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Distribution of emission allowances under the Greenhouse Development Rights and other effort sharing approaches

13 October 2008

A Report by
Niklas Höhne, Sara Moltmann
For Heinrich-Böll-Stiftung, Germany

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PREFACE

Without an enormous and unprecedented level of international cooperation between the global "North" and the global "South", a post-2012 climate regime won't have much chance of avoiding catastrophic climate change. Perhaps for the first time in history, the world faces a crisis that the rich part of the world can't survive without engaging with the poor. It is first and foremost up to the Northern industrialised countries (Annex 1) to take up their 'fair share' of ensuring a rapid, just and equitable transition to a low- (and eventually zero-) carbon economy. The targets that are on the table right now, however ambitious they might seem in the eyes of some, are by far not enough to keep us below a level of catastrophic climate change, without shifting an unsupportable share of the burden to the developing world, and thereby threatening the right to development of its poor majority.

The GDRs Framework has received an unexpected level of support from negotiators, the scientific community and civil society worldwide. This should not come as a surprise since it reflects what one might call a 'new realism': Equity is not just a moral value and fair effort sharing models are not just ethical exercises. The truth is that there won't be a global deal in Copenhagen if it isn't considered 'fair' by the developing world.

This report done by Niklas Höhne and Sara Moltmann from Ecofys compares the distribution of emission allowances under the GDRs framework with other well established proposals like Common but Differentiated Convergence , Multistage, Triptych and Contraction and Convergence, based on plausible quantitative assumptions about how each of these could in principle be operationalized. The study clearly demonstrates that under a GDRs approach most Annex 1 countries would have to take up much higher obligations than under any of the other frameworks. But it also acknowledges the consuming class emerging in the South, and requires developing countries to take up obligations commensurate with their responsibilities and capabilities. There are very good reasons to believe that the GDRs Framework best corresponds to the common but differentiated responsibilities and respective capabilities set out in the Framework Convention. Its political implications are clear and challenging:

1. Industrialized countries must take up much higher emission reduction targets for a post-2012 deal. They have a two-fold obligation: to ambitiously cut emissions domestically, and just as importantly to provide the financial and technological support that will help the South to develop along a low-carbon path..[1]
2. Countries of the South, by virtue of their emerging consumer classes, must similarly take up their fair share and contribute according to responsibilities and their respective capabilities..

The GDR approach provides a step toward a transparent and rigourous means of defining those "fair shares", and to do so in a manner that safeguards a right to development. The question of differentiation and sequencing that naturally evolves from this is going to be one of the stumbling stones on the road to Copenhagen. Evading this debate, in our eyes, is no solution.

This study is based on the first edition of the Greenhouse Development Rights Framework. For the updated and second edition, please refer to www.ecoequity.org/GDRs.

We hope that this report helps to inform the ongoing debate on an equitable and politically viable post-2012 deal.

We are grateful to Ecofys for their work and a truly inspiring cooperation.

Berlin, October 2008
Barbara Unmüßig, President
Lili Fuhr, Head of International Politics Department
Heinrich Böll Stiftung

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[1] This conclusion has been reached by others as well through other means. See for example *Höhne / Ellermann: The EU's emission reduction target, intended use of its CDM and its +2°C:* http://www.europarl.europa.eu/activities/committees/studies/download.do?file=22071

EXECUTIVE SUMMARY

Further action is needed that goes far beyond what has been agreed so far under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol to "prevent dangerous anthropogenic interference with the climate system", the ultimate objective of the UNFCCC. In stabilising and decreasing global emissions all countries shall act "on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities" (UNFCCC, Art. 3.1). This means that especially emerging economies and developing countries have the ability to develop. On this basis the Greenhouse Development Rights approach (GDRs) was developed by EcoEquity for global effort sharing (Baer et al. 2007).

This report compares the GDRs approach to several other effort sharing approaches, namely Common but Differentiated Convergence (CDC), Multistage, Triptych and Contraction and Convergence (C&C), for the different stabilisation levels of 450, 550 and 650 ppmv CO_2eq. The calculations are done with the Evolution of Commitments Tool (EVOC), developed by Ecofys.

The implementation of the GDRs in this report is very similar to what Baer et al. developed. The main differences are that the scope is a broader as all six Kyoto gases are included in this report and the Responsibility Capacity Index to calculate the GDRs reduction per country is calculated for every year between 2010 and 2050. Effort sharing under the GDRs approach depends very strongly on the BAU assumptions, the reduction paths and the resulting global emission reduction. Our calculations are based on the IPCC SRES scenarios.

Generally, only a reduction path aiming at a stabilisation at 450 ppmv CO_2eq or lower will offer a good chance to stay below the 2° limit. However, we also show diagrams per country/group for higher stabilisation levels to understand impact of the choice of the stabilization level.

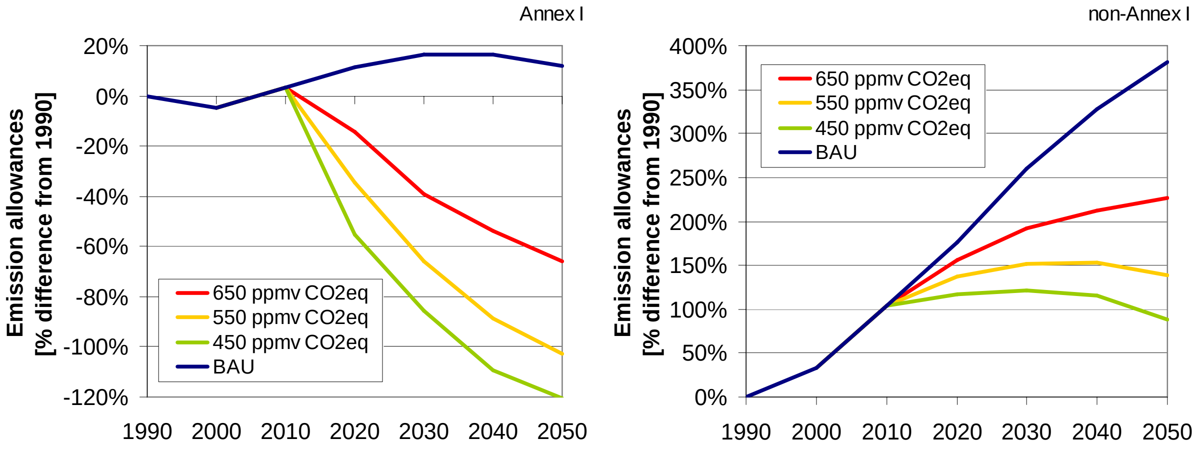

Figure 1. Reference emissions and emission allowances of Annex I and non-Annex I countries under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

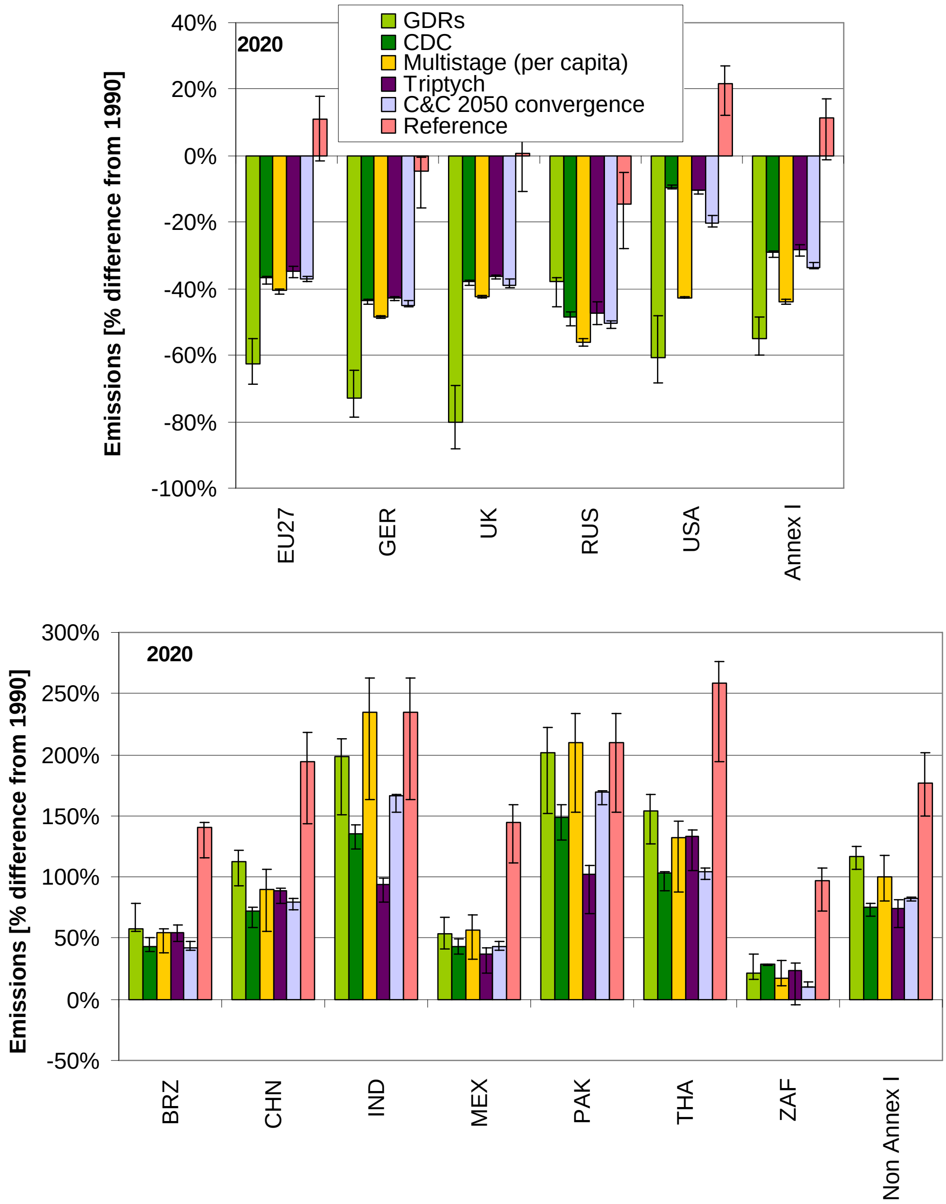

Figure 2. Change in emission allowances from 1990 to 2020 under the 450 ppmv CO_2eq scenario (error bars denote the use of difference reference scenarios)

Countries or regions with a high RCI at the beginning, such as the USA or the EU 27, would have to take a big part of the global emissions reduction effort in early years. Because of this and because of the economic growth of other regions, such as China, India and other parts of Asia, their relative contribution would decrease a bit over time. For Annex I countries this could even lead to slightly increasing emission allowances after 2050, because many rapidly industrialising countries will have to increase their contribution.

In this approach emission allowances can drop below zero, which means that even allowances have to be bough if emissions are reduced to zero. This would be the case for most Annex I countries in a few decades. Therefore, trading or any kind of infrastructure to transfer emission allowances will be necessary.

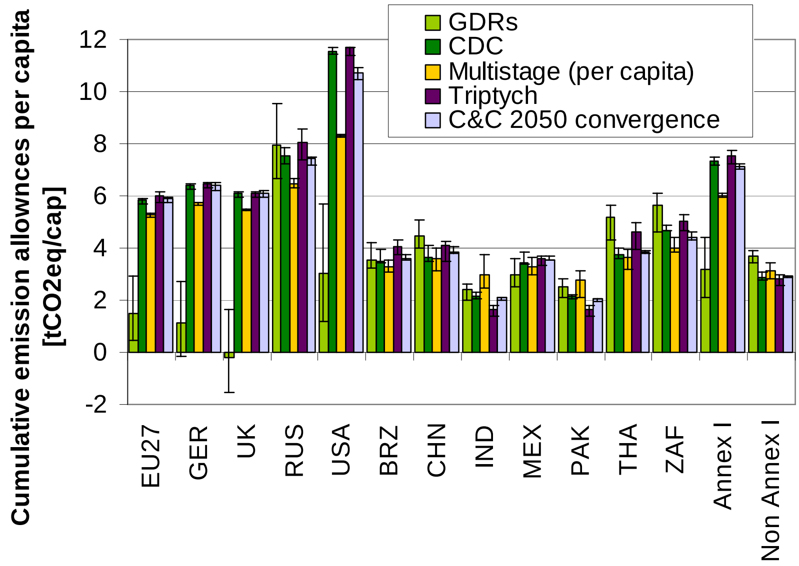

Figure 3. Cumulative emission allowances per capita for different (groups of) countries under the GDRs, CDC, Multistage, Triptych and C&C approaches between 2010 and 2050 for stabilisation at 450 ppmv CO_2eq as annual average.

The effort under the GDRs is higher compared to other approaches for most Annex I countries since negative emission allowances are possible. However, this does not mean that the actual imposition for developed countries is higher compared to other approaches because also a high amount of financial support for more stringent non-Annex I targets would need to come from Annex I countries under other approaches as well.

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1. INTRODUCTION

Further action is needed that goes far beyond what has been agreed so far under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol to “prevent dangerous anthropogenic interference with the climate system”, the ultimate objective of the UNFCCC. It is out of question that developed countries (Annex I countries) will have to take a leading role. They will have to commit to substantial emission reductions and financing commitments due to their historic responsibility and their financial capability. However, the stabilisation of the climate system will require global emissions to peak within the next decade and decline well below current levels by the middle of the century. As this is a global issue it depends on the participation of as many countries as possible.

In stabilising and decreasing global emissions all countries shall act “on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities” (UNFCCC, Art. 3.1). This means that especially emerging economies and developing countries have the ability to develop. On this basis the Greenhouse Development Rights approach (GDRs) was developed by EcoEquity for global effort sharing (Baer et al. 2007).

This report compares the GDRs approach to several other effort sharing approaches for different stabilisation levels. We first describe the methodology of the effort sharing tool and the considered approaches in chapter 2. Our findings on emission allowances are included in chapter 3. We close with the conclusions from this work in chapter 4. The Appendices provide a more detailed description of the effort sharing tool (EVOC) (Appendix A), technical details of the implementation of the GDRs approach in EVOC (Appendix B) and detailed results on emission allowances in tables (Appendix C)

2. METHODOLOGY

This chapter gives an overview oft the methodology used for the effort sharing calculations. It gives a general introduction into the Evolution of Commitments Tool (EVOC), a description of the chosen greenhouse gas emission reduction pathways, a depiction of the general idea of the GDRs approach and short descriptions as well as the chosen parameters for the different effort sharing approaches considered in this report. Technical details on EVOC and the implementation of the GDRs approach can be found in the Appendix.

2.1 GLOBAL REDUCTION PATHWAYS

Stabilisation of atmospheric GHG concentrations during the 21st century at any of the levels considered in this report will require a significant departure from current emission trends. Global emissions will need to decline significantly compared to today; dropping below emissions in 1990 and declining to almost zero over time. The earlier the emissions peak and decline, the lower will be the stabilised concentration level, leading to a lower level of climate change impacts.

To achieve stabilisation of atmospheric GHG concentrations, CO_2 as well as other greenhouse gases, such as methane (CH_4) and nitrous oxide (N_2O), should be included. Since the industrial revolution, anthropogenic emissions have increased the atmospheric CO_2 concentration from 280 ppmv to the current level of around 380 ppmv. The effect of different greenhouse gases is compared using their radiative forcing, i.e. the amount of radiation (heat) trapped by the gas measured in watts per square metre (W/m²). Current atmospheric concentration of the three main GHGs, CO_2, CH_4 and N_2O produce a combined radiative forcing that is approximately equivalent to the forcing of CO_2 alone at a concentration of 422 ppmv (i.e. 422 ppmv CO_2eq accounting for different global warming potentials). Stabilising the CO_2 concentration at 450 ppmv and reducing emissions of the other gases at similar rates would lead to a combined radiative forcing equivalent to that of 550 ppmv CO_2 (450 ppmv CO_2 ~ 550 ppmv CO_2eq) (Eickhout et al. 2003). Similarly 400 ppmv CO_2 corresponds to 450 ppmv CO_2eq and 550 ppmv CO_2 corresponds to 650 ppmv CO_2eq.

Figure 4 (top left) provides an overview of historical emissions, the range of future global CO_2 emissions as adapted from the standard set of emissions scenarios of the Special Report on Emission Scenarios (SRES) of the IPCC (Nakicenovic et al. 2000) as presented by Höhne (2006). A substantial spread of possible future emissions is apparent in the next few decades. The figure also shows a 450 ppmv CO_2 emission corridor derived using a simple climate model and two simple assumptions: annual global emissions cannot decrease more than 3% per year and the annual trend cannot change more than 0.5 percentage points per year (Höhne 2006). The corridor includes two example pathways: One where global emissions increase rapidly, peak and then decrease rapidly and one where emissions decrease moderately from the start. Both paths lead to the same concentration level by the end of the century.

Figure 4 (top right) shows the range of possible global CO_2 emission corridors that lead to stabilisation levels of 400 and 550 ppmv CO_2 according to the same simple assumptions (Höhne 2006).

