allowances than necessary to cover their emissions ('hot air'). This would generate a flow of resources from developed to developing countries if these emission allowances are traded.

Table 28: Configuration of the CPE approach in EVOC for calculations for 2030

	Immediate scenario		Delayed scenario	
	A1B	B2	A1B	B2
Convergence year	*2100*	*2100*	*2100*	*2100*

1.2. Common but Differentiated Convergence (CDC)

Common but differentiated convergence (CDC) is an approach presented by Höhne et al. (Höhne et al., 2006). Annex I countries' per capita emission allowances converge within a certain period of time, e.g., 40 years (2010 to 2050) to an equal level for all countries. The per capita emissions of non-Annex I countries' also converge within the same period to the same level but convergence starts from the date when their per capita emissions reach a certain percentage threshold of the (gradually declining) global average. Non-Annex I countries that do not exceed this percentage threshold do not have bind-

[65] Cost-effectiveness is only indirectly considered in the Triptych and the EU proposal

ing emission reduction requirements. Either they take part in the CDM or they voluntarily take on binding emission reduction targets. Under the latter, emission allowances may be sold if the target is overachieved, but no emission allowances have to be bought if the target is not reached.

The CDC approach, similarly to CPE, aims at equal per capita allowances in the long run. In contrast to CPE it considers more the historical responsibility of countries. Annex I countries would have to reduce emissions similarly to CPE, but many non-Annex I countries are likely to have more time to develop until they need to reduce emissions. Non-Annex I country participation is conditional to Annex I action through the gradually declining world average threshold. No excess emission allowances ("hot air") would be granted to least developed countries.

The parameters for the convergence time, the threshold for participation and the convergence level are shown in Table 29.

Table 29: Configuration of the Common but Differentiated Convergence approach in EVOC for 2030

		Immediate scenario	Immediate scenario		Delayed scenario
	Unit	A1B	B2	A1B	B2
Convergence time	Years	*46*	45	19	24
Threshold	% difference from world average	3.5%	3.5%	3.5%	3.5%
Convergence level	tCO2eq/cap	0.9	0.95	1.1	0.7

1.3. Greenhouse Development Rights

The Greenhouse Development Rights (GDRs) approach to share the effort of global greenhouse gas emissions reduction was developed by Baer et al. (Baer et al., 2007; Baer et al., 2008; Höhne and Moltmann, 2008). It is based on three main pillars:

The right to develop: Baer et al. assume the right to develop as the essential part for any future global climate regime in order to be successful. Therefore a development threshold is defined. Below this level individuals must be allowed to make development their first priority and do not need to contribute to the global effort of emission reduction or adaptation to climate change impacts. Those above this threshold will have to contribute regardless their nationality. This means that individuals above this threshold will have to contribute even if they live in a country that has an average per capita income below this level. The level for this development threshold would have to be matter of international debate. However Baer et al. 2008 suggest an annual income-level of $7,500 per capita. Based on this, the effort sharing of the GDRs is based on the capacity and the responsibility of each country.

Capacity: The capacity (C) of a county is reflected by its income. The income distribution among individuals is calculated using the gini coefficient for a particular country. A gini coefficient close to 1 indicates low equality while a value close to 0 indicates a high equality in income distribution. As the countries capacity is needed to define per-country emission allowances, the sum of income of those individuals per country above the development threshold is added up and used to calculate each countries contribution to fight against climate change.

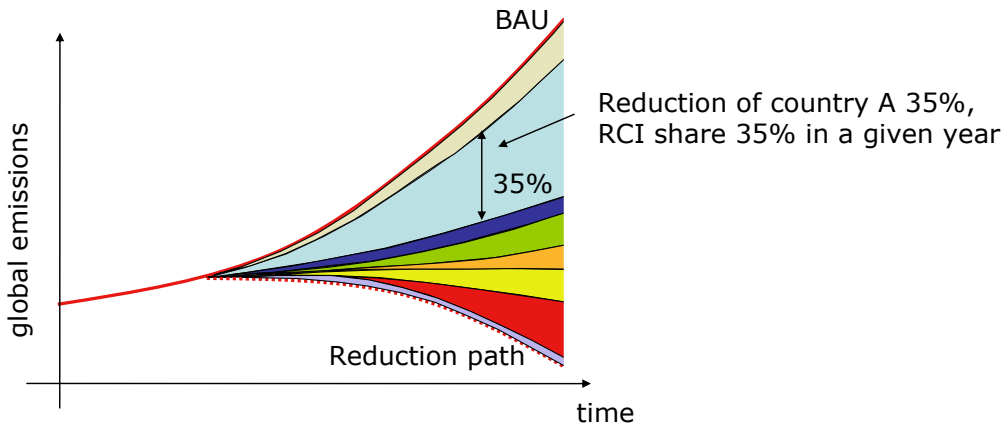
Responsibility: The responsibility (R) is based on the 'polluter pays' principle. For the GDRs it is measured as cumulative per capita CO2 emissions from fossil fuel consumption since 1990. However, it should be distinguished between survival emissions and luxury emissions. Baer et al. assume that emissions are proportional to consumption, which again is linked to income. Emissions related to that share of income below the development threshold are equivalent to the part of national income that is not considered in calculating a country's capacity. Therefore, they shall be considered as survival

emissions. Those emissions linked to income above the development threshold are luxury emissions and shall account for a country's responsibility.

Allocation of emission rights: The allocation of emission reduction obligations and resulting emission rights is based on each country's responsibility and capacity, combined in the Responsibility Capacity Index (RCI). This is defined as RCI= aC + bR, where "a" and "b" are weighting factors. Baer et al. assume and equal weighting of 0.5 for "a" and 0.5 for "b", which gives capacity and responsibility an equal weight.

Two global emissions development paths are considered. First, the business-as-usual (BAU) case and second the reduction path necessary to reach the emission level in order to stabilise global emissions (see Figure below). The difference of these two is the amount of emissions that need to be reduced globally. Each country's annual share of this reduction is determined by the relative share of its RCI compared to the sum of RCIs of all other countries.

Figure 27: Effort sharing under the Greenhouse Development Rights (GDRs) approach according to the Responsibility Capacity Index (RCI)



The Table below includes the configuration parameters for the calculations of the GDRs approach.

Table 30: Configuration of the Greenhouse Development Rights approach in EVOC for 2030

	Unit	Immediate scenario	Delayed scenario
Development threshold	US$(2000) / capita / year	*7500*	*7500*
Start year		1990	1990
Weighting of Capacity	%	50	50
Weighting of Responsibility	%	50	50

1.4. Global Triptych

This approach was originally developed at the University of Utrecht (Blok et al. 1997) to share the emission allowances of the first commitment period within the European Union. It has been updated and revised subsequently (Phylipsen et al. 1998; Groenenberg 2002; den Elzen and Lucas P 2003; Höhne et al. 2003; Phylipsen D et al. 2004; Höhne et al. 2005; den Elzen et al. 2007; Soimakallio et al. 2006).

Analogue to the first Triptych approach, the global Triptych approach is a method to allocate emission allowances among a group of countries based on several national indicators. It takes into account the main differences in national circumstances between countries that are relevant to emissions and emis-

sion reduction potentials. The Triptych approach as such does not define which countries should participate, but we have applied it here to all countries equally.

If the approach is applied globally, substantial reductions for the industrialised countries, especially those with carbon intensive industries (i.e. Eastern Europe and Russian Federation), are required. Substantial emission increases are allowed for most developing countries. But for lower concentration targets (e.g. 450 ppm CO2) these are rarely above BAU-emissions.

The Triptych methodology calculates emission allowances for the various sectors, which are then added up to obtain a national target. Not individual sector targets but only the national targets are binding. This provides countries the flexibility to pursue any cost-effective emission reduction strategy.

The emissions of the sectors are treated differently: For 'electricity production' and 'industrial production',, growth in the physical production is analysed together with an improvement in production efficiency. This takes into account the need for economic development but with constant improvement of efficiency. For the 'domestic' sectors, convergence of per capita emissions is assumed. This takes into account the converging living standard of the countries. For the remaining sectors, 'fossil fuel production', 'agriculture' and 'waste', similar reduction and convergence rules are applied.

Table 31 provides the parameters chosen for the calculation in this report. Details on the applied methodology can be found in Phylipsen et al. 2004. The choice of parameter values is subjective but should reflect a reasonable effort sharing of emission reductions. Several other options are possible.

Table 31: Configuration of the global Triptych approach in EVOC for 2030

		Immediate scenario		Delayed scenario	
Sector	Quantity	A1B	B2	A1B	B2
Industry	Maximum deviation of total industrial production at country level in 2100	90%	90%	90%	90%
	Maximum deviation of total industrial production at global level in 2100	20%	20%	20%	20%
	Convergence of Energy Efficiency Indicator in 2050	0.27	0.35	0.23	0.38
	Structural change factor	0.27	0.35	0.23	0.38
Electricity	Maximum deviation of total power production at country level in 2050	90%	90%	90%	90%
	Maximum deviation of total power production at global level in 2050	20%	20%	20%	20%
	Share of renewables and emission free fossil in 2050	75%	70%	80%	70%
	Share of CHP in 2050	10%	10%	5%	10%
	Reduction of solid fuels in 2050 compared to base year	85%	85%	90%	85%
	Reduction of liquid fuels in 2050 compared to base year	85%	85%	80%	85%
	Amount of nuclear energy	Absolute unchanged			
	Amount of natural gas	Remainder			
	Total efficiency of CHP	90%	90%	90%	90%
	Convergence of power generation efficiency of solid fuels in 2050	50%	50%	50%	50%
	Convergence of power generation efficiency of liquids fuels in 2050	50%	50%	50%	50%
	Convergence of power generation efficiency of gas in 2050	65%	65%	65%	65%
Domestic sector	Domestic convergence level – per capita emissions in tCO2/cap/yr	0.28	0.3	0.23	0.3
	Convergence year	2065	2075	2065	2085
Fossil fuel production	Fossil fuel emission level – % total emissions below base year in 2050	90%	90%	90%	90%
	Convergence year	2049	2080	2060	2085
Agriculture	Reduction below reference scenario emissions in 2050 – low GDP/cap	65%	50%	60%	45%
	Reduction below reference scenario emissions in 2050 – high GDP/cap	80%	70%	80%	65%
Waste	Waste convergence level – per capita emissions in 2050	0	0	0	0.2
	Convergence year	2070	2070	2070	2085

Annex 3 - Project specific assumptions

1. Time aspects

Although the fight against climate change will be the main challenge of the 21st century, the contributions of the UNFCCC signatories have to be fulfilled until 2025 or 2030. The focus of the agreement is post-2020, nevertheless the level of ambition in 2020 is one factor determining possible targets in the future. We therefore include 2020, 2025 and 2030 as target years for the assessment of the fair share distribution.