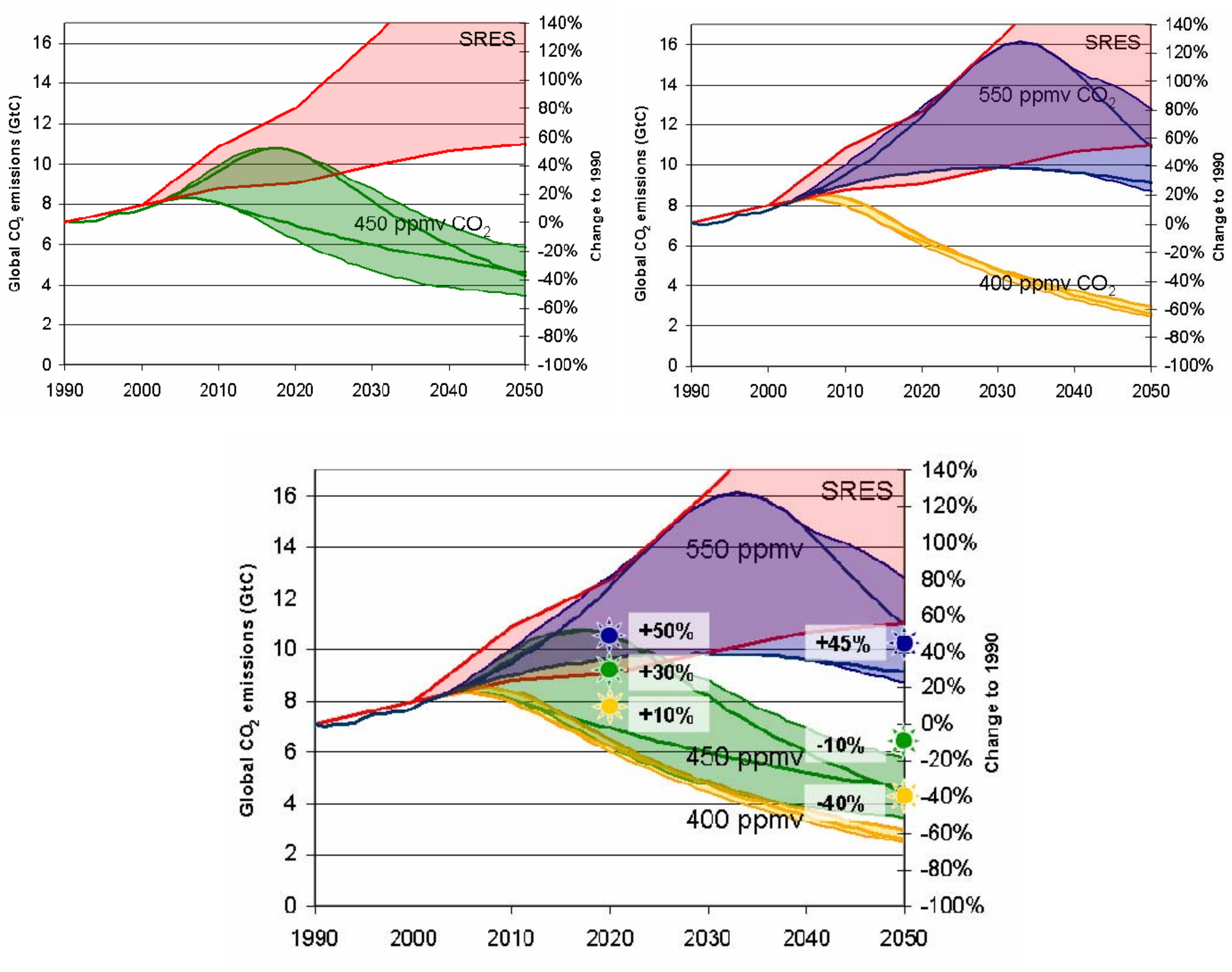

Figure 4. Possible global CO_2 emission pathways until 2050: Reference emissions and emissions corridor towards stabilisation at 450 ppmv CO_2 (550 ppmv CO_2eq) (top left); reference emissions, emissions corridor towards 550 ppmv CO_2 (650 ppmv CO_2eq) and emissions corridor towards 400 ppmv CO_2 (450 ppmv CO_2eq) (top right); and selected global emission levels for 2020 and 2050 relative to 1990 for this analysis (emission pathways and corridors according to Höhne (2006))

Figure 4 (bottom) shows the summary of all three stabilisation corridors and the SRES reference scenario. In addition, we included six reference points (for 2020 and 2050 and for each stabilisation level), which have to be met in all calculations in section 2.4.

The reference points are based on a review of recent literature (den Elzen and Meinshausen 2005; Höhne et al. 2005; Höhne and Blok 2006; IPCC 2007) (c. p. Höhne et al. 2007 for more detail). The values for 400 ppmv CO_2 (2020, 2050) and for 450 ppmv CO_2 (2050) do not correspond completely to the given emission reduction corridors in Figure 4. The reason for that is that the shown reduction pathways only reflect one scenario set presented by Höhne (2006), which is based on simple assumptions and only CO_2. For the choice of the reference points we considered a larger set of sources, which however do not provide such illustrative corridors.

Figure 4 provides only CO_2 emissions, but other greenhouse gases are also important. For this analysis it is assumed that for a given concentration level, emissions of the non-CO_2 gases need to be reduced by the same percentage as the CO_2 emissions. We assumed here for the case towards 550 ppmv CO_2 that global greenhouse gas emissions, weighted with global warming potentials, can be 50% above the 1990 level in 2020 and 45% above the 1990 level in 2050. For the 450 ppmv CO_2 case it would be +30% in 2020 and -10% in 2050. For the 400 ppmv CO_2 case it would be +10% in 2020 and -40% in 2050 (see Table 1).

Table 1. Possible emission reduction pathways and global emissions reference points for the different global emission stabilisation levels as used in this report

	Emission level in ppmv		Reduction compared to 1990	
	CO_2	~CO_2eq	2020	2050
	550	650	+50%	+45%
	450	550	+30%	-10%
	400	450	+10%	-40%

Two different ways are possible to reach a stable concentration level (see Figure 5): The concentration level can approach the target from below, always staying lower than the target level (dashed blue path). The second possibility is that the concentration level exceeds the target level followed by a decline (red solid line, “overshooting”). However, the final emission level can be similar in both cases but the cumulative emissions are different. The possibility of overshooting is sometimes considered in literature (e.g. den Elzen and Meinshausen 2005), in some cases it is excluded (e.g. Höhne et al. 2005).

The reduction pathways in Table 1 could imply temporary overshooting for early years and low stabilisation levels. Overshooting is possible for the 2020 reference point to reach 400 ppmv CO_2, but it is unlikely for the 2020 reference point to reach 450 ppmv CO_2. For all other reference points overshooting is not considered.

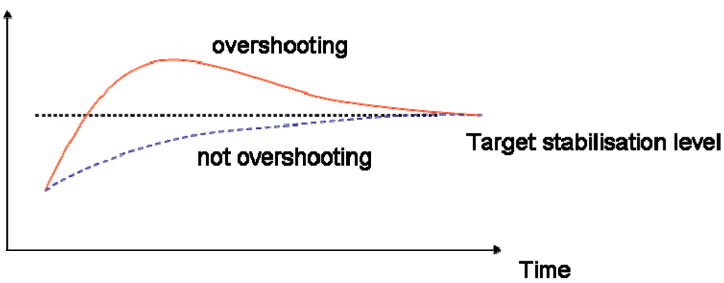

Figure 5. Reduction paths including and excluding overshooting of the global emission level

2.2 EVOLUTION OF COMMITMENTS TOOL

The effort sharing figures in chapter 3 are calculated with the Evolution of Commitments tool (EVOC), which was developed by Ecofys. It allows distributing emission allowances among countries. As the future developments are unknown, we calculate one case for each of the IPCC SRES scenarios (A1B, A1FI, A1T, A2, B1, B2) to capture a wide spread of possible future developments (Nakicenovic et al. 2000). In the figures we provide the median over the six scenarios and the whole spread as error bars.

Comparing the reductions with the reference cases gives an indication about the level of effort needed to reach the reductions.

To calculate future national emission allowances from historic emissions population, GDP in purchasing power parities (PPP), electricity demand and industrial value added (IVA) growth rates are used. For these parameters the country data of the base year are mainly taken from UN (2002) and IEA (2002). To calculate future data the regional growth rates derived from the IMAGE model (IMAGE-team, 2001) are applied to the country data of the base year. This means, that all countries within one IMAGE region initially have the same growth rates in EVOC.

In the EVOC tool we assume the Kyoto targets to be met in 2010 instead of 2012 due to reasons of simplicity. In the long run this does not have a major impact on the countries' reduction obligations. With the chosen configurations the emissions of Annex B countries decrease in all sectors until they reach their Kyoto target in 2010. All non-Annex B countries and those Annex B countries having a higher Kyoto target than their business as usual emissions follow their reference scenario. After 2010 the different reduction approaches provide the methods how to allocate emissions allowances. It is not possible with the EVOC tool to reach the above-mentioned reduction paths for 2020 and 2050 (Table 1.1) in one calculation. Therefore, we made two calculations for each concentration level for most approaches in order to reach the target reductions, one for 2020 and one for 2050.

The horizontal red lines for Annex I countries in the figures in chapter 3 indicate the emission level in 2010. This is the starting point for the calculations. For most countries this is the Kyoto target (solid lines). For the USA the 2010 level is based on the national target of an improvement of emissions per GDP by 18% from 2002 to 2012. This would result in emissions far above the Kyoto target (+23%, dotted line, compared to -7%). For Russia and the rest of Eastern Europe in Annex I we chose as a starting point the reference emissions in 2010 which are well below their Kyoto target (-32% compared to 0 to -8%).

In most cases we show the necessary emission rights levels in 2020 and 2050 in comparison to the 1990 emissions. For a typical Annex I country emissions have declined from their 1990 value to their Kyoto target in 2010 (see Figure 6 left). From then on further reductions are necessary. The reductions shown in chapter 3 include the reductions from 1990 to the Kyoto target plus the additional reductions after 2010. Typical Non-Annex I countries' emissions increase from 1990 until they participate (earliest after 2010), growth is then slowed and eventually turned into a reduction (see Figure 6 right). Therefore, the reductions shown in chapter 3 usually show an increase over 1990 levels.

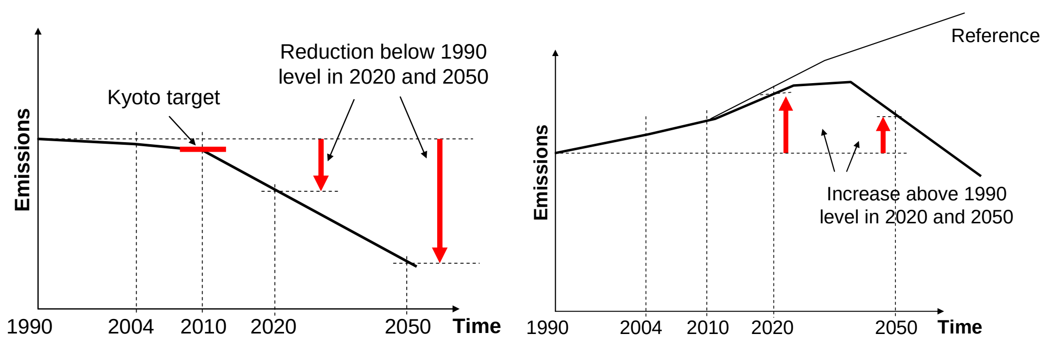

Figure 6. Illustrative pathway for an Annex I country (left) and a Non-Annex I country (right)

2.3 GREENHOUSE DEVELOPMENT RIGHTS APPROACH

This report puts the main focus on the Greenhouse Development Rights (GDRs) approach. The GDRs approach to share the effort of global greenhouse gas emissions reduction was developed by Baer et al. (2007).

2.3.1 The right to develop

Baer et al. (2007) assume the right to develop as the essential part for any future global climate regime in order to be successful. In an environmentally constrained world this right of development cannot be a right of mere economic growth but the satisfaction of fundamental needs that leads to a decent level of security and well-being. To define this level a development threshold is defined. Below this level individuals must be allowed to make development their first priority. This means they 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. suggest an income-level of $9,000 per capita and year. Based on this, the effort sharing of the GDRs is based on the capacity and the responsibility of each country.

2.3.2 Capacity

The capacity C of a county is reflected by its income. At the same time it has to be considered that the income within a country is not equally distributed. This means that some individuals within a country may have a high capacity while others have little or none at all. According to Baer et al. each individual has the capacity to contribute to global effort sharing that has an income above the development threshold, independent of its nationality. The income distribution among individuals is taken into account by the Gini coefficient of a country. A coefficient close to one indicates low equality while a value close to zero 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 summed and considered to calculate each countries capacity.

2.3.3 Responsibility

The responsibility R is based on the “polluter pays” principle. For the GDRs according to Baer et al. it is measured as cumulative per capita CO_2 emissions from fossil fuel consumption. Baer et al. chose 1990 as starting date to cumulate emissions because from this date each country should have been aware of the climate problem caused by emission of greenhouse gases. 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. Therefore those emissions related to that share of income below the development threshold, which is equivalent to the part of national income that is not considered in calculating a countries capacity, shall be considered as survival emissions. Those emissions linked to income above the development threshold are luxury emissions and shall account for a countries responsibility.

2.3.4 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 $RCI = R^a \cdot C^b$, where *a* and *b* are weighting factors. Baer et al. assume *a* to be 0.4 and *b* to be 0.6. This gives capacity a bit more weight than responsibility but is only one option of weighting.

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 7). 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.

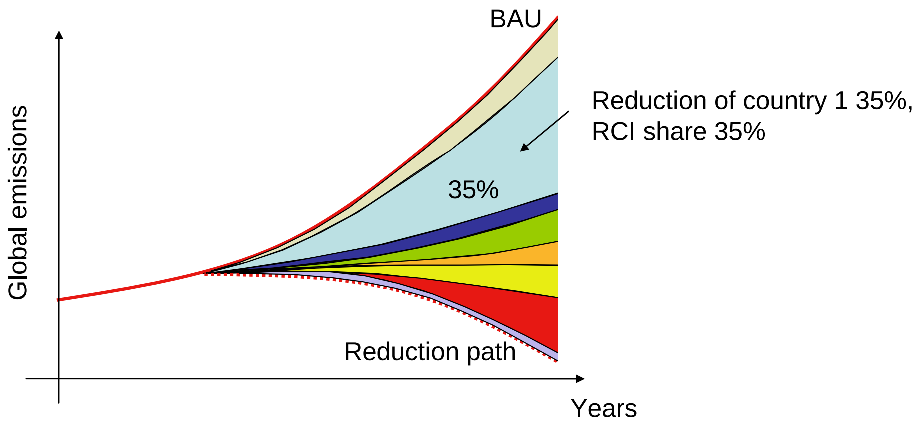

Figure 7. Effort sharing under the Greenhouse Development Rights (GDRs) approach according to the Responsibility Capacity Index (RCI)

In order to implement the GDRs it in the EVOC tool the methodology had to be adjusted slightly compared to the original approach of Baer et al. to fit to the model requirements (cp. chapter 2.4.1 and Appendix B of this report for more detail). For a more detailed description of the original GDRs approach see Baer et al. (2007).

2.4 EFFORT SHARING KEYS AND PARAMETER SETS FOR ALL CONSIDERED APPROACHES

This section presents the parameters applied for five possible future architectures consistent with emission pathways towards 450, 550 and 650 ppmv CO_2eq for the years 2020 and 2050. This means that the calculation outcomes have to meet the global emissions reference points mentioned above. The following approaches are included in the calculation of emission allowances:

- Greenhouse Development Rights
- Common but differentiated convergence
- Multistage
- Contraction and convergence by 2050
- Global Triptych

For this comparison of the emission rights under different distribution approaches in a future architecture the Evolution of Commitments tool (EVOC) is used. A detailed description of the EVOC model is included in Appendix A.

2.4.1 Greenhouse Development Rights approach

The GDRs approach as it is implemented in EVOC mainly follows the definitions and formulas given by Baer et al. (2007). A short introduction into the methodology of this original GDRs is described above in section 2.3. A more detailed description of the GDRs approach as implemented in EVOC is given in Appendix B.

An important characteristic that is different compared to the other approaches considered here is that emission allowances may become negative (i.e. the difference of emission allowances in 2050 can be more than 100% compared to 1990 emissions) for some countries. Therefore, trading or any kind of transfer of emission allowances will be compulsory for this approach. Furthermore, it not only takes into account emissions and financial capacity of a country but also the distribution within a country.

The main differences of this version of the GDRs compared to Baer et al. are:

- All Kyoto gases are considered (CO_2, CH_4, N_2O, PFC, HFC, SF_6), while Baer et al. consider only CO_2.
- The RCI is calculated for each year, while Baer et al. did this only for one year.
- Cumulative emission rights per capita are calculated as total cumulative emission rights divided by the last year's population.
- The business-as-usual scenarios are based on the EVOC adaptation of the SRES scenarios (cp. Appendix A of this report)
- The reduction scenarios and the related stabilisation levels are based on Höhne et al. (2007) (cp. section 2.1 of this report).

Table 2. Parameters chosen for the Greenhouse Development Rights approach

Parameter	Unit	450 ppmv CO_2eq	550 ppmv CO_2eq	650 ppmv CO_2eq
Development threshold	US$(2000) / capita / year	9,000	9,000	9,000
Start year		1990	1990	1990
Weighting of Capacity	%	60%	60%	60%
Weighting of Responsibility	%	40%	40%	40%
Level of global GHG emissions in 2050	Percentage change compared to 1990	-40%	-10%	+45%

2.4.2 Contraction and convergence by 2050

Under Contraction and convergence (C&C) (Meyer 2000; GCI 2005), all countries participate in the regime 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 ('Contraction'). As a second step, 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 ('Convergence'). The convergence level is calculated such that resulting global emissions follow the agreed global emission path. The resulting convergence levels for this report are given in Table 3. It might be more difficult for some countries to reduce emissions compared to others, e.g. due to climatic conditions or resource availability. Therefore, emission trading could be allowed to level off differences between allowances and actual emissions. However, C&C does not explicitly provide for emission trading.

As current per capita emissions differ greatly between countries 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.

For a stabilisation at about 650 ppmv CO_2eq a convergence at about 4 to 5 tCO_2eq per capita in 2050 is necessary (see Table 3). In this case the average per capita emissions will have to lie around 6 tCO_2eq per capita in 2020. For a stabilisation at about 550 ppmv CO_2eq in 2050 a convergence at about 3 tCO_2 per capita with average per capita emissions of about 5 tCO_2eq in 2020 is required. To reach a stabilisation at about 450 ppmv CO_2eq a convergence at about 2 tCO_2 per capita is necessary. In this case average per capita emissions in 2020 around 4 tCO_2 per capita are needed.

Table 3. Convergence level of per capita emissions rights in tCO_2eq/cap for the considered SRES scenarios in 2050

Scenario	450 ppmv CO_2eq	550 ppmv CO_2eq	650 ppmv CO_2eq
A1, B1	2.1	3.2	5.2
A2	1.7	2.5	4.0
B2	2.0	3.0	4.8

Under relatively strict long-term targets (e.g. 450 ppmv CO_2eq) and convergence by, e.g., 2050, also several developing countries would have to reduce their emissions compared to the BAU; as the per capita emissions have to converge to a level below current average of developing countries, those developing countries above or close to the average (e.g. Argentina, Brazil, Venezuela, Mexico, South Africa, South Korea, Namibia, Thailand, China) will soon (e.g. 2020) be constrained and will not receive excess allowances. More excess allowances would be available under a higher concentration target, e.g. 550 ppmv CO_2, or under earlier convergence, e.g. by 2030. The later the convergence year, the higher is the contribution of developing countries because late convergence years require low emission levels. These would lead to a smooth convergence path for many developing countries. For convergence in earlier years higher, above developing country average conversion levels would be needed. This would allow more space for initially increasing, peaking and then declining emissions of developing countries.

2.4.3 Common but differentiated convergence

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, e.g., 40 years (2010 to 2050) to an equal level for all countries. Individual non-Annex I countries' per capita emissions 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 pass this percentage threshold do not have binding emission reduction requirements. Either they take part in the CDM or they voluntarily take on positively 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 C&C, aims at equal per capita allowances in the long run (see Figure 8). In contrast to C&C it considers more the historical responsibility of countries. Annex I countries would have to reduce emissions similarly to C&C, 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.

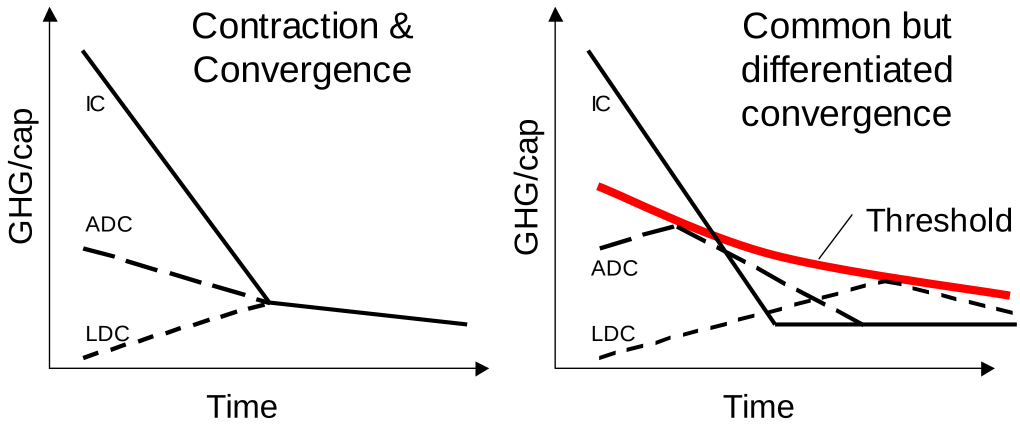

Figure 8. Schematic representation of GHG emissions per capita for three types of countries (an industrialized country (IC), an advanced developing country (ADC) and a least developed country (LDC)) under Contraction & Convergence (left) and under Common but Differentiated Convergence (right)

The parameters for the convergence time, the threshold for participation and the convergence level used in this report are provided in Table 4.

Table 4. Parameters used for the Common but Differentiated Convergence approach[1]

Parameter	Unit	450 ppmv CO_2eq		550 ppmv CO_2eq		650 ppmv CO_2eq	
		2020	2050	2020	2050	2020	2050
Convergence time	Years	30	40	40	40	40	40
Threshold	% difference from world average	-65%	-35%	-15%	-5%	20%	20%
Convergence level	tCO_2eq/cap	1	1.9	1.8	2.8	5.2	4.8

2.4.4 Multistage

As the name suggests in a Multistage approach countries participate in several stages, with differentiated types and levels of commitments[2]. Each stage has stage-specific commitments with countries graduating to higher stages when they exceed certain thresholds (e.g. emissions per capita or GDP per capita). All countries agree to have commitments at a later point in time. For this analysis thresholds based on per capita emissions with four stages were applied as follows (e.g. Höhne et al. 2005):

- ***Stage 1 – No commitments:*** Countries with a low level of development do not have climate commitments. As a minimum all least developed countries (LDCs) would be in this stage. In the model countries in this stage follow their reference scenario as no emission reductions are required.

[1] It may not be possible to meet both reference points (for 2020 and 2050) per stabilisation level (450, 550 or 650 ppmv CO_2eq.) for one set of parameters. Different parameter configurations are necessary for each reference point. This means that the configurations e.g. for 2020 450 ppmv CO_2eq. are valid only until 2020. For long-term calculations (2050) other configurations are necessary which are valid only for 2050.

[2] E.g. Claussen and McNeilly 1998; Gupta 1998; Berk and den Elzen 2001; USEPA 2002; Blanchard et al. 2003; CAN 2003; Criqui et al. 2003; den Elzen et al. 2003; Gupta 2003; Höhne et al. 2003; Ott et al. 2004; Blok et al. 2005; den Elzen 2005; den Elzen et al. 2005; Höhne et al. 2005; Höhne and Ullrich 2005; Michaelowa et al. 2005; den Elzen et al. 2006

- ***Stage 2 – Enhanced sustainable development:*** At the next stage, countries commit in a clear way to sustainable development: The environmental objectives have to be built into the development policies. Such a first 'soft' stage would make it easier for new countries to join the regime. Requirements for such a sustainable pathway could be defined, e.g. inefficient equipment is phased out and requirements and certain standards are met for any new equipment, or there is a clear deviation from the current policies depending on the countries. This stage is implemented in the model by assuming countries reduce emissions by a percentage below their reference scenario within 10 years and then follow the reduced reference scenario.
- ***Stage 3 – Moderate absolute target:*** In this stage, countries commit to a moderate target on absolute emissions. The emission level may be higher than the starting year, but it should be below a reference scenario. The target could be positively binding, meaning that allowances can be sold if the target is exceeded but no allowances have to be bought if the target is not achieved. An incentive to accept such a target would be the possibility to participate in emissions trading. To model the group of countries in this stage, a percentage reduction below their reference scenario more stringent than in stage 2 is assumed.
- ***Stage 4 – Absolute reduction target:*** Countries in stage 4 receive absolute emission reduction targets and have to reduce their absolute emissions substantially until they reach a low per capita level (essentially a fifth stage). The whole group of countries reduces its emissions as a certain percentage compared to 1990. The actual contribution of each country depends on its per capita emissions. Countries with high emissions per capita have to reduce more than countries with low emissions per capita. As time progresses, more and more countries enter stage 4.

The parameters for reductions and stage participation thresholds chosen for the calculations are given in Table 5. The choice of parameter values is subjective but should reflect a reasonable effort sharing of emission reductions among developed and developing countries. Several other options are possible. Lower stage-thresholds, for example, would require higher contributions of developing countries.

Table 5. Parameters used for the Multistage approach [3]

Parameter	Unit	450 ppmv CO_2eq		550 ppmv CO_2eq		650 ppmv CO_2eq	
		2020	**2050**	**2020**	**2050**	**2020**	**2050**
Threshold to enter stage 2	tCO_2eq/cap	3.5	2.5	5.5	3.0	6.0	5.5
Threshold to enter stage 3	tCO_2eq/cap	4.5	3.5	6.5	5.0	7.5	6.0
Threshold to enter stage 4 in 2010	tCO_2eq/cap	6.0	4.0	7.5	6.0	9.0	7.0
Threshold to enter stage 4 in 2100	tCO_2eq/cap	5.0	3.5	7.0	5.0	7.5	6.0
Threshold for no further reduction in stage 4	tCO_2eq/cap	1.5	1.0	2.0	1.5	5.0	4.5
Stage 2 (enhanced sustainable development) reduction below reference scenario in 10 years	%	15	25	10	20	5	5
Stage 3 (Moderate absolute target) reduction below reference scenario in 10 years	%	30	30	20	30	10	10
Stage 4 (Absolute reduction) reduction per year*	%	5.5	9.0	3.5	6.0	0.7	4.5

*The reduction percentages per year are applied to the absolute emission allowances in the previous year and therefore lead to an exponential decline in absolute emission allowances. Other slopes (e.g. linear) are possible.

[3] It may not be possible to meet both reference points (for 2020 and 2050) per stabilisation level (450, 550 or 650 ppmv CO_2eq.) for one set of parameters. Different parameter configurations are necessary for each reference point. This means that the configurations e.g. for 2020 450 ppmv CO_2eq. are valid only until 2020. For long-term calculations (2050) other configurations are necessary which are valid only for 2050.

2.4.5 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 2003, Höhne et al. 2003, Phylipsen et al. 2004, Höhne et al. 2005, Höhne 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.[4] It takes into account main differences in national circumstances between countries that are relevant to emissions and emission 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 ppmv CO_2) these are rarely above BAU-emissions.

The Triptych methodology calculates emission allowances for the various sectors which are added 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’, a growth in the physical production is assumed together with an improvement in production efficiency. This takes into account the need for economic development but 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 6 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.

[4] Unlike e.g. the Multistage approach which is more a framework of stages that can be filled with different allocation methods for the several stages or C&C which is based only on per capita emissions.

Table 6. Parameter choices for 2020 and 2050 for the Triptych cases aiming at 450, 550 and 650 ppmv CO_2eq concentration

Sector	Quantity	450 ppmv CO_2eq		550 ppmv CO_2eq	650 ppmv CO_2eq	
		2020	2050	2020 + 2050	2020	2050
Industry	Maximum deviation of total industrial production at country level in 2050	45%	45%	45%	45%	45%
	Maximum deviation of total industrial production at global level in 2050	10%	10%	10%	10%	10%
	Convergence of Energy Efficiency Indicator in 2050	0.1	0.4	0.4	0.7	0.55
	Structural change factor	0.1	0.35	0.45	0.75	0.65
Electricity	Maximum deviation of total power production at country level in 2050	45%	45%	45%	45%	45%
	Maximum deviation of total power production at global level in 2050	10%	10%	10%	10%	10%
	Share of renewables and emission free fossil in 2050	98%	74%	72%	55%	40%
	Share of CHP in 2050	0%	10%	10%	15%	20%
	Reduction of solid fuels in 2050 compared to base year	100%	90%	90%	50%	60%
	Reduction of liquid fuels in 2050 compared to base year	100%	90%	90%	60%	65%
	Amount of nuclear energy	Absolute unchanged				
	Amount of natural gas	Remainder				
	Total efficiency of CHP	90%	90%	90%	90%	90%
	Convergence of power generation efficiency of solid fuels in 2050	50%	50%	50%	50%	50%
	Convergence of power generation efficiency of liquids fuels in 2050	55%	55%	50%	50%	50%
	Convergence of power generation efficiency of gas in 2050	70%	70%	65%	65%	65%
Domestic Sector	Domestic convergence level – per capita emissions in tCO_2/cap/yr in 2050	0.4	0.7	1.5	2.7	1.7
Fossil fuel production	Fossil fuel emission level – % total emissions below base year in 2050	95%	90%	90%	90%	90%
Agriculture	Reduction below reference scenario emissions in 2050 – low GDP/cap	80%	60%	60%	20%	20%
	Reduction below reference scenario emissions in 2050 – high GDP/cap	90%	70%	70%	40%	40%
Waste	Waste convergence level – per capita emissions in 2050	0	0	0	0	0

3. RESULTS

This chapter provides the results of the effort-sharing calculations for the Greenhouse Development Rights approach, Contraction and Convergence, Common but Differentiated Convergence, Multistage and Triptych.

3.1 RESULTS PER STABILISATION LEVEL

Figure 9, Figure 10 and Figure 11 show modelled results for the change in emission allowances from 1990 to 2020 and 1990 to 2050 for the 450, 550 and 650 ppmv CO_2eq cases respectively for GDRs, C&C, CDC, Multistage, Triptych, and the reference case. The initial allocation of allowances before trading is shown. Final resulting emission levels after trading could be different. For most approaches emissions trading is likely but not necessary. For others, e.g. the GDRs approach, trading is essential.

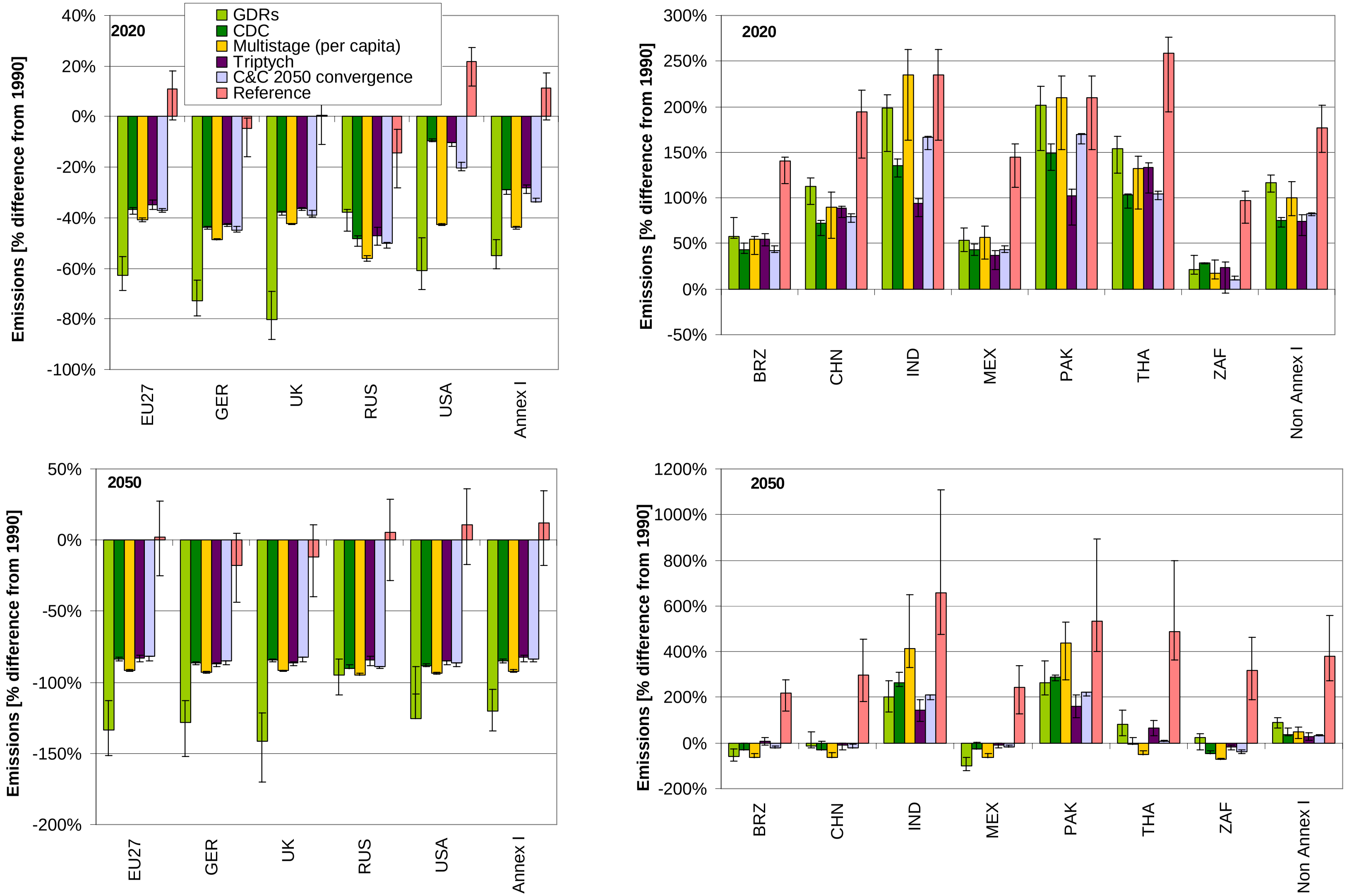

Figure 9. Change in emission allowances from 1990 to 2020 (top) or 2050 (bottom) under the 450 ppmv CO_2eq scenario

Note: Data are included for EU 27, GER (Germany), UK (United Kingdom), RUS (Russia), USA (United States of America), Annex I, BRZ (Brazil), CHN (China), IND (India), MEX (Mexico), PAK (Pakistan), THA (Thailand), ZAF(South Africa) and non-Annex I. The Data are included in Appendix C. The horizontal red lines for Annex I indicate the emission level in 2010 which are similar to the Kyoto targets for Germany and the UK.