Another question is, when effort sharing starts and thus global emission reductions. It is possible to

- Start effort sharing immediately.
- Start effort sharing in 2020, until then assume that countries follow their pledges.

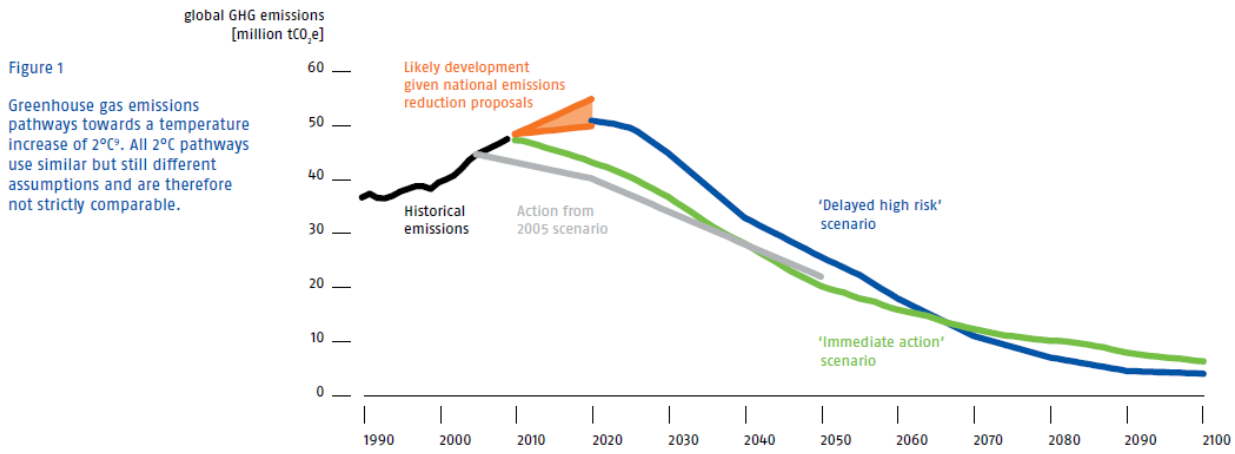
The second option would imply a delayed global pathway, meaning that emission reductions would have to be much stronger later on. This effect is not yet visible for most countries in effort sharing calculations up to 2030. This report therefore focuses on the first option. The choice of either of these also affects the choice of the global emission trajectory put into the model.

1.1 Global emission pathways

The calculations of the effort sharing are based on the immediate and delayed emissions pathway prepared by Höhne et al. (2013). The results of the report focus on the immediate scenario; however, we illustrate results of delayed scenarios in the Annex. The first one is based on a set of scenarios that represent global least cost pathways over the current century. It is the median range of scenarios provided in the UNEP bridging the GAP report (UNEP 2011). As such, they start reductions as early as possible and require global GHG emissions in 2020 to be lower than the level pledged by countries under the UNFCCC negotiations before 2014 (as shown in the red lines in Figure 2). Although named a 'global immediate least cost scenario', in this paper this pathway represents already a delayed pathway, if compared to earlier pathways. This is due to insufficient action on climate change in the past 5 years.

According to the second scenario, called "Delayed high risk" scenario, the emissions peak in 2020. This assumption is based on the emission reductions pledged made by governments under the UNFCCC for 2020, which are not sufficient to limit temperature increase to 2° C (UNEP 2011). Analysts and modellers have only recently started to model impacts of such delayed scenarios. We used scenarios from OECD (2011) and Vliet et al. (2012) for this report. At the point of elaboration of this analysis (late 2013), these are the only two published scenario calculations according to our knowledge. For our calculations, we used a median of these two existing scenarios.

Figure 28: Global pathways of GHG emissions (including LULUCF) (Sources: (UNEP 2011), (Climate Action Tracker 2012), (OECD 2011), (Vliet et al. 2012)); delayed and immediate pathway use different assumptions and are therefore not directly comparable



In the negotiations, over 100 countries have now called for limiting global temperature increase to 1.5°C, not 2°C. Pathways of global emissions that are consistent with 1.5°C are very rare in the literature. In general, they are very similar to 2°C pathways by 2020 and 2030 and only after that, the 1.5°C scenarios assume even more stringent reductions, which result in globally negative emissions at the end of the century.

2. Detailed description of the EVOC model

This section describes the Evolution of Commitments tool (EVOC) version 8, developed by Ecofys, which we use to quantify emission allowances under the various approaches in this report. It includes emissions of CO2, CH4, N2O, hydroflourocarbons (HFCs), perflourocarbons (PFCs) and sulphur hexafluoride (SF6) for 192 individual countries. Historical emissions are based on national emission inventories submitted to the UNFCCC and, where not available, other sources such as the International Energy Agency. Future emissions are based on the IPCC Special Report on Emissions Scenarios (Nakicenovic et al., 2000). The greenhouse gas emission data for 1990 to 2006 is derived by an algorithm that combines emission estimates from various sources.

We first collected historical emission estimates by country, by gas and by sector from the following sources and ordered them in the following hierarchy:

1. National submissions to the UNFCCC as collected by the UNFCCC secretariat and published in the GHG emission database available at their web site.
2. CO2 emissions from fuel combustion as published by the International Energy Agency.
3. Emissions from land-use change as published by Houghton in the WRI climate indicator analysis tool.
4. Emissions from CH4 and N2O as estimated by the US Environmental Protection Agency.
5. CO2, CH4, N2O, HFC, PFC and SF6 emissions from the latest EDGAR database.
6. Future emissions are derived from the MNP/RIVM IMAGE implementation of the SRES scenarios.

The datasets vary in their completeness and sectoral split. We first defined which of the sectors provided in the datasets correspond to seven sectors. This definition is provided in the Table below. Note that CO2 emissions from the IEA do not include process emissions from cement production. Hence, if IEA data is chosen, process emissions from cement production are not included.

For each country, gas and sector, the algorithm completes the following steps:

1. For all data sets, missing years in-between available years within a data set are linearly interpolated and the growth rate is calculated for each year step.
2. The data source is selected, which is highest in hierarchy and for which emission data are available. All available data points are chosen as the basis for absolute emissions.
3. Still missing years are filled by applying the growth rates from the highest data set in the hierarchy for which a growth rate is available.

As future emissions are only available on a regional basis and not country-by-country, the resulting set of emissions is then extended into the future by applying the growth rates of the respective sectors and gas of the region to which the country belongs.

For population, GDP in purchase power parities and electricity demand, the country base year data was taken from the United Nations, respectively. These data are extended into the future by applying the growth rates from the IMAGE model for the region to which the country belongs.

A limitation of the tool is the unknown future development of emissions of individual countries. Here, we have used the standard set of future emissions scenarios, the IPCC SRES scenarios, as a basis. They provide a broad range of storylines and therefore a wide range of possible future emissions. We cover this full range of possible future emissions, economic and population development in a consistent manner. But the SRES scenarios are only available at the level of up to 17 regions (as in the IMAGE implementation) and scaling them down to individual countries introduces an additional element of uncertainty. We applied the growth rates provided for 17 world regions to the latest available data points of the individual countries within the respective regions. So, on the level of regions, we cover the full-range uncertainty about future emissions. When again aggregating the regions, the effect of downscaling cancels out. But the full level of uncertainty is not covered on the national level as substantial differences may exist for expected growth for countries within one of the 17 regions.

The future reference development of emissions, economic and population is affected by the starting values (which is data available from the countries or other international sources and which can be substantially different for countries in one region) and the assumed growth rates (which are derived from the 17 regions).

The assumed growth rates may affect the results of countries to a different extent. Some countries are less affected as they dominate their regional group, such as Brazil, Mexico, Egypt, South Africa, Nigeria, Saudi Arabia, China and India. It is for second or third largest countries in a region or for members of an inhomogeneous group, for which this method may lead to an over or underestimation of the future development.

The second or third largest countries in a region include, for instance, Argentina, Venezuela, United Arab Emirates and South Korea. Under the CPE approach, the error would be small as countries follow their reference scenario only until the base year and converge afterwards. For CDC, Multistage and the GDR approach, the downscaling method may influence the time of participation. But the countries listed above would all participate at the earliest possible moment, based on their already today high per capita emissions. In the Triptych approach, growth in industrial and electricity production and a reduction below reference for agriculture is used, which may be affected by the downscaling method.