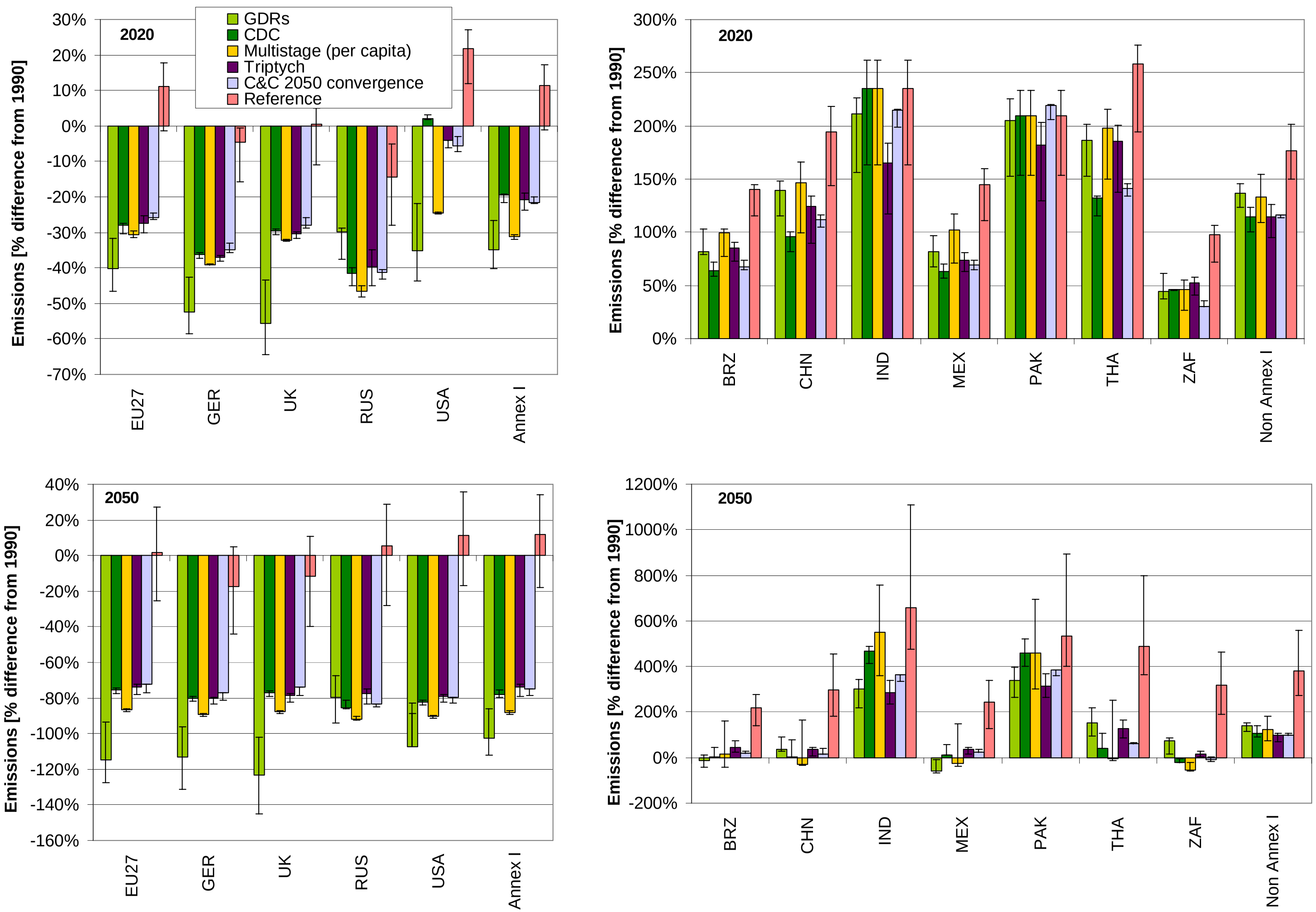

Figure 10. Change in emission allowances from 1990 to 2020 (top) or 2050 (bottom) under the 550 ppmv CO_2eq scenario

Note: Data are included for EU 27, GER (Germany), UK (United Kingdom), RUS (Russia), USA (United States of America), Annex I, BRZ (Brazil), CHN (China), IND (India), MEX (Mexico), PAK (Pakistan), THA (Thailand), ZAF(South Africa) and non-Annex I. The Data are included in Appendix C. The horizontal red lines for Annex I indicate the emission level in 2010 which are similar to the Kyoto targets for Germany and the UK.

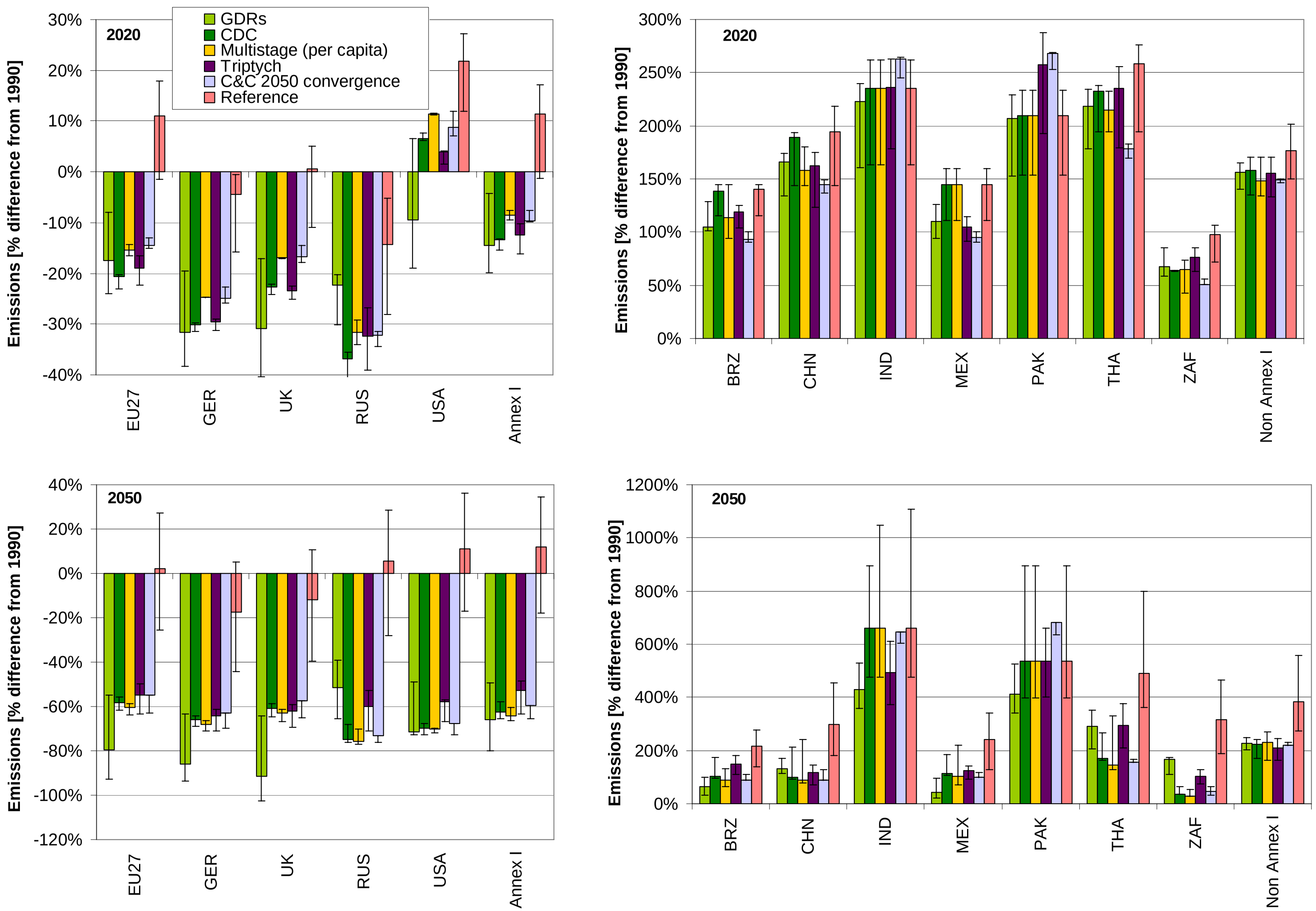

Figure 11. Change in emission allowances from 1990 to 2020 (top) or 2050 (bottom) under the 650 ppmv CO_2eq scenario

Note: Data are included for EU 27, GER (Germany), UK (United Kingdom), RUS (Russia), USA (United States of America), Annex I, BRZ (Brazil), CHN (China), IND (India), MEX (Mexico), PAK (Pakistan), THA (Thailand), ZAF(South Africa) and non-Annex I. The Data are included in Appendix C. The horizontal red lines for Annex I indicate the emission level in 2010 which are similar to the Kyoto targets for Germany and the UK.

Looking broadly at the results across the approaches, one can observe that significant reductions below 1990 levels for all approaches and stabilisation levels are necessary from developed countries in addition to early deviation from reference in developing countries. We also observe that the difference in reductions between stabilisation targets (450, 550 and 650 ppmv CO_2eq) is usually larger than the difference between the various approaches aiming at one stabilisation target for most countries.

As we have kept the global emission level constant over all approaches, one can observe how the approaches distribute these global emissions over the countries and regions. On the one hand, under C&C, all countries participate and developing countries with high per capita emissions may need to reduce substantially. By 2050 Annex I countries as a group have to reduce less relative to other cases. This is equally the case for the Triptych approach. The CDC approach assumes action by developed countries first and delayed action by developing countries. The setting used for the Multistage approach lean even more toward reductions by Annex I countries and delayed reductions by non-Annex I countries. The GDRs approach shows the highest responsibility from Annex I countries. By 2050 many Annex I countries are granted negative emission allowances. This means that emissions in these countries will have to decline (close) to zero and emission reductions in other countries will have to be supported and financed to receive additional emission allowances. Hence, the range of approaches here shows a wide spectrum of the weight between Annex I and non-Annex I action.

Still the results for individual countries and regions differ little across approaches except for the GDRs. We observe that for most individual Annex I countries the resulting reductions below 1990 levels under all approaches are dominated by the starting point (the Kyoto target) and vary most between stabilisation levels not between approaches. An exception is the GDRs approach. This is a completely different approach as it allows negative emission allowances. Therefore, the reductions are far more stringent for Annex I compared to the other approaches.

For most developing countries the differences between the various approaches are larger, because they make different assumptions on their participation (e.g. India or Thailand). The Triptych approach, with the parameters used here, may be demanding for coal-intensive countries that in other approaches would not have participated, e.g. India. For other countries that need to participate in all approaches, such as Brazil, Chine, Mexico or South Africa the levels across approaches are again more uniform as they are for Annex I countries. Again, the GDRs approach is less stringent for most developing countries compared to other approaches. The differences between countries within one geographical region can be large. For example, Malaysia is participating in the Multistage system almost immediately, while participation of the Philippines is delayed until the middle of the century.

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3.2 RESULTS PER COUNTRY OR GROUP

The following section gives more detailed results for Brazil, China, Germany, India, Mexico, Pakistan, Russia, South Africa, Thailand, the UK, the USA, the EU 27, the group of Annex I countries and the group of non-Annex I countries.

3.2.1 Brazil

Figure 12 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for Brazil. Under the BAU emissions are expected to increase substantially by 2040 and to decrease slightly afterwards. Under the 450 ppmv scenario the emission allowances are assumed to decrease by about 50% below 1990 emissions by 2050, which is far below BAU. Brazil would need to reduce emissions from the beginning after 2010.

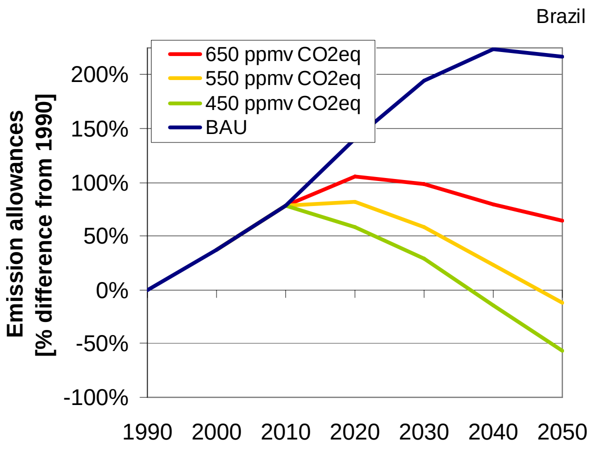


Figure 12. Brazil's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 13 gives an overview of all considered effort sharing approaches and global stabilisation levels for Brazil. With per capita emissions at world average the C&C approach requires early reduction. The GDRs and Multistage approaches would grant Brazil more room to increase its emissions in the short term. The Triptych approach takes into account the particular national circumstances of Brazil of low emissions in electricity generation and transport and therefore requires less reduction than other approaches, esp. by 2050. By 2050 the GDRs requires comparatively stringent reductions. Under the GDRs Brazil would have a share in the global reduction effort, which is equivalent to the global RCI share, of 3% between 2020 and 2050.

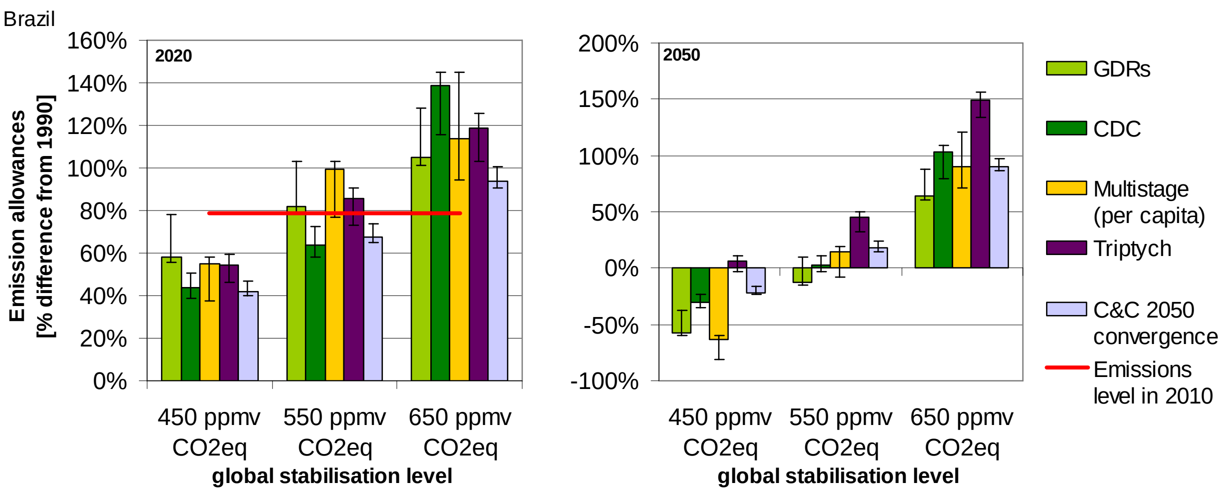


Figure 13. Brazil's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.2 China

Figure 14 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for china. Under the BAU emissions are expected to increase substantially by 2040 and remain more or less constant afterwards. Under the 450 ppmv scenario the emission allowances are assumed to decrease to 13% below 1990 levels by 2050, which is far below BAU. China would need to reduce emissions from the beginning after 2010.

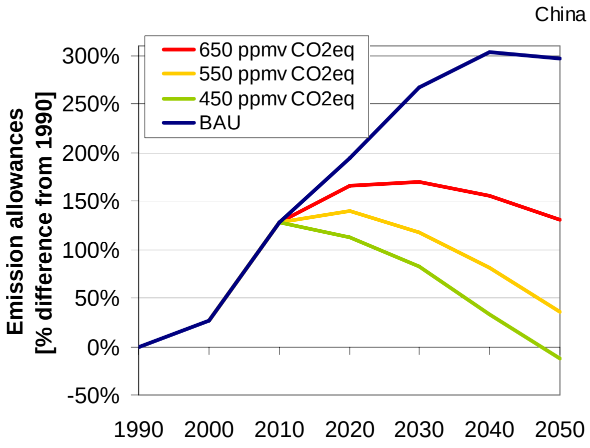


Figure 14. China's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 15 gives an overview of all considered effort sharing approaches and global stabilisation levels for China. Under C&C and CDC China needs to reduce emissions early. The GDRs and Multistage approaches would grant China more room to increase its emissions in the short term. The Triptych approach requires relatively strict emission limits for the electricity sector and therefore relatively stringent reductions for China. By 2050 the GDRs requires comparatively moderate reductions. Under the GDRs China would have a share in the global reduction effort, which is equivalent to the global RCI share, of 15% in 2020 and 20% in 2050.

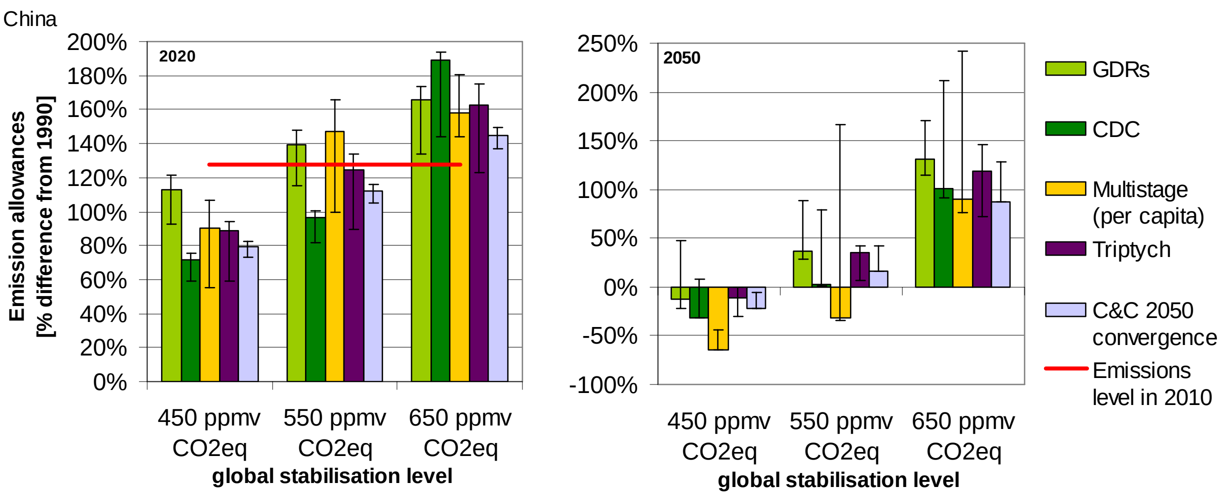


Figure 15. China's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.3 EU 27

Figure 16 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for the EU 27. Under the BAU the emissions are expected to increase and peak around 2030. Under the 450 ppmv scenario the emission allowances are assumed to decrease to about 135% below 1990 levels by 2050, which means negative emission allowances after 2030. The EU would need to decrease emissions from the beginning after 2010.

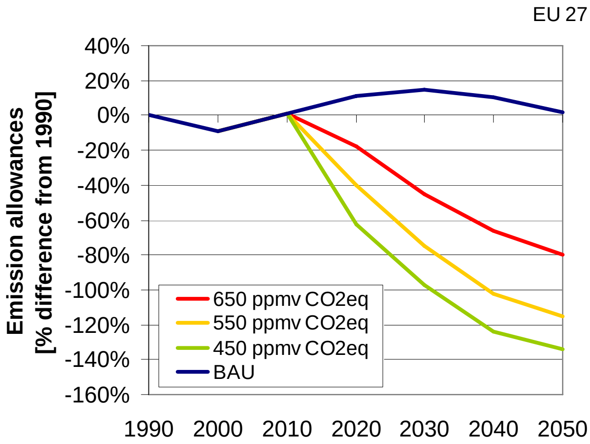


Figure 16. EU's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 17 gives an overview of all considered effort sharing approaches and global stabilisation levels for the EU 27. Under the GDRs emission reductions are very stringent. For the CDC and Multistage approach, earlier reductions are necessary to compensate for the additional emission growth in developing countries. Under Triptych the most moderate reductions are assumed although these are still close to CDC and. Under the GDRs the EU 27 would have a share in the global reduction effort, which is equivalent to the global RCI share, of 22% in 2020 and 13% in 2050.

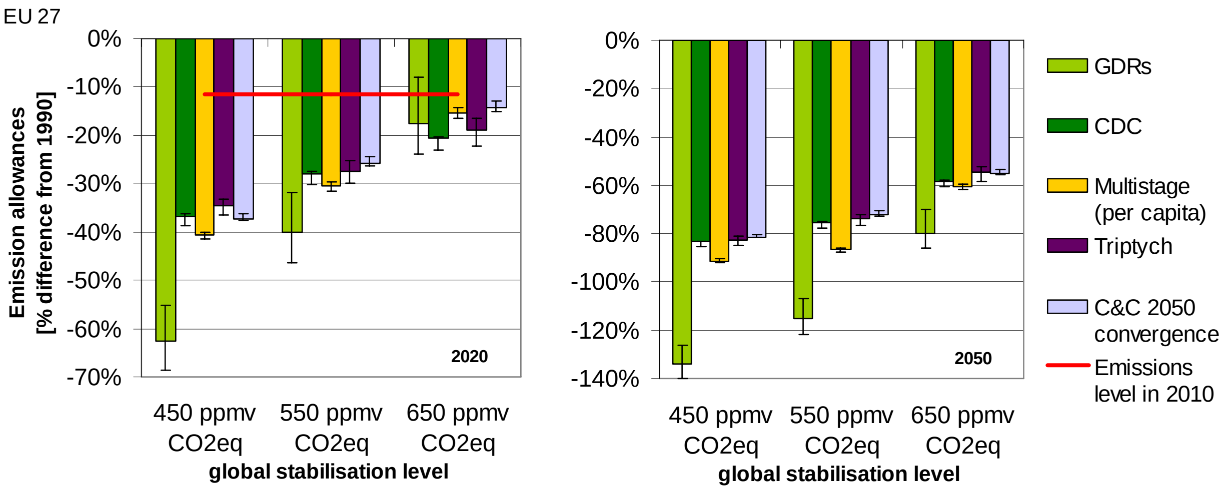


Figure 17. EU's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.4 Germany

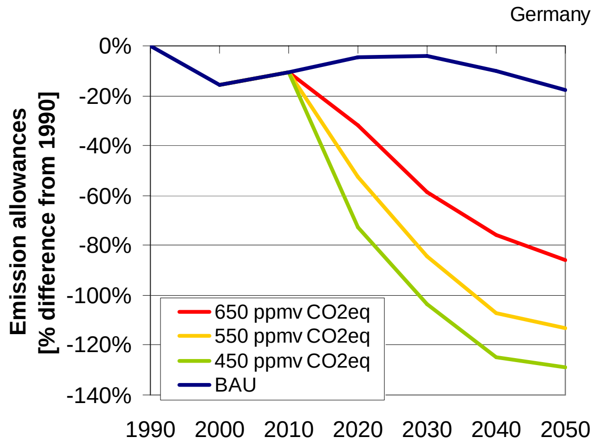


Figure 18. Germany's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 18 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for Germany. Under the BAU emissions are expected to increase and peak around 2030. Under the 450 ppmv scenario the emission allowances are assumed to decrease to 130% below 1990 levels by 2050, which means negative emission allowances after 2030. Germany would need to decrease emissions from the beginning after 2010.

Figure 19 gives an overview of all considered effort sharing approaches and global stabilisation levels for Germany. The trend is similar compared to the EU 27 obligations but emissions have to be reduced further. Under the GDRs emission reductions are very stringent. For the CDC and Multistage approach, earlier reductions are necessary to compensate for the additional emission growth in developing countries. Triptych shows a similar but slightly more moderate development although it is still close to CDC and C&C. Under the GDRs Germany would have a share in the global reduction effort, which is equivalent to the global RCI share, of 4% in 2020 and 2% in 2050.

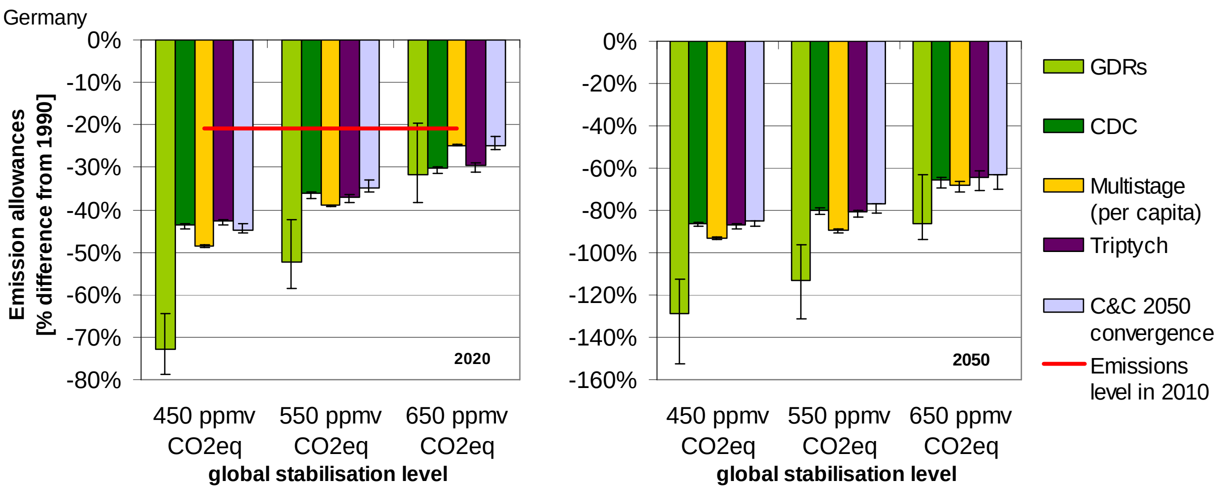


Figure 19. Germany's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.5 India

Figure 20 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv India. Under the BAU emissions are expected to increase substantially until 2050. Under the 450 ppmv scenario the emission allowances are assumed to decrease by about $^2/_3$ below BAU, which is about 200% above 1990 levels by 2050. India would need to slow its emission growth from the beginning after 2010. Emission allowances would peak around 2030 to 2040.

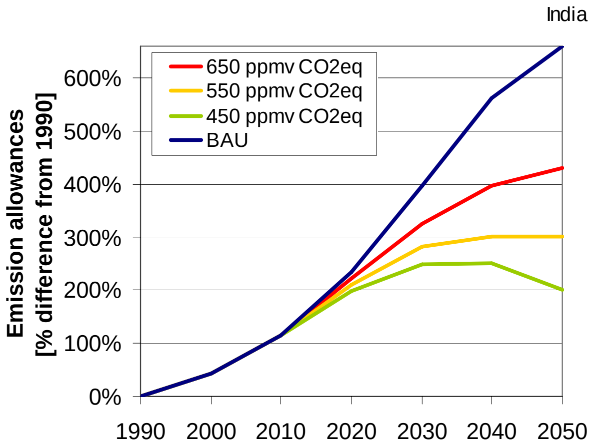


Figure 20. India's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 21 gives an overview of all considered effort sharing approaches and global stabilisation levels for India. Under the Multistage and CDC approaches India is granted the highest emission allowances, often close to its BAU in the short term and for high stabilisation levels. Triptych requires stringent reductions due to ambitious targets for the electricity sector, which is based on coal in India. Especially by 2050 the GDRs requires comparatively stringent reductions. This is due to the assumption that capability and responsibility increase fast. Under the GDRs India would have a share in the global reduction effort, which is equivalent to the global RCI share, of 2% in 2020 and 11% in 2050.

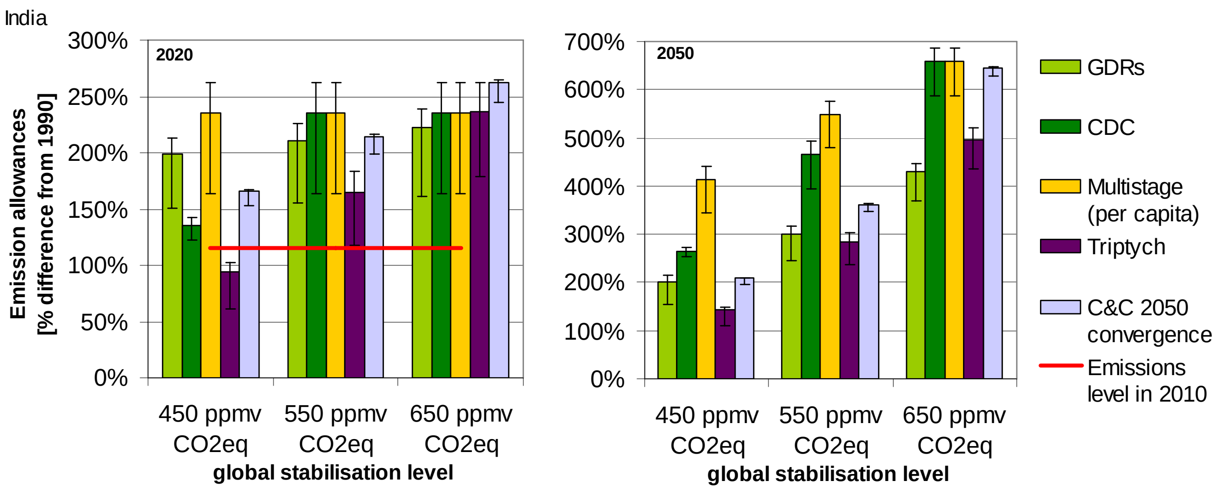


Figure 21. India's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.6 Mexico

Figure 22 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for Mexico. Under the BAU emissions are expected to increase substantially by 2040 and grow slowly afterwards. Under the 450 ppmv scenario the emission allowances are assumed to decrease to 100% below 1990 levels by 2050, which is far below BAU. This means Mexico will be granted no emission allowances by 2050. Mexico would need to reduce its emissions substantially from the beginning after 2010.

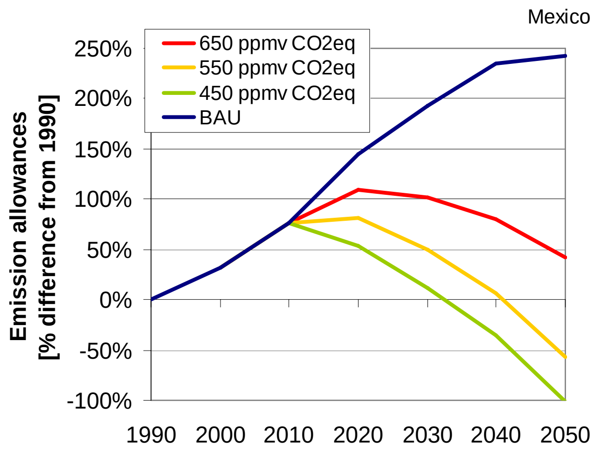


Figure 22. Mexico's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 23 gives an overview of all considered effort sharing approaches and global stabilisation levels for Mexico. Under C&C and Triptych Mexico needs to reduce emissions early. The Triptych approach requires relatively strict emission limits for the electricity sector and therefore relatively stringent reductions below reference for Mexico. The GDRs and Multistage approaches would demand less mitigation efforts in the short term but would require more stringent reductions later on. Under the GDRs Mexico would have a share in the global reduction effort, which is equivalent to the global RCI share, of 2% between 2020 and 2050.

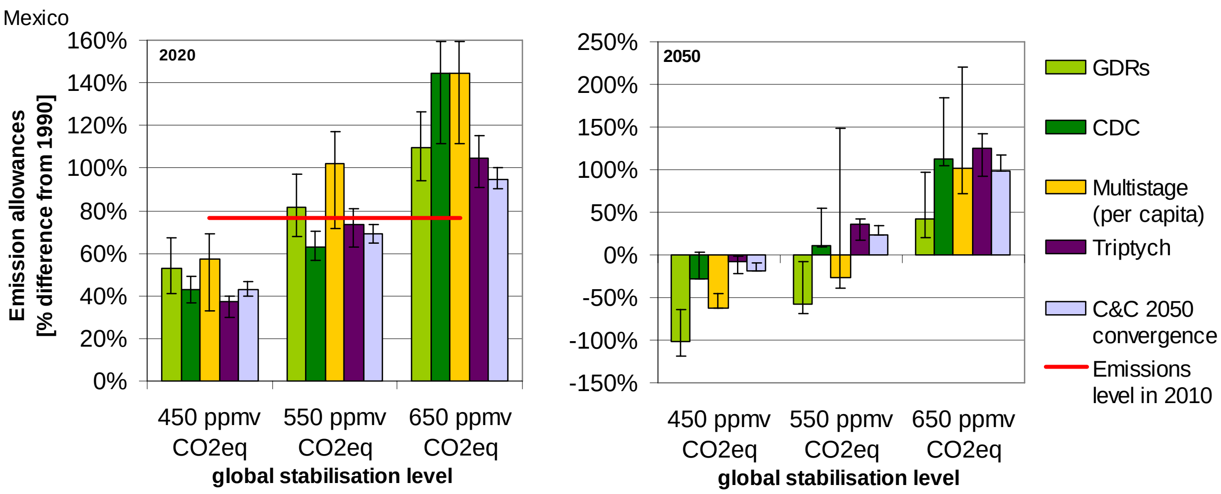


Figure 23. Mexico's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.7 Pakistan

Figure 24 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for Pakistan. Under the BAU emissions are expected to increase substantially by 2050. Under the 450 ppmv scenario the emissions are assumed to half by 2050 compared to BAU emissions. Pakistan would start slowly decelerating its emission growth. Emissions would peak around 2040.

Figure 25 gives an overview of all considered effort sharing approaches and global stabilisation levels for Pakistan. Under the GDRs, Multistage and Triptych approaches Pakistan is granted the highest emission allowances, often at or close to BAU level, in some cases even above (C&C and Triptych for 650 ppmv). Triptych requires stringent reductions for low stabilisation levels. Under the GDRs Pakistan would have a share in the global reduction effort, which is equivalent to the global RCI share, of 0.1% in 2020 and 0.8% in 2050.