Members of an inhomogeneous group would be those of South East Asia, which includes Indonesia and the Philippines as lower-income countries and Malaysia, Singapore and Thailand as higher-income countries. Here the growth is averaged over the region, probably underestimated for Indonesia and the Philippines and overestimated for Singapore. The dominant element here is the starting point. The low per-capita emissions of the Philippines and Indonesia lead to their late participation, while the high per-capita emissions in Malaysia, Singapore and Thailand lead to their immediate participation. In the Triptych approach, growth in industrial and electricity production and a reduction below reference for agriculture is used, which may be affected by the downscaling method.

For Annex I countries, the future reference development is not as relevant since they always participate in the regime on the highest stage and have to reduce emissions independent of the reference development. Future values are only relevant for intensity targets (GDP) or for the Triptych approach (industrial and electricity production and agriculture).

A different uncertainty is introduced since our future emissions are static, meaning that emissions in non-participating developing countries do not change as a result of ambitious or relaxed emission reductions in developed countries. Stringent reductions could affect emissions of non-participating countries in two ways. There could be increased emissions through migration of energy-intensive industries or decreased emissions due to technology spill-over. Overall, we assume that this effect is small and not significantly influencing the results of this analysis.

Annex 4 - Calculation of mitigation potentials

The following sections describe the analysis framework for the assessment of mitigation potentials as used for this report.

1. Detailed description of the ClimStrat model

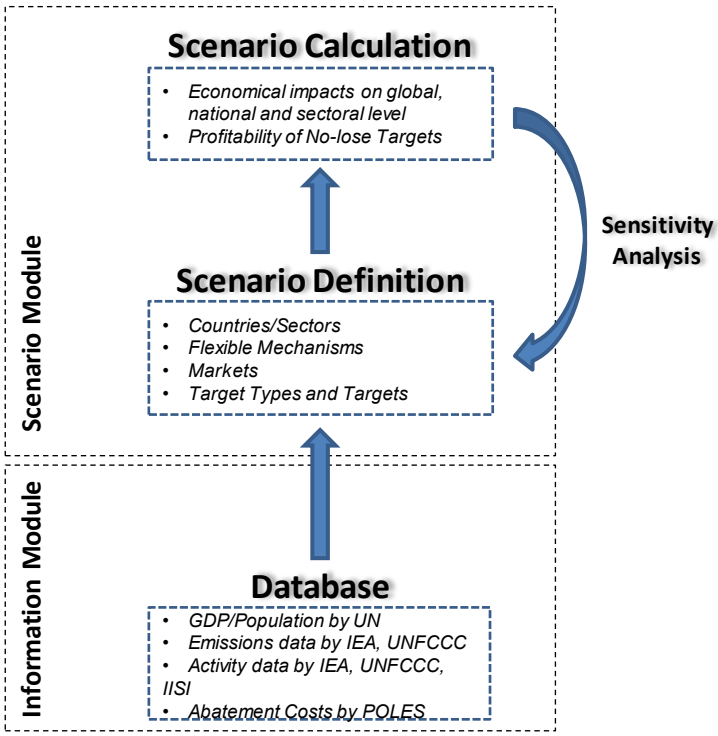
1.1. Objective and structure of ClimStrat

ClimStrat is a computerized tool to help policymakers perform quick and flexible "on-the-spot" analyses of international climate agreement proposals. The focus is on the economic implications of emission reduction targets by a number of countries. The international climate agreement proposals that are modelled in the tool consist of several types of reduction targets on sectoral and/or national level. The use of national and sectoral emission trading markets and other flexible mechanisms such as national as well as sectoral crediting mechanisms and the use of offsetting mechanisms can help to reduce the costs for reaching those targets.

The calculations are based on marginal abatement cost curves for 137 countries and the years 2020 to 2050. Ten different sets of marginal abatement cost curves are provided, reflecting different development scenarios with respect to technology, GDP growth and fossil fuel prices. This allows further sensitivity analyses to be conducted.

ClimStrat is designed with a flexible market structure and a high number of target options, countries and sectors so that a whole range of diverse questions can be analysed. An intuitive user interface is provided to help the user define the scenarios with regard to market composition, target definition and trading options. In addition to the analysis section, ClimStrat also contains a large selection of historical and projected emissions, production and socio-economic indicator data for single countries or regions. Therefore it can also be used as an information source containing a number of the most used/ cited data sources. The design structure of ClimStrat is shown in the following table. The information module forms the basis for the scenario module. Sensitivity runs are possible by changing parameters in the scenario definition.

Figure 29: Design of ClimStrat



1.2. Information module

1.2.1. General Information

To get a better understanding of the situation in different countries and sectors, ClimStrat provides the user with a broad information section. This includes historical data on CO2 and non-CO2 greenhouse gas emissions, production and socio-economic indicators from different sources as well as projections from different scenario-runs conducted by POLES. In addition to the original POLES data, scenarios have been constructed based on historical emissions and the projected growth rates from POLES.

Data are available for a large number of countries, regions, sectors and sub-sectors. Categories correspond to the UNFCCC GHG inventories, including total GHG emissions including/excluding LULUCF. Based on data availability, sub-sectors additional to the UNFCCC ones have been included in the database, creating a high degree of detail in some areas. The data can be exported to Excel.

1.2.2. Abatement Potential

In order to provide a picture of the abatement potential of different countries, ClimStrat also presents GHG reduction amounts for different carbon values, which can be entered individually by the user. The data is available for many individual countries, as well as worldwide, for any year between 2020 and 2050. While the focus lies on total GHG emission including/excluding LULUCF, some sector-specific data is available as well. The abatement potential is based on different scenario-runs conducted by POLES, which can be chosen separately.

1.3. Scenario module

1.3.1. Scenario definition

For each scenario, a multitude of flexible trading markets and mechanisms can be defined to which countries including a corresponding sector can then be assigned. Sectoral, nationwide emission reduction targets can be set for each given sector of a particular country.

The following section explains which flexible mechanisms and flexible markets can be distinguished, and which target types can be defined.

(1) Targets and target types

Emissions reduction targets can be set on a national as well as on a sectoral level for each country. Targets can either be absolute or relative. An absolute target is defined as a percentage reduction of the emissions level of a specific base year, although it can be entered as an absolute number (in tons of GHG emissions) as well. The base year can be between 1990 and 2050, whereby, from 2011, emissions levels are given as future BAU emissions levels.

In contrast, a relative target is based on an indicator such as per GDP, per production (in t or MWh) or per capita. This can in turn be translated into an absolute emissions reduction target based on the emissions and production projections.

Based on the availability of sectors and sectoral indicator data, the following **Error! Reference source not found.** provides a list of the possible specific target types that can be set.

Table 32: Target types available in ClimStrat

	International Emissions Trading		Offsetting Mechanism		Crediting Mechanism		Other Markets	
Target Type	***National***	***Sectoral***	***National***	***Sectoral***	***National***	***Sectoral***	***National***	***Sectoral***
absolute	x	x	x[2]	x[2]	-	-	x	x
per capita	x	-	x[2]	-	-	-	x	-
per GDP	x	-	x[2]	-	-	-	x	-
per t product	-	x[1]	-	x[1,2]	-	-	-	x[1]

[1] *Currently, implemented only for Iron&Steel and Electricity*

[2] *eg. NAMAs (Nationally Appropriate Mitigation Actions)*

(2) Flexible market mechanisms

Based on the set targets, absolute amounts of emissions reductions are determined. Flexible mechanisms are available to reduce the costs that would occur if the emissions were reduced domestically. These mechanisms comprise emissions trading markets on a national or sectoral basis, a crediting mechanism and an offsetting mechanism. The use of the flexible mechanisms can be restricted. The following basic mechanisms and markets are available in ClimStrat to which combinations of sectors and countries can be exclusively assigned.

- International emissions trading market
- Offsetting market
- No-lose target
- Further emissions trading market

In the **International Emissions Trading Market (IETS)**, countries with GHG reduction targets can trade freely among themselves. However, some restrictions can be defined through the so-called domestic quota and offsetting limit. The domestic quota defines a certain share of the emissions reduction target that has to be achieved within the borders of the respective country, i.e. it restricts the amount of certificates a country can trade on the international emissions trading market.

Unlike the international emissions trading market where permits are traded, the **offsetting market** sells offsets. In order to reflect the current conditions of applying the offsetting mechanism, it is assumed that only 20% of the offsetting potential can be used. Those sectors of a country which are part of the offsetting market can also agree to set their own reduction targets which have to be met within the national borders of that particular sector. In other words, the domestic quota of such reduction targets is automatically set to 100.

Furthermore, it is assumed that those targets have to be fully realised before offsets can be produced and sold. As a consequence, it is assumed that the country realises its own emission reduction commitments at the least cost, whereas more expensive mitigation measures are subject to market forces which increases the overall marginal price of abatement. One example for targets for those offsetting countries are Nationally Appropriate Mitigation Actions (NAMAs) that are not eligible for offsetting.

The international emissions trading market is directly connected to the offsetting market, which means emissions can be reduced, offset and accredited within this market. The extent to which a sector of a country uses the offsetting mechanism is defined by the offsetting limit. This equals the share of the (remaining) emissions reduction obligation that can be offset.

The third flexible mechanism that can be incorporated in a scenario is the **crediting mechanism**. This mechanism allows the modelling of non-binding targets that are only realised if countries profit from meeting the target. Here, the country decides on a (national or sectoral) specific reduction target that

has to be met first before generating credits or offering emissions reductions. In contrast to the offsetting mechanism, the full abatement potential is available for generating credits. The credits can be sold on the IETS. Also, they do not fall under the offsetting limit, which means that they can be directly sold on the IETS.