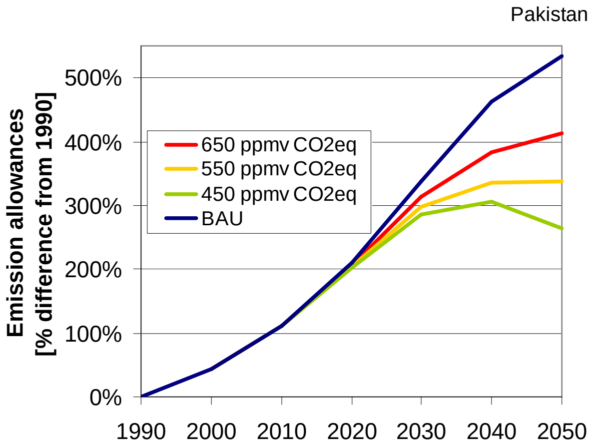


Figure 24. Pakistan's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

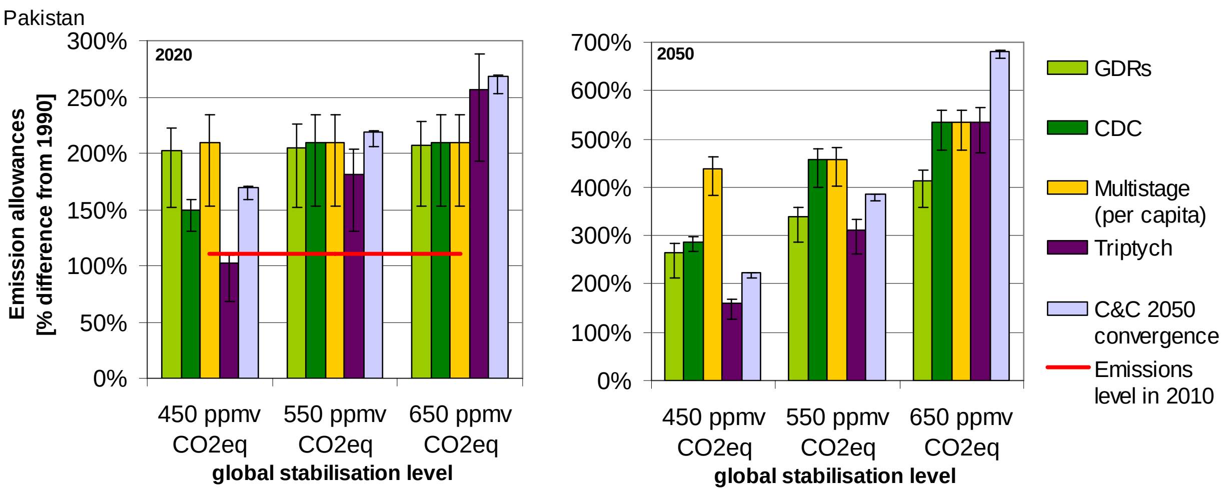


Figure 25. Pakistan's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.8 Russia

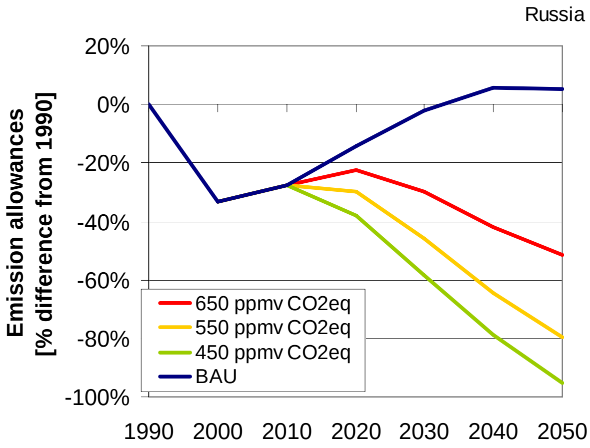


Figure 26. Russia's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 26 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for Russia. Under the BAU emissions are expected to increase by 2040 and remain more or less constant afterwards. Under the 450 ppmv scenario the emissions are assumed to decrease to 95% below 1990 levels by 2050, which is far below BAU. Russia would need to decrease emissions from the beginning after 2010.

Figure 27 gives an overview of all considered effort sharing approaches and global stabilisation levels for Russia. The GDRs approach would require comparatively moderate emissions reductions from Russia. This is due to the relative low GDP per capita compared to other Annex I countries. Second best would be the Triptych approach as it also relies on the stronger growth assumed for Russia compared to other Annex I countries. C&C would be most stringent due to high per capita emissions. As for nearly all Annex I countries, the Multistage approach would lead to the most stringent reduction efforts to compensate that many developing countries only participate at a late point in time. Under the GDRs Russia would have a share in the global reduction effort, which is equivalent to the global RCI share, of 4% in 2020 and 5% in 2050.

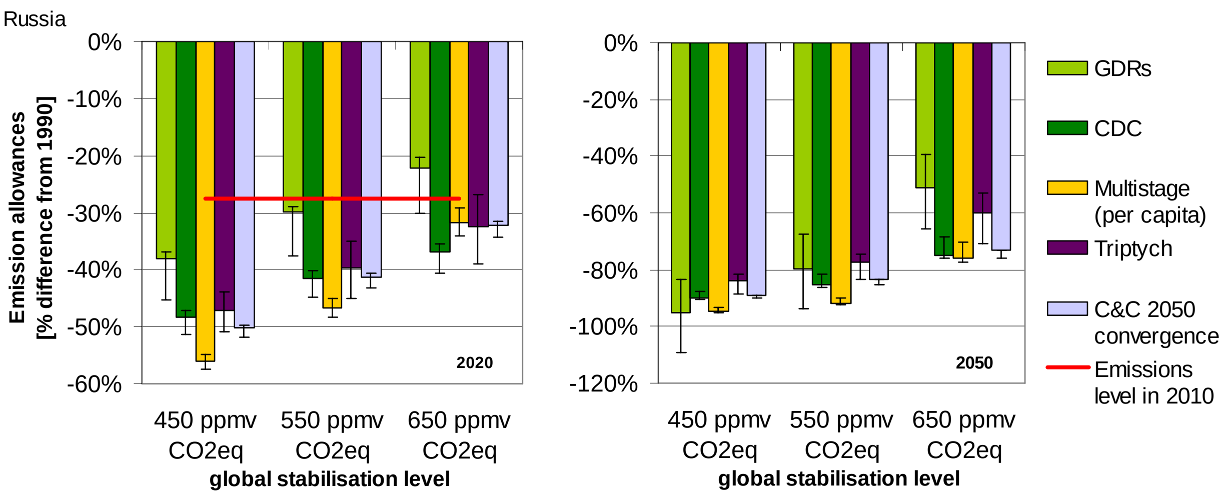


Figure 27. Russia's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.9 South Africa

Figure 28 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for South Africa. Under the BAU emissions are expected to increase substantially by 2050. Under the 450 ppmv scenario the emissions are assumed to decrease nearly to 1990 levels (+25%) by 2050 which is far below BAU. South Africa would need to reduce its emissions from the beginning after 2010.

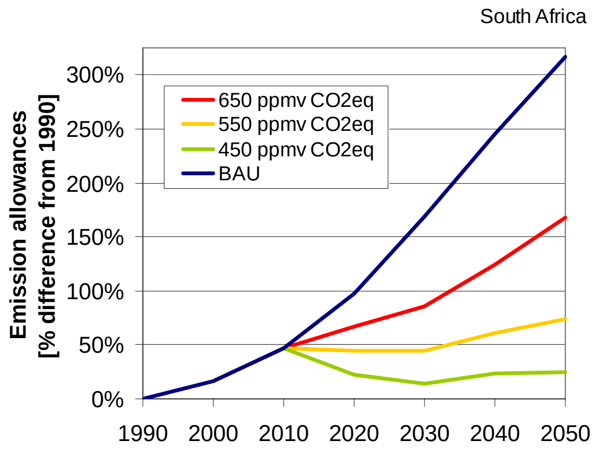


Figure 28. South Africa's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 29 gives an overview of all considered effort sharing approaches and global stabilisation levels for South Africa. Under all future scenarios calculated South Africa would need to slow the growth of emissions already by 2020. As under C&C emissions have to be reduced below current non-Annex I average, South Africa needs to reduce emissions early under this approach. The CDC approach would grant South Africa more room to increase its emissions in the short term, but requires more reductions in the long term. In a Multistage regime, South Africa would move very quickly into higher stages and would have to slow emission growth significantly. The Triptych approach is less stringent for South Africa. The GDRs approach requires comparatively medium efforts in the short term but allows by far the highest emissions in the long term. Under the GDRs South Africa would have a share in the global reduction effort, which is equivalent to the global RCI share, of 1% in 2020 and 2% in 2050.

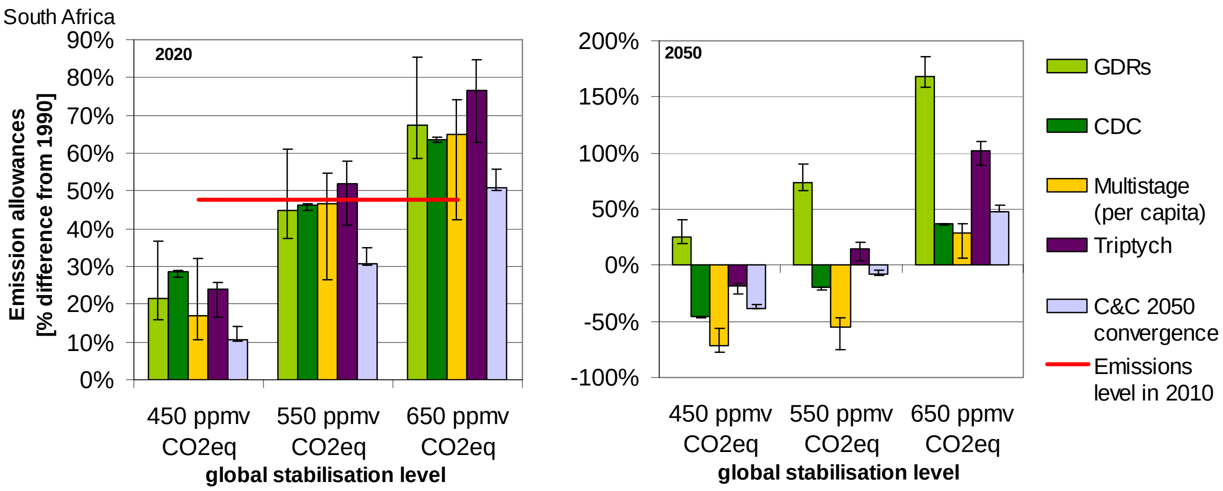


Figure 29. South Africa's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.10 Thailand

Figure 30 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for Thailand. Under the BAU emissions are expected to increase substantially by 2040 and grow slowly afterwards. Under the 450 ppmv scenario the emissions are assumed to decrease far below BAU by 2050, which would be 80% above the 1990. Thailand would need to reduce its emissions from the beginning after 2010.

Figure 31 gives an overview of all considered effort sharing approaches and global stabilisation levels for Thailand. The most stringent reductions are required under C&C and CDC in the sort term, while the GDRs approach and Multistage grant most emission allowances. In the long term also Multistage requires stringent emissions reductions. Under the GDRs Thailand would have a share in the global reduction effort, which is equivalent to the global RCI share, of 1% between 2020 and 2050.

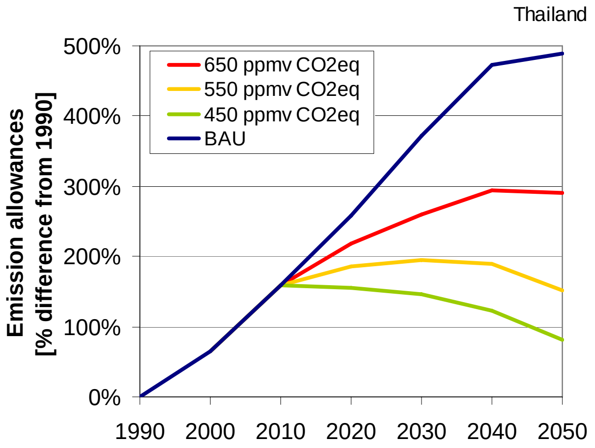


Figure 30. Thailand's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

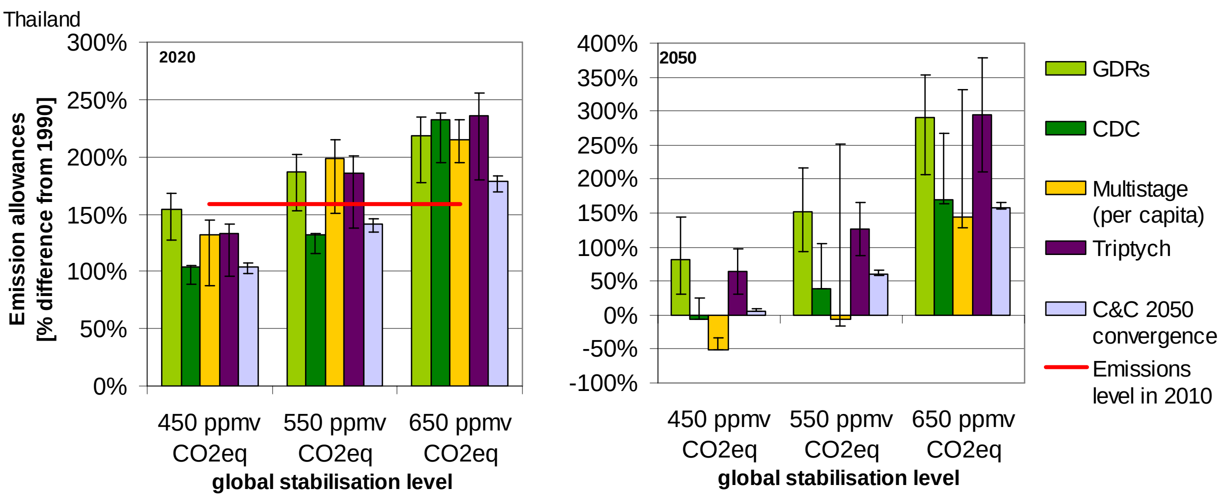


Figure 31. Thailand's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.11 UK

Figure 32 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for the UK. Under the BAU emissions are expected to increase and peak around 2030. Under the 450 ppmv scenario the emissions are assumed to decrease to 140% below 1990 levels by 2050 which means negative emission allowances after 2025. The UK would need to decrease emissions from the beginning after 2010.

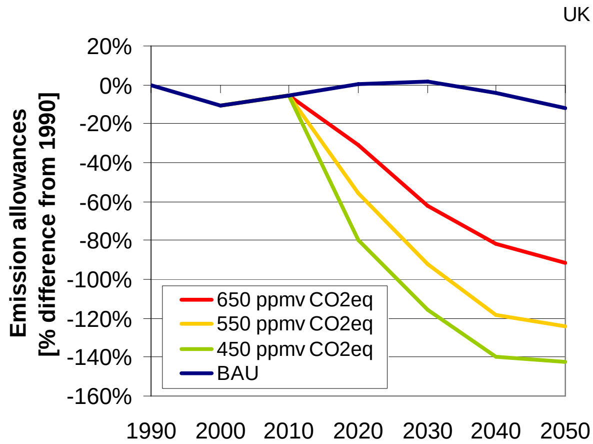


Figure 32. UK's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 33 gives an overview of all considered effort sharing approaches and global stabilisation levels for the UK. The trend is similar compared to the EU 27 obligations but emissions have to be reduced further. Under the GDRs emission reductions are very stringent. For the CDC and Multistage approach, earlier reductions are necessary to compensate for the additional emission growth in developing countries. Triptych shows a similar development and allowances are close to CDC. Under the GDRs the UK would have a share of the global reduction effort, which is equivalent to the global RCI share, of 3% in 2020 and 2% in 2050.

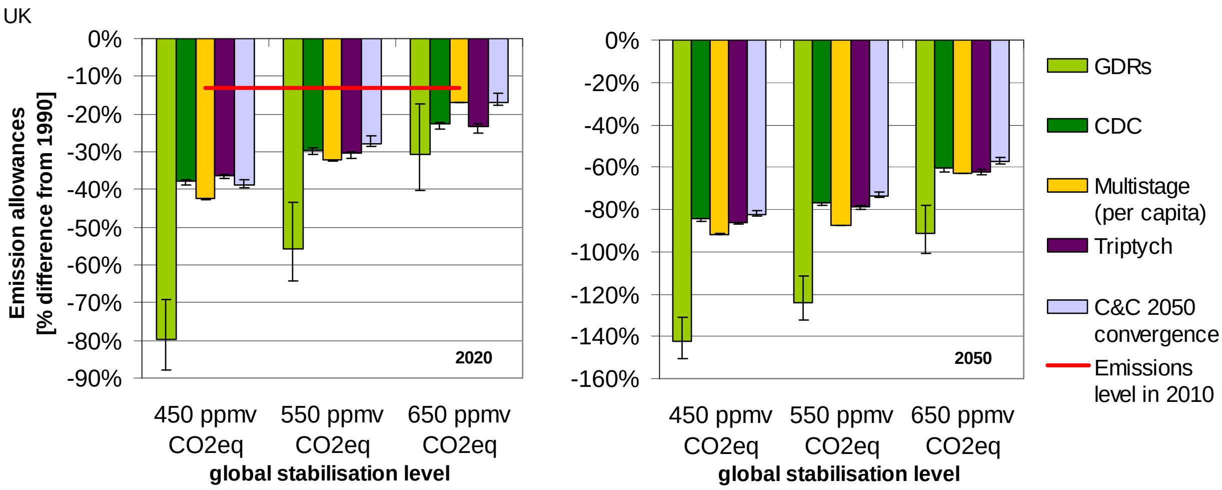


Figure 33. UK's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.12 USA

Figure 34 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for the USA. Under the BAU emissions are expected to increase and peak around 2020 to 2030. Under the 450 ppmv scenario the emissions are assumed to decrease to 125% below 1990 levels by 2050, which means negative emission allowances after 2030. The USA would need to decrease emissions from the beginning after 2010.