In addition to these three pre-defined markets, a multitude of other **emissions trading markets** can be incorporated, covering the sectors of every country. These additional markets can also be restricted via the above explained parameters of the domestic quota as well as the offsetting limit. However, they do not have access to credits from the crediting mechanism.

There is a restriction when assigning countries' sectors that a sector of a country can only be assigned to one single market. Double counting is consequently impossible.

1.3.2. Scenario calculation

(1) Calculation assumptions

The scenario calculation is based upon several assumptions which include:

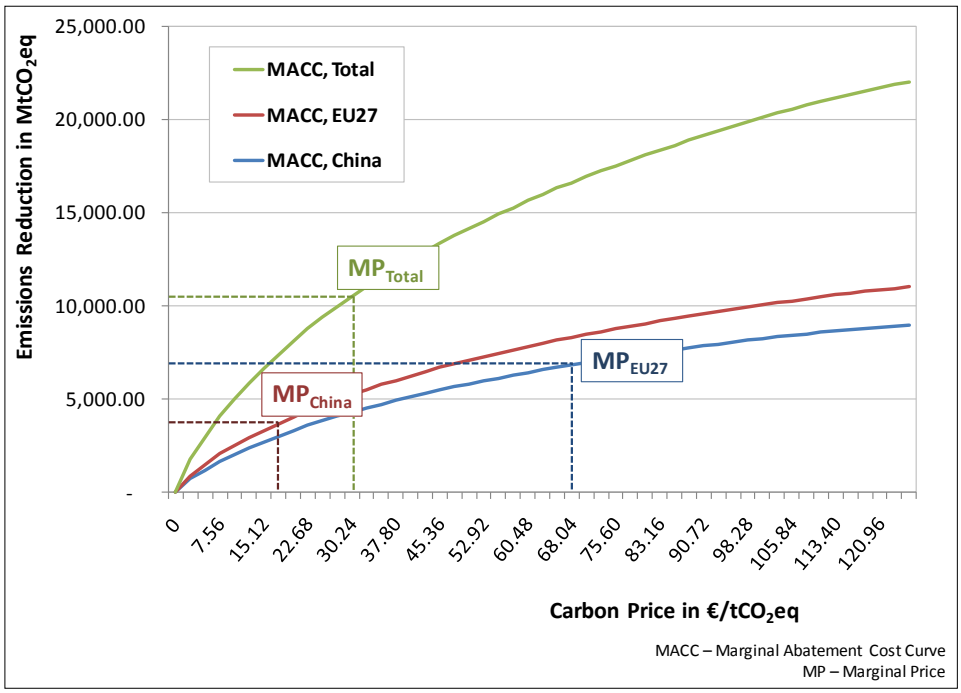
- BAU emissions for a given year and sector will not include the implementation of any additional mitigation measures or policies.
- Each country has an individual Marginal Abatement Cost Curve (MACC), derived from POLES, which is used to calculate the corresponding total reduction costs in € for a certain level of emissions reduction in tCO2eq.
- The maximum price of carbon is €436 per t/CO2eq.
- All GHG abatement options are eligible projects within the offsetting market. However, only 20% of all abatement options will be available to the offsetting market.
- The banking and borrowing of permits are not considered, as the ClimStrat Model does not use trading periods in order to calculate costs. This means that the related issue of "hot air" from previous commitment periods is also not considered.
- However, "hot air" is taken into account when the emissions reduction target is lower than the BAU level.
- Interim targets cannot be set; the targeted emission reduction from today until the target year follows a linear carbon or price path.
- It is assumed that a country's emissions trading behaviour will be to purchase permits to produce the most cost-effective outcome (i.e. an Annex I country would first purchase CER credits up to the CDM quota and then buy more expensive ETS credits).

(2) Calculation algorithms

1.3.2.1 Calculation of the carbon price

The carbon price is the outcome in a market where emissions reductions are demanded and supplied. We can explain this by looking at a two-country example, where two countries are committed to reducing emissions to a specific level (see the table below). Assuming that no trading takes place, a marginal price (MP) of abatement would emerge for each country (e.g. MP_{China} and MP_{EU27}). In contrast, in a trading situation, there would only be one price for the two countries (MP_{total}). This is because China would increase its domestic emissions reductions to above its committed level in order to be able to sell the surplus as certificates at the MP. In contrast, EU27 would rather buy reduction certificates at a lower price than reduce within its own borders at higher costs. As a result, both countries benefit from trading: The selling country records profits whereas the buying country lowers its reduction costs. This method can be applied to an unlimited number of countries or reduction targets. Calculating the carbon price is the fundamental functionality of ClimStrat.

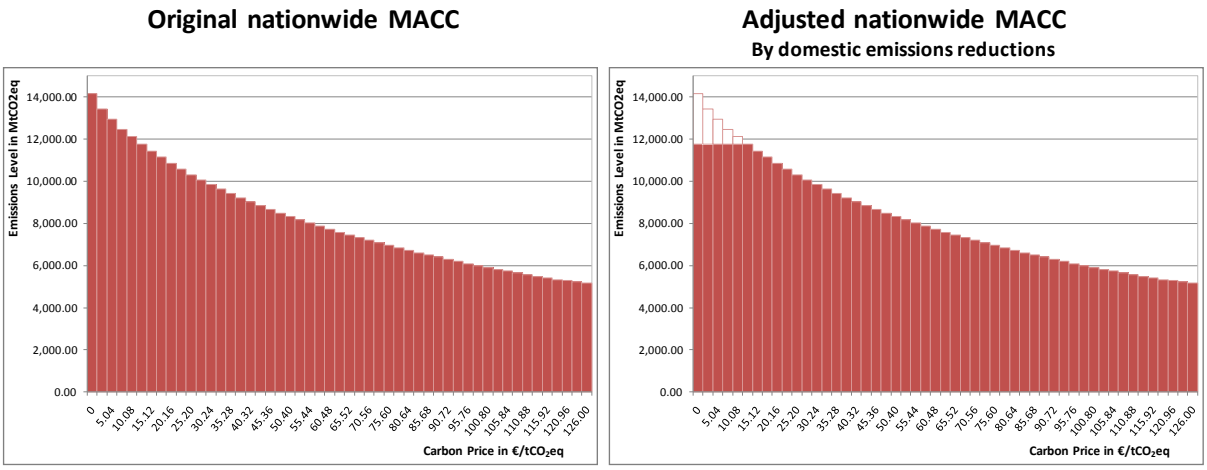
Figure 30: Calculation of the carbon price



1.3.2.2 Consideration of domestic emissions reductions

If a country has made domestic emissions reductions up to a corresponding marginal carbon price, those reductions can no longer be made anywhere else. In turn, the respective MACC has to be reduced according this domestic reduction. In fact, a new lower emission level has to be updated in the MACC to the marginal carbon price of the domestic reduction. This effect is illustrated in the Figure below. The adjusted MACC is then considered in further calculations.

Figure 31: Consideration of domestic emissions reductions[66]



Curve adjustment of national MACC by other sectoral MACCs

Whenever a sector of a country has committed to its own emissions reduction target, the corresponding nationwide MACC needs to be adjusted by the respective sectoral curve in order to avoid double

[66] The figure shows the emissions level corresponding to a carbon price: The higher the carbon price, the more interesting the investment in emissions reduction measures and the lower the emissions level in the respective year.

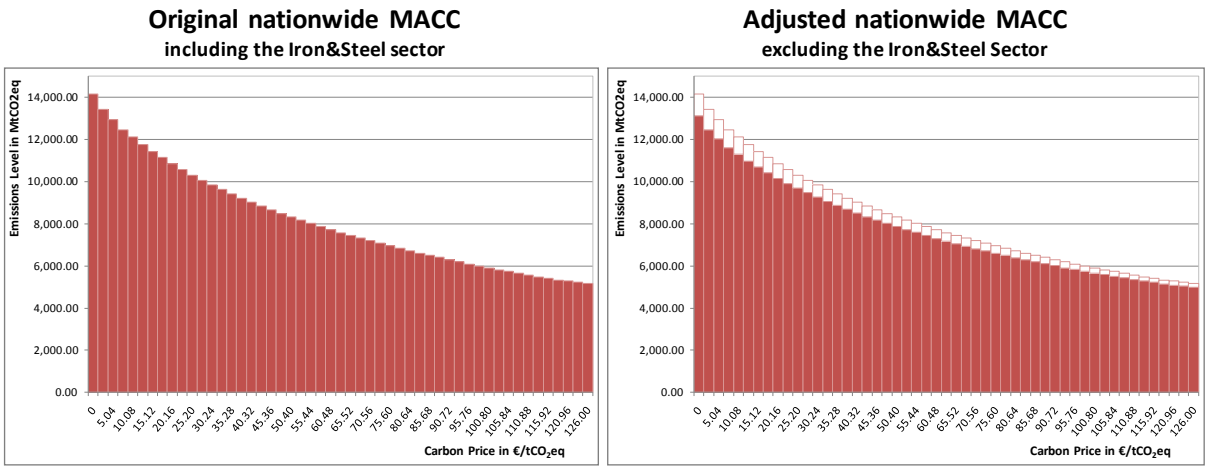
counting. The table below represents the underlying calculation algorithm for such an adjustment. For each marginal carbon price, there is a corresponding emissions level for each sector, so that MACC values have to be reduced step-by-step, or price-by-price. The table below shows the adjusted nation-wide MACC.

Equation 1: Curve adjustment of national MACC by other sectoral MACCs

$E_{n,\,year,\,nation\text{-}wide}[p] = E_{n,year,nation\text{-}wide}[p] - E_{n,\,year,\,sector}[p]$ for p = 0 until 436

(with n – country, p – price)

Figure 32: National MACC adjustment



1.3.2.3 Curve adjustment due to the offsetting potential

A MACC represents the full potential of emissions abatement: In order to reflect the current situation of a limited use of emissions reductions in offsetting countries, the MACCs are adjusted by the offsetting potential of 20% (see Figure). This means that only 20% of the original abatement potential (evenly spread) is assumed to be offered in the offsetting market.

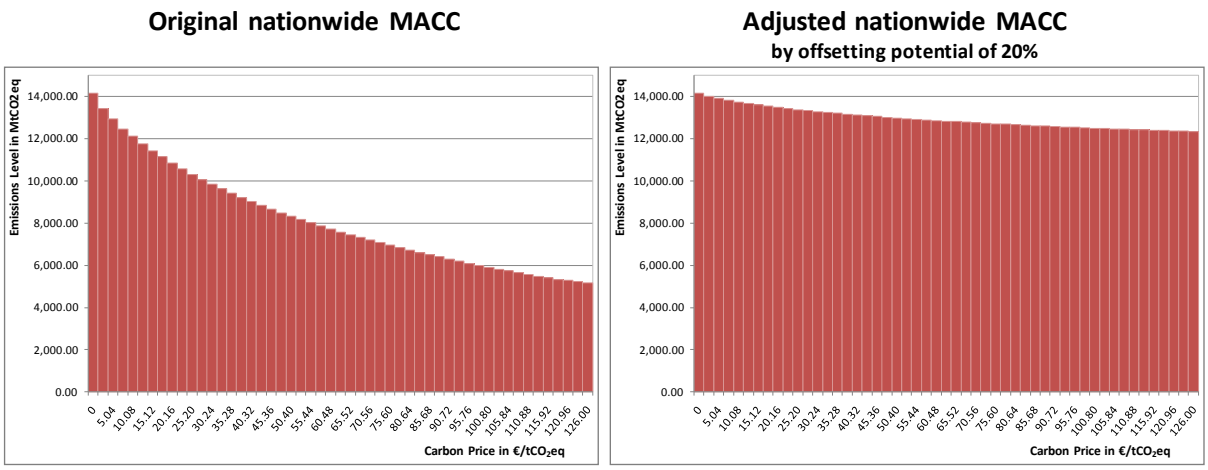
Equation 2: Curve adjustment due to the offsetting potential

$E_{n,\,year,\,sector}[p] = E_{n,year,sector}[0] - ((E_{n,\,year,\,sector}[0] - E_{n,\,year,\,sector}[p]) \cdot 0.2)$ for p = 0 until 436

(With n – country, p – price)

The following figure shows the effect of that curve adjustment on the right-hand side.

Figure 33: Offsetting potential adjustment



Annex 5 - Combining Effort Sharing with Mitigation Potential

After the independent calculations on fair shares and the mitigation potential, the results are combined. Taking the emission levels resulting from different effort sharing calculations, abatement costs arising from compliance with these targets are calculated. In addition, carbon prices that, if implemented, would lead to compliance are provided. In order to show the full range of costs resulting from different effort sharing approaches, three different scenarios are formed from the effort sharing approaches: min, median and max. The max scenario combines the maximal allowed emission level of all effort sharing approaches (i.e. the least ambitious target) for each country, while min and median are calculated accordingly. As abatement costs are higher for more ambitious targets, the highest costs are produced in the min scenario. It should be noted that each of the three scenarios does not represent one consistent effort sharing scenario, but rather combines different approaches for different countries. Therefore the min scenario is more ambitious than the global emissions pathway that is the basis for the effort sharing calculations, while the max scenario is less ambitious. The calculations are based on the assumption of purely domestic efforts, that is, without use of international emissions trading.

The combination of the results of the effort sharing calculations with the mitigation potential requires a closer look at the baselines used. While the effort sharing calculations use the growth rates of two SRES scenarios, the mitigation potential is based on a recent POLES scenario. As mentioned above, this scenario includes current or already planned measures, like the EU 2020 targets, in the baseline. The SRES scenarios, on the other hand, take a completely different approach by presenting a future range of possible pathways. They do not include considerations of current or planned measures. For most countries, the difference between the POLES baseline and the SRES baseline in 2030 lies between 5% and 40% depending on the country. We circumvent the problem of different baselines by implementing the absolute emission target levels resulting from the effort sharing approaches in the abatement cost calculations, rather than the emission reductions. While the effort sharing calculations would produce a different result if the POLES baseline were used, the linkage using absolute emission levels ensures comparability of the two approaches.

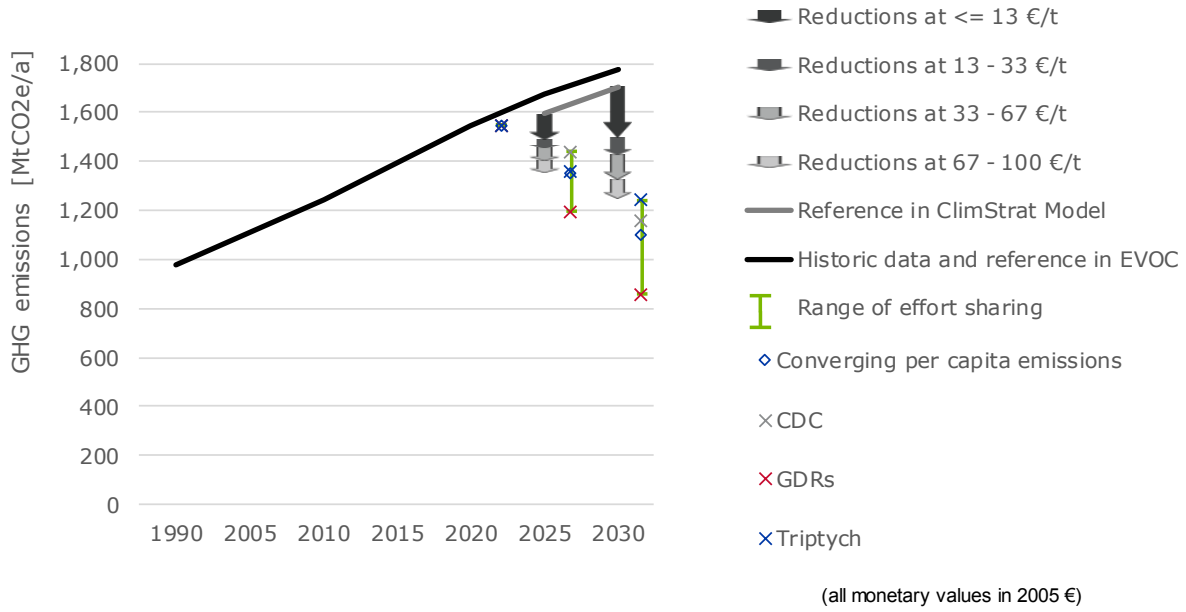
The cost curves in POLES furthermore do not explicitly include mitigation measures with negative costs. All mitigation measures are triggered by the introduction of a carbon price. Therefore, it is assumed that emission reductions from measures with negative costs are carried out at the same rate as emission reductions caused by the carbon price.

Another factor in the results for very ambitious targets is the limitation of the marginal abatement cost curve. The highest carbon price modelled by POLES is 436€/tCO2eq[67]. For highly ambitious targets, this price might not be high enough to reach the target. This outcome is much more likely in the no trade case, as international emissions trading provides a balancing of low and high ambition. However, if it does occur, an assumption has to be made about the cost of emission abatement "beyond" the curve. We assume that the cost per ton abated stays constant, meaning that countries can reduce their emissions to zero for the highest carbon price of 436€/tCO2eq. As POLES is a technology-focused model, it does not take society-wide changes of behaviour, like modal shift and sustainable urban design, into account. Therefore, we can think of these abatement efforts when very ambitious targets are modelled.

[67] This is equivalent to US$2000/tC.

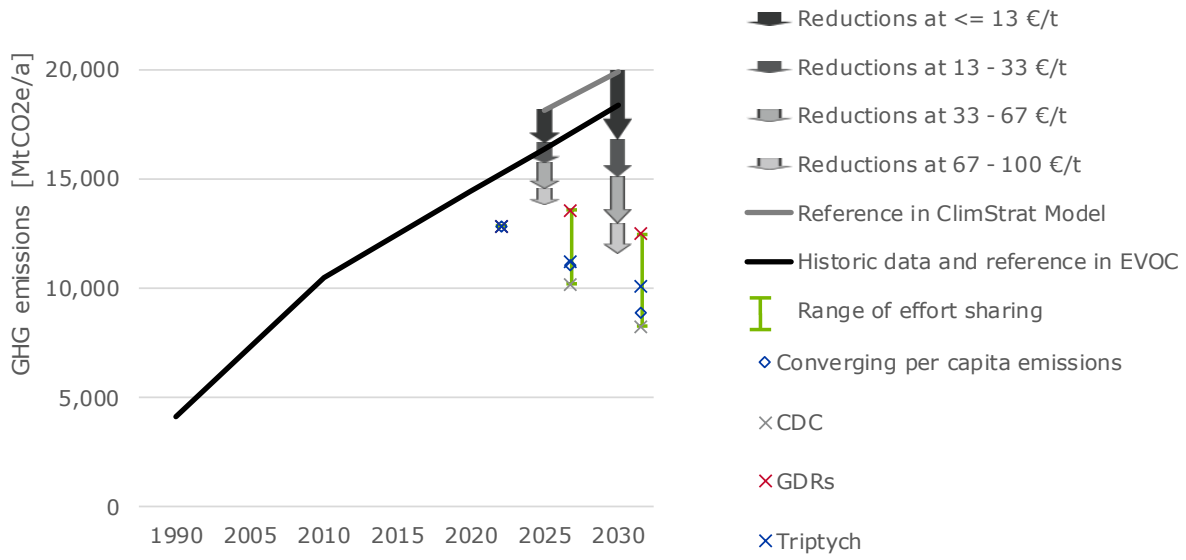
Annex 6 - Results of the delayed scenario for calculating fair shares and potentials