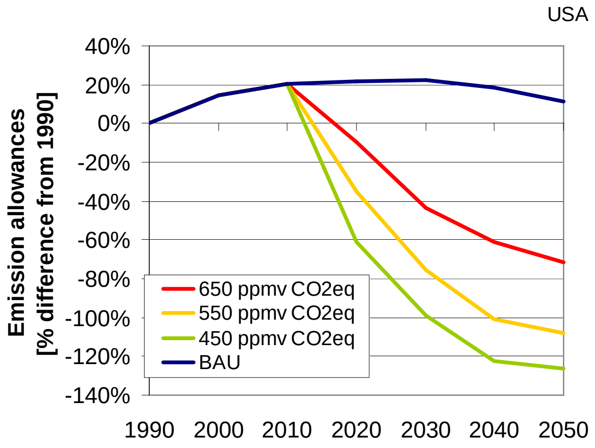


Figure 34. USA's reference emissions and emission allowances under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 35 gives an overview of all considered effort sharing approaches and global stabilisation levels for the USA. Under the GDRs emission reductions are very stringent due to the high capacity and responsibility of the USA. As for nearly all Annex I countries, the Multistage approach would lead to stringent reduction efforts to compensate that many developing countries only participate at a late point in time. Convergence of emissions per capita would also be demanding because of the current high levels. Under the CDC and Triptych less stringent reductions would be necessary. The reduction requirements under the GDRs approach would be by far the most stringent and would be above Annex I average. Under the GDRs the USA would have a share in the global reduction effort, which is equivalent to the global RCI share, of 27% in 2020 and 14% in 2050.

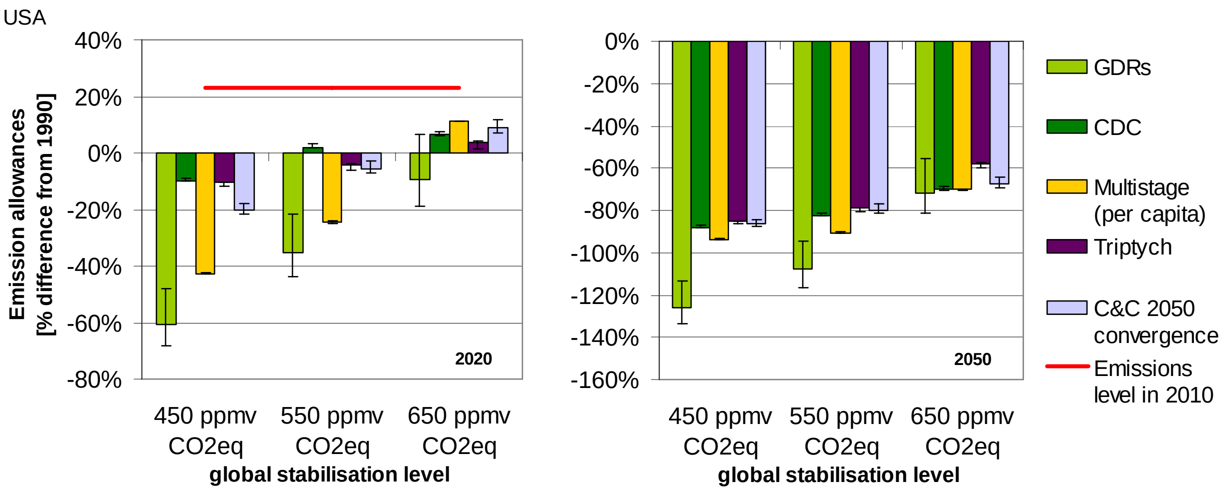


Figure 35. USA's reference emissions and emission allowances under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.13 Annex I

Figure 36 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for Annex I. Under the BAU emissions are expected to increase and peak around 2030 to 2040. Under the 450 ppmv scenario the emissions are assumed to decrease to 120% below 1990 levels by 2050, which means negative emission allowances after 2035. Annex I would need to decrease emissions from the beginning after 2010.

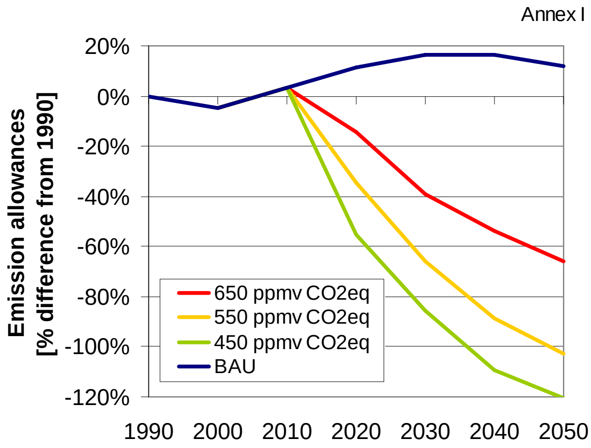


Figure 36. Reference emissions and emission allowances of Annex I countries under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 37 gives an overview of all considered effort sharing approaches and global stabilisation levels for the group of Annex I countries. Under the GDRs emission reductions are very stringent due to the high capacity and responsibility of the Annex I countries. The Multistage approach would lead to stringent reduction efforts to compensate that many developing countries only participate at a late point in time. Convergence of emissions per capita would also be demanding because of the current high levels. Under the CDC and Triptych less stringent reductions would be necessary. Under the GDRs Annex I would have a share in the global reduction effort, which is equivalent to the global RCI share, of 64% in 2020 and 41% in 2050.

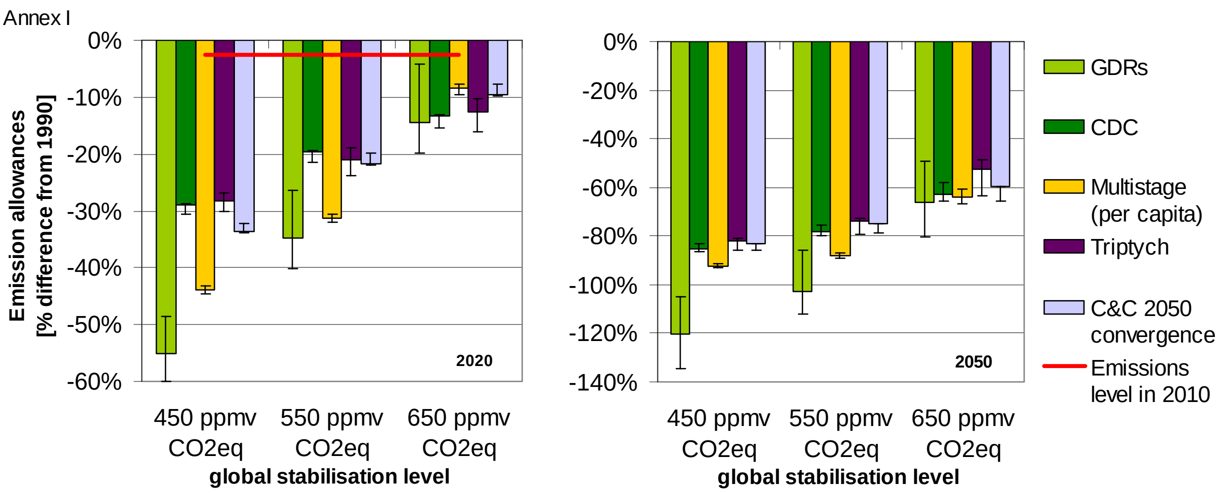


Figure 37. Reference emissions and emission allowances of Annex I countries under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

3.2.14 Non-Annex I

Figure 38 illustrates the emissions under the BAU and the reduction of emission allowances under the GDRs approach for the global stabilisation levels of 450, 550 and 650 ppmv for non-Annex I. Under the BAU emissions are expected to increase substantially by 2050. Under the 450 ppmv scenario the emissions are assumed to decrease far below BAU, which would be about 100% above 1990 levels. Non-Annex I would need to slow the growth of emissions from the beginning after 2010. Emissions would peak around 2030.

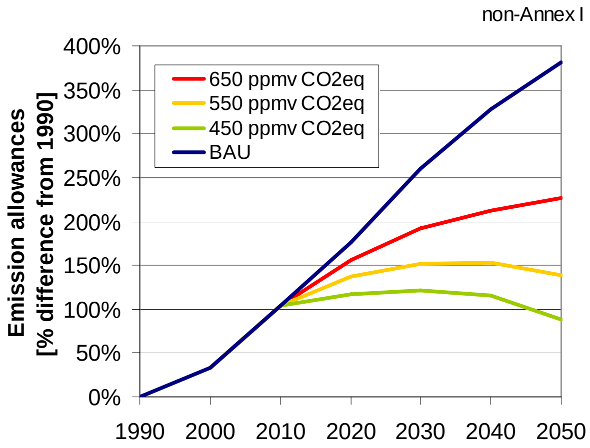


Figure 38. Reference emissions and emission allowances of non-Annex I countries under the Greenhouse Development Rights approach between 1990 and 2050 for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

Figure 39 gives an overview of all considered effort sharing approaches and global stabilisation levels for the group of non-Annex I countries. This is reverse to the Annex I obligations. Under the GDRs emission reductions are most moderate due to the low capacity and responsibility of non-Annex I countries. The Multistage approach would lead to moderate reduction efforts because many developing countries enter the multistage system later in time. Due to comparatively low emissions per capita C&C would be less demanding than CDC and Triptych. Under the GDRs non-Annex I would have a share in the global reduction effort, which is equivalent to the global RCI share, of 34% in 2020 and 60% in 2050.

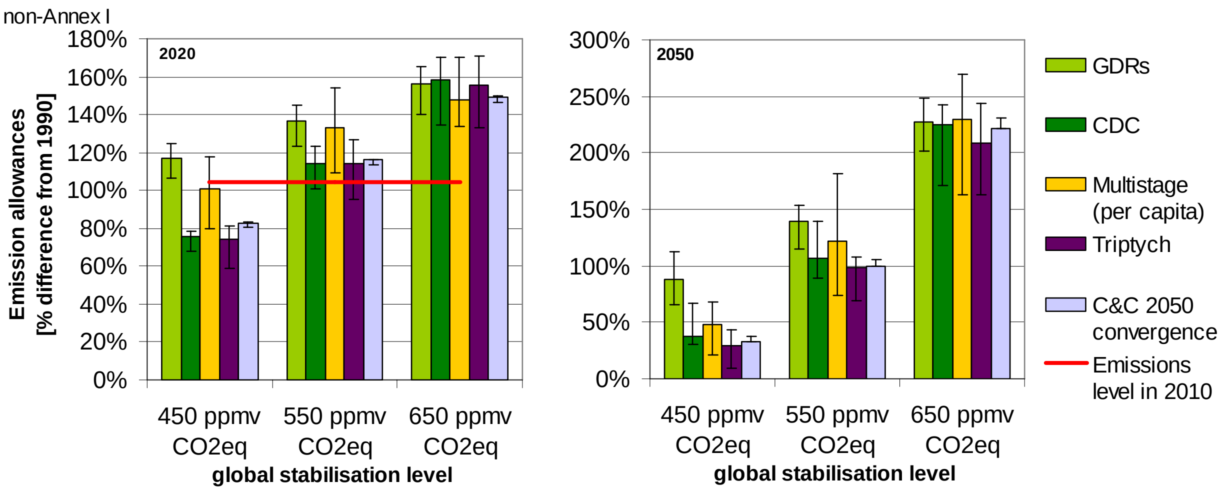
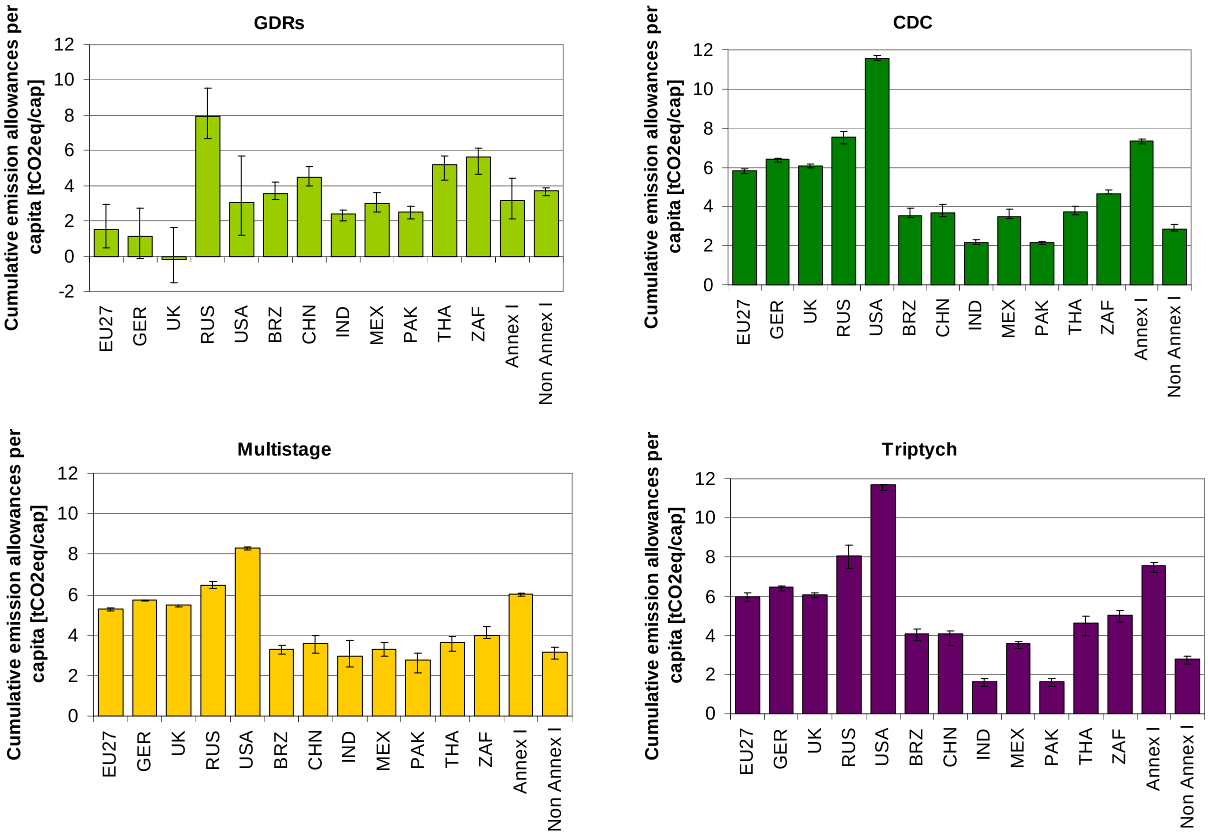
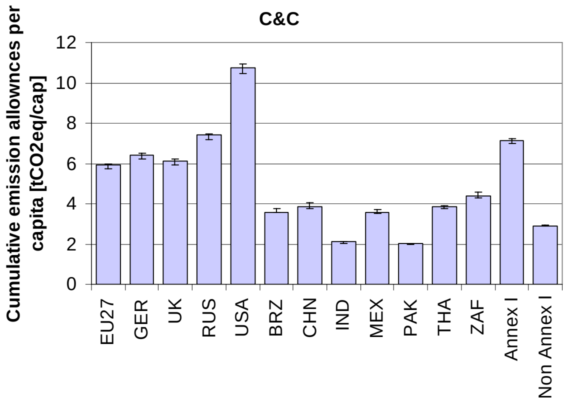


Figure 39. Reference emissions and emission allowances of non-Annex I countries under different effort sharing approaches for 2020 (left) and 2050 (right) for three stabilisation pathways (450, 550 and 650 ppmv CO_2eq)

4. CUMULATIVE EMISSION RIGHTS PER CAPITA

Figure 40 below provides cumulative emission rights per capita for different (groups of) countries under the GDRs, CDC, Multistage, Triptych and C&C approaches between 2010 and 2050 for stabilisation at 450 ppmv CO_2eq as annual average. The values given are total cumulative emissions between 2010 and 2050 divided by the average population per country in that period and divided by the number of years of accumulation. Average global cumulative emissions per capita are around 3.7 t CO_2eq per capita and year for all approaches.





Note: Data are included for EU 27, GER (Germany), UK (United Kingdom), RUS (Russia), USA (United States of America), Annex I, BRZ (Brazil), CHN (China), IND (India), MEX (Mexico), PAK (Pakistan), THA (Thailand), ZAF(South Africa) and non-Annex I. The Data are included in Appendix C, also for 550 and 650 ppmv CO_2eq.