1. Brazil



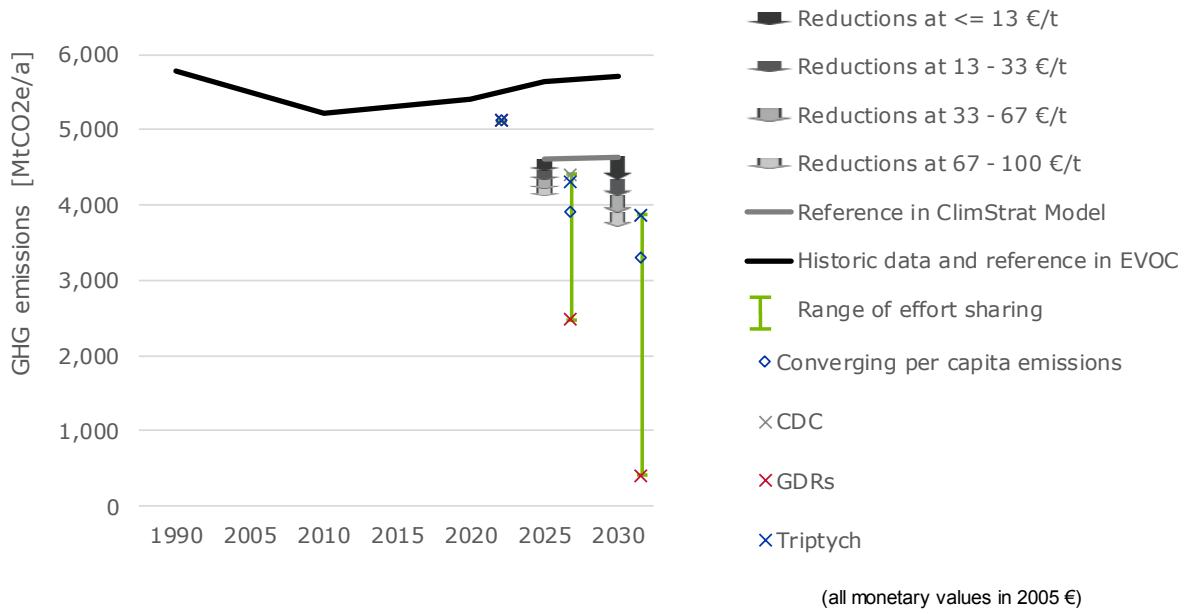
(all monetary values in 2005 €)

2. China

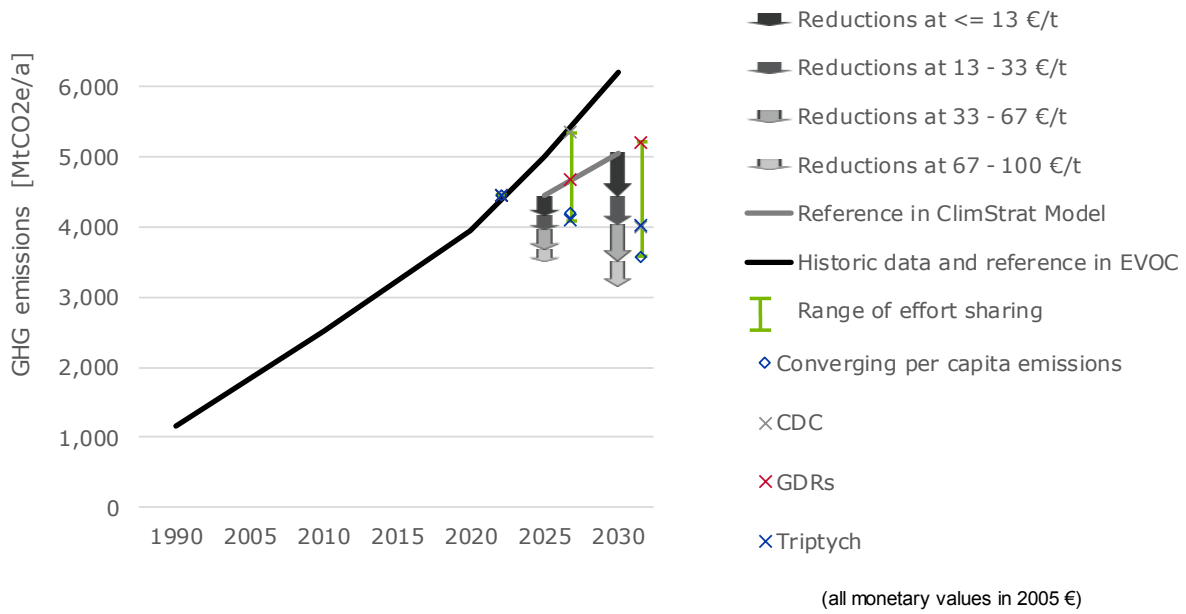


(all monetary values in 2005 €)

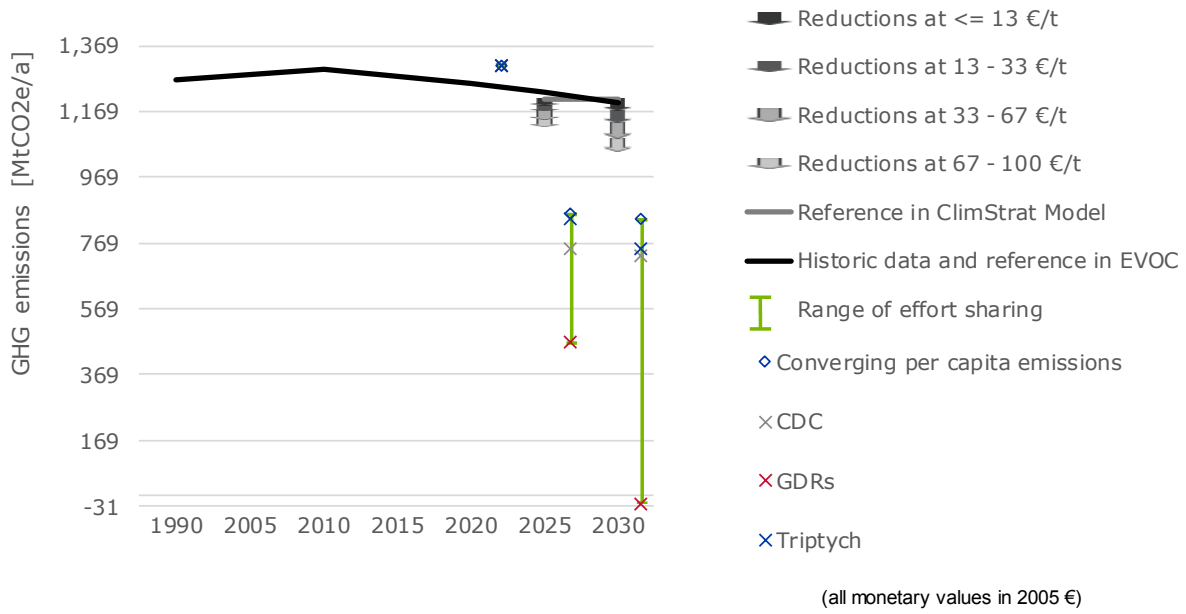
3. European Union



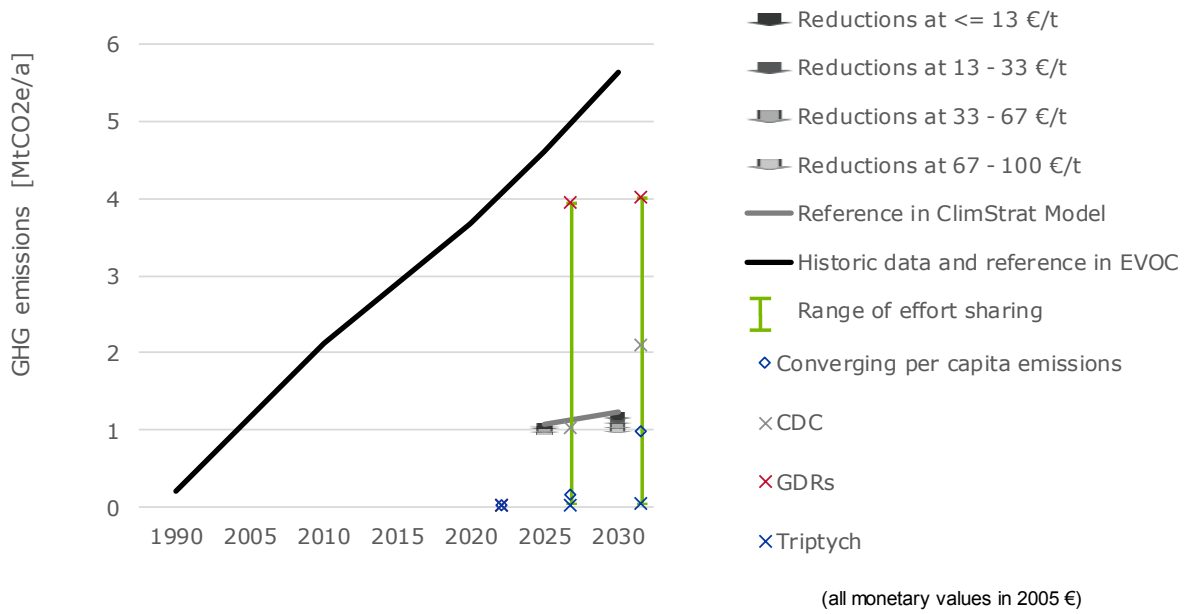
4. India



5. Japan

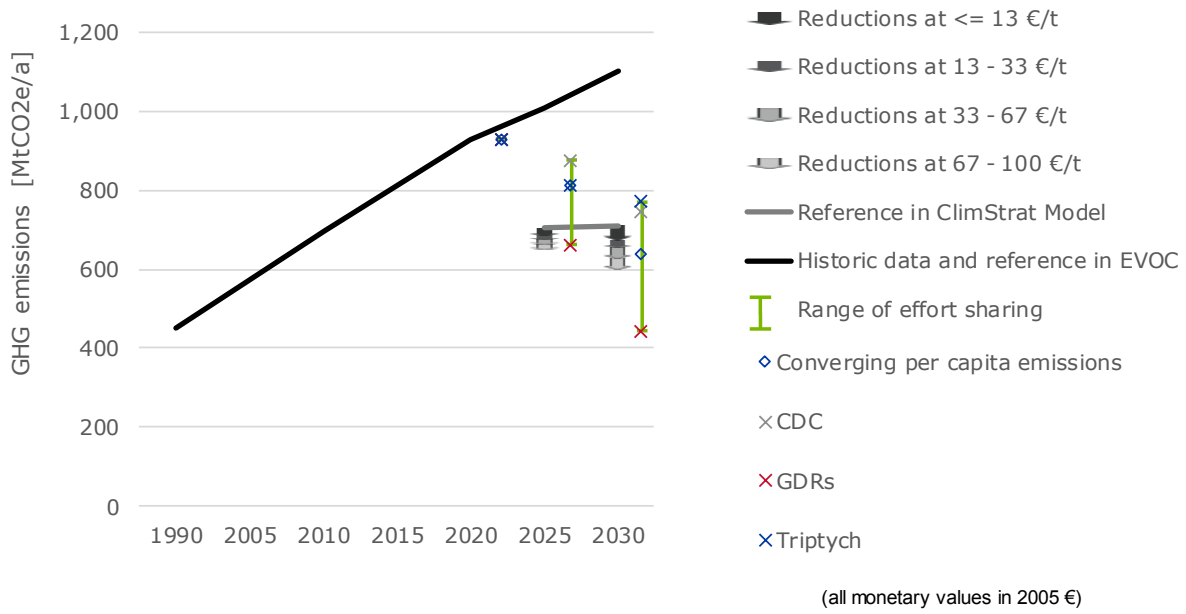


6. Maldives

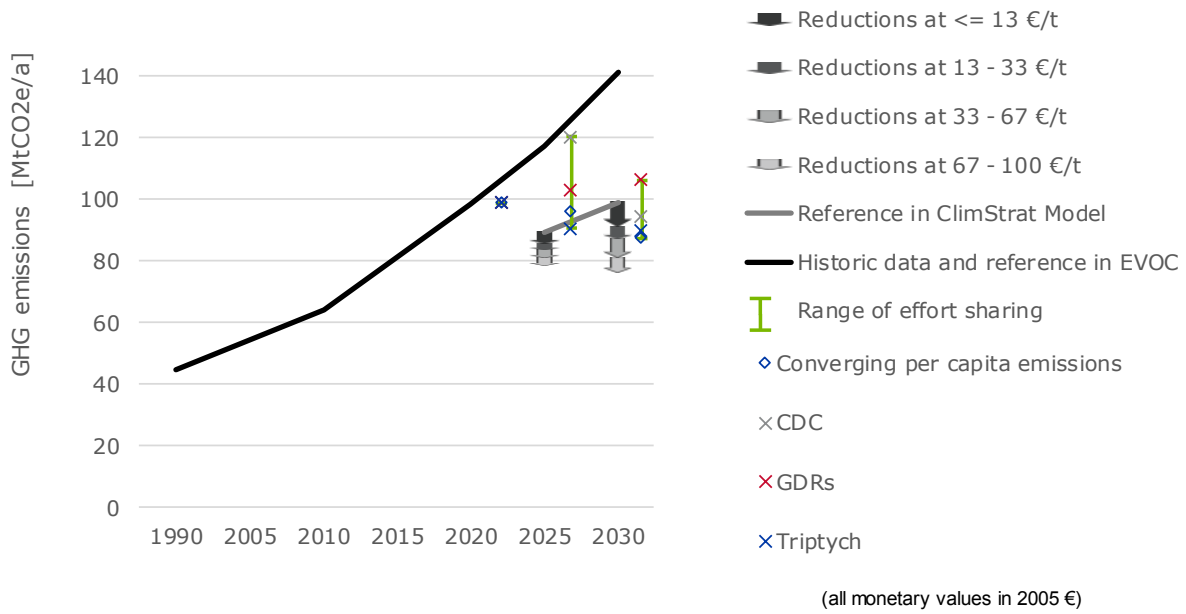


Note: The Maldives have pledge zero net emissions in 2020, the delayed scenario starts there and effort sharing calculations thus lead to relatively low emissions in 2025 and 2030.

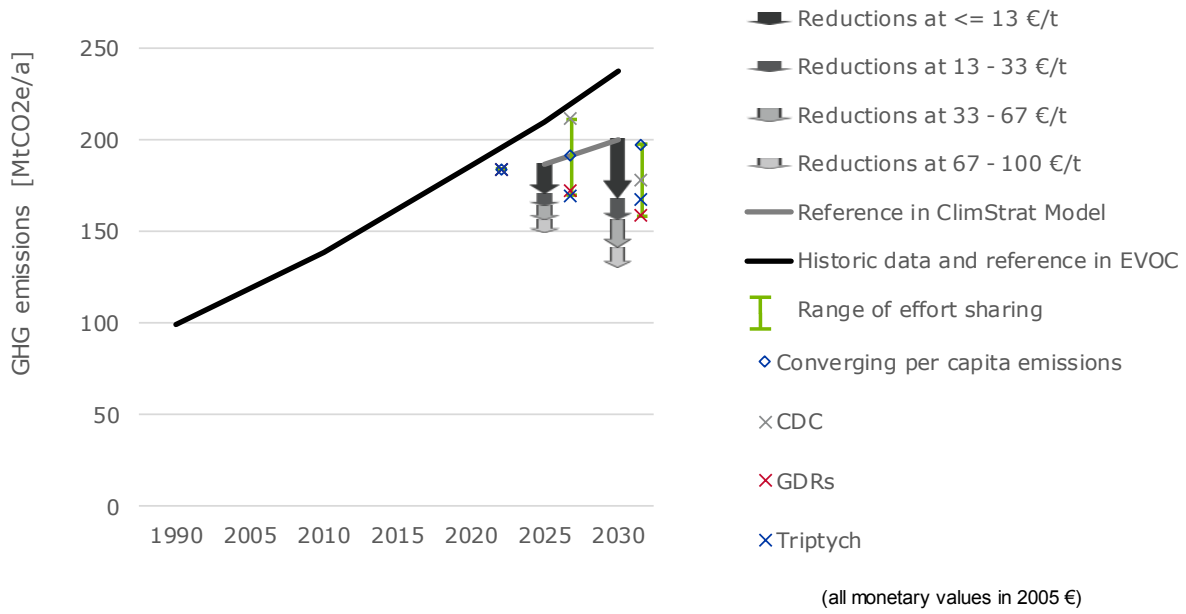
7. Mexico



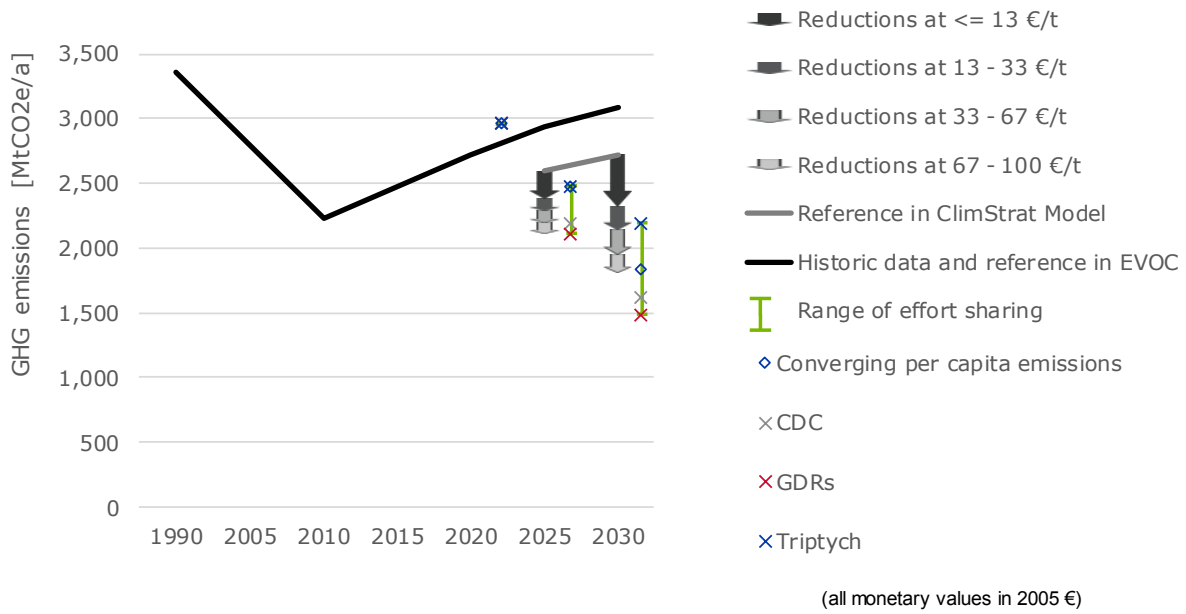
8. Morocco



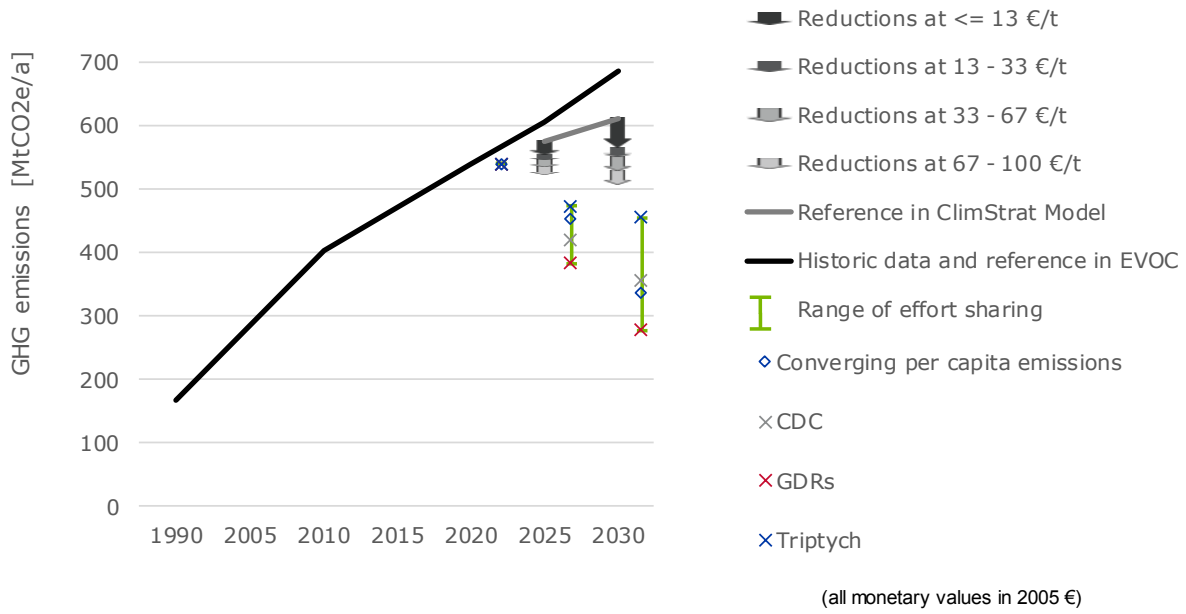
9. The Philippines



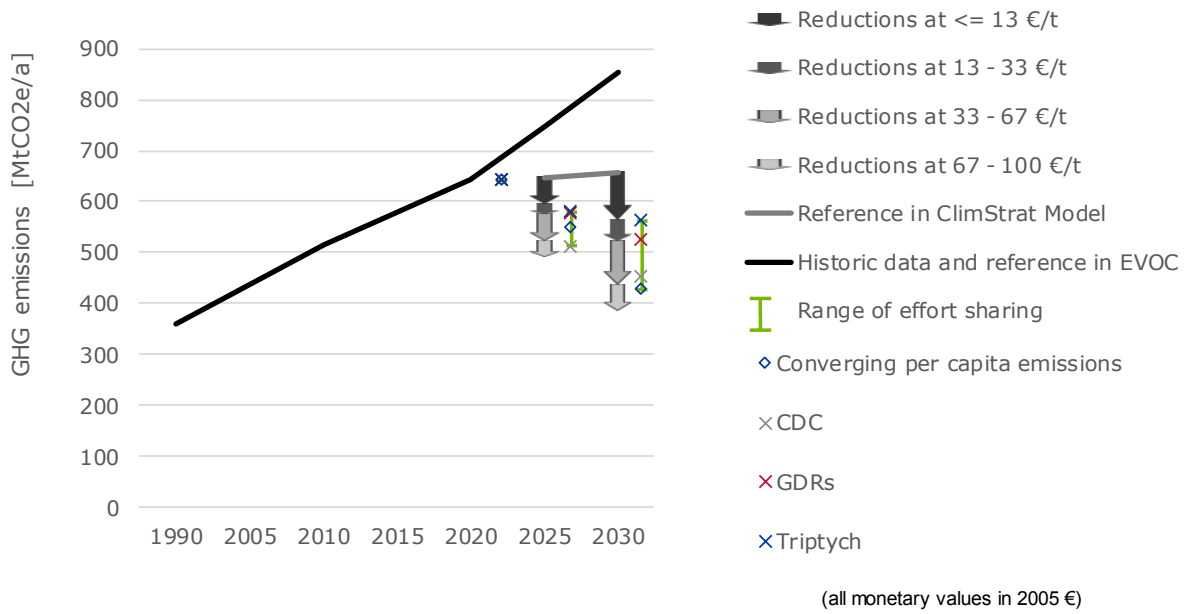
10. Russia



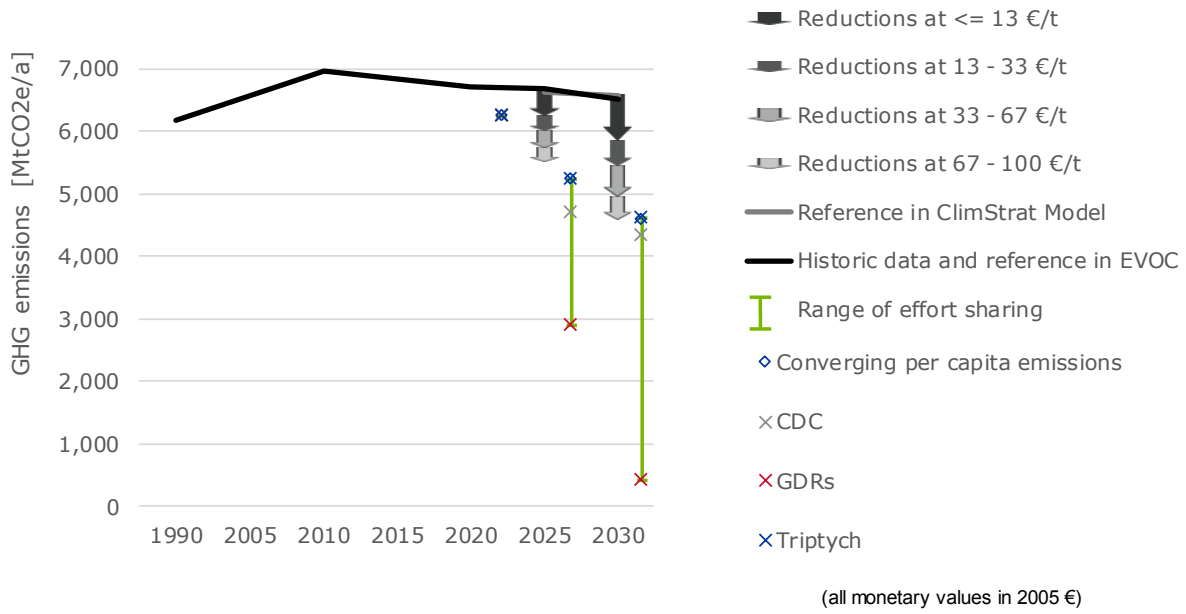
11. Saudi Arabia



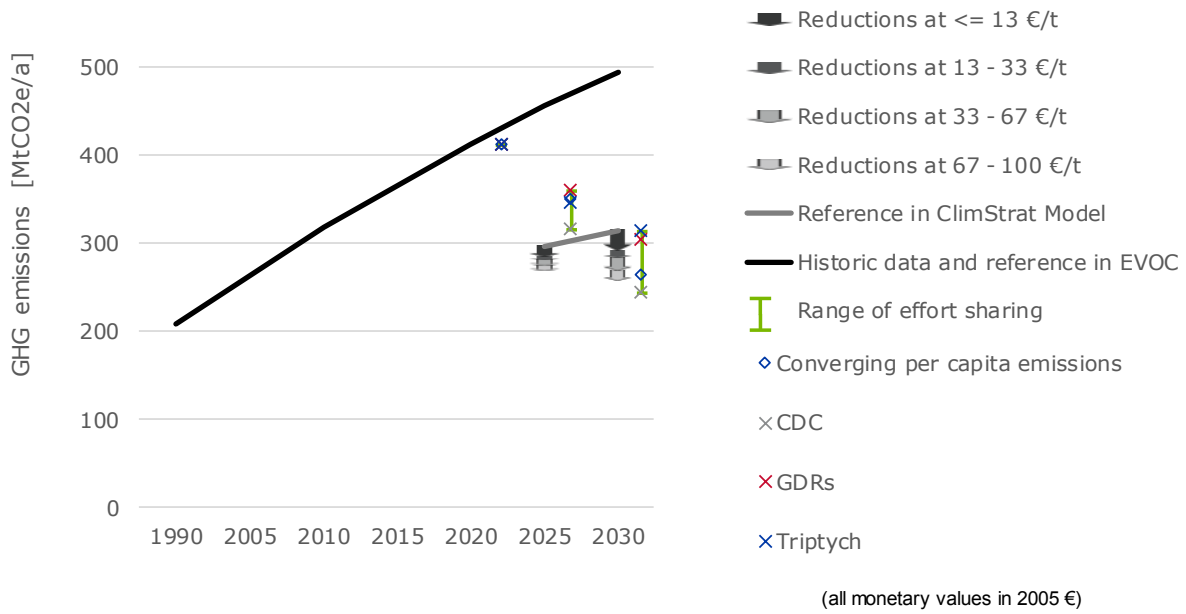
12. South Africa



13. United States



14. Venezuela



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