Figure 40. Cumulative emission allowances per capita for different (groups of) countries under the GDRs, CDC, Multistage, Triptych and C&C approaches between 2010 and 2050 for stabilisation at 450 ppmv CO_2eq as annual average.

5. CONCLUSIONS

This report shows the results under a Greenhouse Development Rights (GDRs) regime (Baer et al. 2007) for global effort sharing until 2050. In addition, it compares the GDRs approach to several other effort sharing approaches for different stabilisation levels.

Conclusions on the methodology:

- The implementation of the GDRs in this report is very similar to what Baer et al. developed. The main differences are that the scope is a bit broader as all six Kyoto gases are included in this report and the Responsibility Capacity Index to calculate the GDRs reduction per country is calculated for every year between 2010 and 2050.
- Effort sharing under the GDRs approach depends very strongly on the BAU assumptions, the reduction paths and the resulting global emission reduction. We used a static BAU scenario that becomes more and more outdated the further the calculations go into the future. Since countries participate in the GDRs approach, their BAU for the future changes. In the real world implementation, one would have to update the BAU regularly.
- Figures are given for three stabilisation levels: 450, 550 and 650 ppmv CO_2eq. Generally, only reduction path aiming at a stabilisation at 450 ppmv CO_2eq or lower will offer a good chance to stay below the 2° limit. However, the bar diagrams per country/group for all stabilisation levels and approaches show very well the same trend as for lower stabilisation pathways.

Conclusions on the results

- Countries or regions with a high RCI at the beginning, such as the USA or the EU 27, would have to take a big part of the global emissions reduction effort in early years. Because of this and because of the economic growth of other regions, such as China, India and other parts of Asia, their relative contribution would decrease a bit over time. For Annex I countries this could even lead to slightly increasing emission allowances after 2050, regarding the relative change compared to 1990, because many rapidly industrialising countries will have to increase their contribution.
- For developing countries with a low RCI at the beginning, less reduction is required in the short term. The GDRs is more stringent in the long term for countries with very low emissions that would not participate in other regimes, e.g. India and Pakistan. Also for medium/advanced developing countries it can be more stringent in the long-term, e.g. Brazil and Mexico. It however strongly depends on the assumptions of the reference scenario.
- In this approach emission allowances can drop below zero, which means that even allowances have to be bough if emissions are reduced to zero. This would be the case for most Annex I countries in a few decades. Therefore, trading or any kind of infrastructure to transfer emission allowances will be necessary.
- The effort under the GDRs is higher compared to other approaches for most Annex I countries since negative emission allowances are possible. However, this does not mean that the actual imposition for developed countries is higher compared to other approaches because also a high amount of financial support for more stringent non-Annex I targets would need to come from Annex I countries under other approaches as well.

REFERENCES

Baer, Paul, Tom Athanasiou and Sivan Kartha. (2007). *The right to development in a climate constrained world. The Greenhouse Development Rights framework.* Publication series on ecology, volume 1. Berlin: Heinrich-Böll-Foundation, Christian Aid, EcoEquity and the Stockholm Environment Institute. http://www.ecoequity.org/docs/TheGDRsFramework.pdf.

Berk, M.M. and M.G.J. den Elzen. (2001). Options for differentiation of future commitments in climate policy: how to realise timely participation to meet stringent climate goals? *Climate Policy, 1* (4), 465-480.

Blanchard, O., C. Criqui, A. Kitous and L. Vinguier. (2003). Efficiency with equity: A prgamatic Approach. In Kaul, I., P. Conceiçäo, K. Le Goulven and R.U. Mendoza (Eds.), *Providing public goods: managing globalization*. Grenoble, France: Oxford: Oxford Universitty Press: Office of Devlopment Studies, United Nations Devleopment Program.

Blok, K. , N. Höhne, A. Torvanger and R. Janzic. (2005). *Towards a Post-2012 Climate Change Regime.* Brussels, Belgium: 3E nv. http://europa.eu.int/comm/environment/climat/pdf/id_bps098.PDF.

Blok, K., G.J.M. Phylipsen and J.W. Bode. (1997). *The Triptique approach. Burden differentiation of CO_2 emission reduction among European Union member states. Discussion paper*. Utrecht University, Department of Science, Technology and Society. Paper presented at the Informal workshop for the European Union Ad Hoc Group on Climate, 16-17 January 1997, Zeist.

CAN, (Climate Action Network). (2003). *Preventing dangerous climate change.* CAN position paper presented at COP 9. Milan, Italy: Climate Action Network. http://www.climnet.org.

CIA. (2008, 03-26-2008). *The World Factbook: Distribution of family income - Gini index.* Central Intelligency Agency (CIA). https://www.cia.gov/library/publications/the-world-factbook/fields/2172.html.

Claussen, E. and L. McNeilly. (1998). *Equity and Global Climate Change, The Complex Elements of Global Fairness.* Table of models. PEW Centre on Global Climate Change, Arlington: http://www.pik-potsdam.de/data/emic/table_of_emics.pdf.

Criqui, P., A. Kitous, M.M. Berk, M.G.J. den Elzen, B. Eickhout, P. Lucas, D.P. van Vuuren, N. Kouvaritakis and D. Vanregemorter. (2003). *Greenhouse gas reduction pathways in the UNFCCC Process up to 2025 - Technical Report.* No. B4-3040/2001/325703/MAR/E.1 for the DG Environment. Grenoble, France: CNRS-IEPE. http://europa.eu.int/comm/environment/climat/pdf/pm_techreport2025.pdf.

den Elzen, M.G.J. (2005). *Analysis of future commitments and costs of countries for the "South-North Dialogue" Proposal using the FAIR 2.1 world model.* No. MNP-report 728001032 (www.mnp.nl/en) Netherlands Environmental Assessment Agency (MNP), Bilthoven, the Netherlands.

den Elzen, M.G.J., M.M. Berk, P. Lucas, B. Eickhout and D.P. van Vuuren. (2003). *Exploring climate regimes for differentiation of commitments to achieve the EU climate target.* No. MNP-report 728001023. Bilthoven, the Netherlands: Netherlands Environmental Assessment Agency (MNP).

den Elzen, M.G.J., N. Höhne, B. Brouns, H. Winkler and H E. Ott. (2005). Differentiation of countries' post-2012 mitigation commitments under the "South-North Dialogue" Proposal. *Global Environmental Change, (submitted)*.

den Elzen, M.G.J. and P. Lucas. (2003). *FAIR 2.0: a decision-support model to assess the environmental and economic consequences of future climate regimes.* No. MNP-report 550015001, www.mnp.nl/fair. Bilthoven, the Netherlands: Netherlands Environmental Assessment Agency (MNP).

den Elzen, M.G.J. and M. Meinshausen. (2005). *Meeting the EU 2°C climate target: global and regional emission implications.* MNP-report, No. 728001031. Bilthoven, the Netherlands: Netherlands Environmental Assessment Agency (MNP). http://www.gci.org.uk/briefings/rivm.pdf.

den Elzen, Michel G.J., Paul Lucas Marcel Berk, Patrick Criqui and Alban Kitous. (2006). Multi-Stage: A Rule-Based Evolution of Future Commitments Under the Climate Change Convention. *International Environmental Agreements: Politics, Law and Economics 6*(1), 1 - 28 http://springerlink.metapress.com/(s4bu3sqizksn1155wrtngojy)/app/home/contribution.asp?referrer=parent&backto=issue,1,6;journal,2,22;linkingpublicationresults,1:106601,1.

Eickhout, B., M.G.J. den Elzen and D.P. van Vuuren. (2003). *Multi-gas emission profiles for stabilising greenhouse gas concentrations.* No. MNP-report 728001026. Bilthoven, the Netherlands: Netherlands Environmental Assessment Agency (MNP). www.mnp.nl\en.

GCI. (2005). *GCI Briefing: Contraction & Convergence.* Retrieved April, 2006. Global Commons Institute. http://www.gci.org.uk/briefings/ICE.pdf.

Groenenberg, H. (2002). *Development and Convergence: a bottom-up analysis for the differentiation of future commitments under the Climate Convention.* Unpublished PhD, Utrecht University, Utrecht, the Netherlands.

Gupta, J. (1998). *Encouraging developing country participation in the climate change regime.* Discussion Paper E98-08. Institute for Environmental Studies, Free University of Amsterdam, Amsterdam, the Netherlands:

Gupta, J. (2003). Engaging Developing Countries in Climate Change: KISS and Make-Up! In Michel, D. (Ed.), *Beyond Kyoto: Meeting the Long-Term Challenge of Global Climate Change*: the Johns Hopkins University Center for Transatlantic relations, Transatlantic Dialogue on Climate Change.

Höhne, Niklas. (2006). *What is next after the Kyoto Protocol? Assessment of options for international climate policy post 2012*. Amsterdam, The Netherlands: Techne Press. http://www.technepress.nl/publications.php?id=13.

Höhne, Niklas and Kornelis Blok. (2006). The impact of the Kyoto Protocol on climate stabilization. In *What is next after the Kyoto Protocol? Assessment of options for international climate policy post 2012*. Amsterdam, The Netherlands: Techne Press. http://www.technepress.nl/publications.php?id=13.

Höhne, Niklas, Kornelis Blok, Jochen Harnisch, Dian Phylipsen and Carolina Galleguillos. (2003). *Evolution of commitments under the UNFCCC: Involving newly industrialized countries and developing countries.* No. Research-report 20141255, UBA-FB 000412. Berlin: ECOFYS Gmbh.

Höhne, Niklas, M.G.J. den Elzen and M. Weiss. (2006). Common but differentiated convergence (CDC), a new conceptual approach to long-term climate policy. *Climate Policy, 6*, 181-199.

Höhne, Niklas, Dian Phylipsen and Sara Moltmann. (2007). *Factors underpinning future action - 2007 update.* Cologne: Ecofys Germany. http://www.fiacc.net/data/fufa2.pdf.

Höhne, Niklas, Dian Phylipsen, Simone Ullrich and Kornelis Blok. (2005). *Options for the second commitment period of the Kyoto Protocol, research report for the German Federal Environmental Agency.* Climate Change 02/05, ISSN 1611-8855. Berlin: ECOFYS GmbH. http://www.umweltdaten.de/publikationen/fpdf-l/2847.pdf.

Höhne, Niklas and Simone Ullrich. (2005). *Emission allowances under the proposal of the "South north dialogue - equity in the greenhouse".* No. Research-report DM 70096. Cologne, Germany: ECOFYS.

Houghton, R.A. (2003). *Emissions (and Sinks) of Carbon from Land-Use Change. (Estimates of national sources and sinks of carbon resulting from changes in land use, 1950 to 2000).* Report to the World Resources Institute from the Woods Hole Research Center. Woods Hole, Massachusetts, USA: Woods Hole Research Center. http://cait.wri.org.

IEA. (2002). *CO_2 Emissions from Fuel Combustion (2002 edition).* Paris, France: International Energy Agency, Available online at: http://data.iea.org/ieastore/co2_main.asp.

IEA. (2005). *CO_2 Emissions from Fuel Combustion (2005 edition)*. Paris, France: International Energy Agency. http://data.iea.org/ieastore/co2_main.asp.

IMAGE team. (2001). *The IMAGE 2.2 implementation of the SRES scenarios. A comprehensive analysis of emissions, climate change and impacts in the 21st century.* CD-ROM publication 481508018. Bilthoven, the Netherlands: http://www.rivm.nl/image/.

IPCC. (2007). *Climate Change 2007. Mitigation of climate change.* IPCC Assessment Reports. Geneva, Switzerland: Working Group III, IPCC Secretariat (International Panel on Climate Change). http://www.ipcc.ch.

Meyer, Aubrey. (2000). *Contraction & convergence. The global solution to climate change.* Schumacher Briefings, No. 5. Bristol, UK:

Michaelowa, A., S. Butzengeiger and M. Jung. (2005). Graduation and Deepening: An Ambitious Post-2012 Climate Policy Scenario, *International Environmental Agreements: Politics, Law and Economics* (Vol. 5, pp. 25-46).

Nakicenovic, N., J. Alcamo, G. Davis, B. de Vries, J. Fenhann, S. Gaffin, K. Gregory, A. Grübler, T.Y. Jung, T. Kram, E. Emilio la Rovere, L. Michaelis, S. Mori, T. Morita, W. Pepper, H. Pitcher, L. Price, K. Riahi, A. Roehrl, H. Rogner, A. Sankovski, M. Schlesinger, P. Shukla, S. Smith, R. Swart, S. van Rooyen, N. Victor and Z. Dadi. (2000). *Special report on emissions scenarios*. IPCC Special Reports. Cambridge, UK: Cambridge University Press.

Olivier, J.G.J. and J.J.M. Berdowski. (2001). Global emissions sources and sinks. In Berdowski, J., R. Guicherit and B.J. Heij (Eds.), *The Climate System* (pp. 33-78): A.A. Balkema Publishers/Swets & Zeitlinger Publishers, Lisse, The Netherlands. ISBN 90 5809 255 0.

Ott, H E., H. Winkler, B. Brouns, S. Kartha, M. Mace, S. Huq, Y. Kameyama, A.P. Sari, J. Pan, Y. Sokona, P.M. Bhandari, A. Kassenberg, E.L. La Rovere and A. Rahman. (2004). *South-North dialogue on equity in the greenhouse. A proposal for an adequate and equitable global climate agreement.* S. Eschborn, Gesellschaft für Technische Zusammenarbeit. http://www.wupperinst.org/uploads/tx_wiprojekt/1085_proposal.pdf.

Phylipsen, Dian, Niklas Höhne and Robert Janzic. (2004). *Implementing Triptych 6.0 - Technical report.* Project, No. DM70046 and ICC03080. Utrecht, The Netherlands: Ecofys. http://www.ecofys.com/com/publications/documents/EcofysTriptych6.0.pdf.

Phylipsen, G.J.M., J.W. Bode, K. Blok, H. Merkus and B. Metz. (1998). A Triptych sectoral approach to burden differentiation; GHG emissions in the European bubble. *Energy Policy, 26* (12), 929-943. http://www.sciencedirect.com/science/article/B6V2W-3VTY6DM-2/2/b0cd6a94b06384c447e31b765d6b570a.

UN. (2002). *World population prospects: The 2000 revision.* Data set on CD-ROM. New York: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.

UNFCCC, (United Nations Framework Convention on Climate Change Secretariat). (2005). *2005 Annex I Party GHG Inventory Submissions. (1990 - 2003). Common reporting format from Finland to the UNFCCC*. http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/2761.php.

USEPA. (2002). *International analysis of methane and nitrous oxide abatement opportunities: Report to Energy Modelling Forum, Working Group 21.* Appendix A. Emissions and projections of non-CO_2 greenhouse gases for developing countries: 1990-2020. Draft. Washington, D.C., USA: United States Environmental Protection Agency.

USEPA. (2006). *Global Anthropogenic Non-CO_2 Greenhouse Gas Emissions: 1990 – 2020.* Appendix A-D. Washington, D.C., USA: United States Environmental Protection Agency. http://www.epa.gov/nonco2/econ-inv/international.html.

WIDER. (2007, 03-26-2008). *World Income Inequality Database V 2.0b May 2007.* World Insitute for Development Economic Research (WIDER). http://62.237.131.23/wiid/wiid.htm.

APPENDIX A DESCRIPTION OF THE EVOC TOOL

This section describes the Evolution of Commitments tool (EVOC) version 8, developed by Ecofys, that is used to quantify emission allowances under the various approaches in this report. It includes emissions of CO_2, CH_4, N_2O, hydroflourocarbons (HFCs), perflourocarbons (PFCs) and sulphur hexafluoride (SF_6) 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 2003 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. For Annex I countries, the latest available year is usually 2004. Most non-Annex I countries report only or until 1994 (UNFCCC 2005).
2. CO_2 emissions from fuel combustion as published by the International Energy Agency. The latest available year is 2003 (IEA 2005).
3. Emissions from land-use change as published by Houghton in the WRI climate indicator analysis tool (Houghton 2003).
4. Emissions from CH_4 and N_2O as estimated by the US Environmental Protection Agency. Latest available year is 2005 (USEPA 2006)
5. CO_2, CH_4, N_2O, HFC, PFC and SF_6 emissions from the EDGAR database version 3.2 available for 1990 and 1995 (Olivier and Berdowski 2001).[5]

Future emissions are derived from the MNP/RIVM IMAGE implementation of the SRES scenarios (IMAGE team 2001).

The datasets vary in their completeness and sectoral split. We first defined which of the sectors provided in the datasets correspond to 7 sectors. This definition is provided in Table 7. Note that CO_2 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.

[5] For CH_4 and N_2O, the values of EPA are largely based on the EDGAR database (1990 and 1995), but extended to the year 2000.

Table 7. Data sources and definition of sectors

	UNFCCC		Edgar 3.2 database		USEPA		LUCF Houghton		IEA		IMAGE CD	
	Regional:	country by country	**Regional:**	country by country	**Regional:**	country-by country	**Regional:**	country-by country	**Regional:**	country by country	**Regional:**	17 regions
	Temporal:	1990 to 2002 (various)	**Temporal:**	1990 and 1995	**Temporal:**	1990-2020	**Temporal:**	1950-2000	**Temporal:**	1970-2000	**Temporal:**	1970 to 2100
	Gas:	CO2, CH4, N2O, HFCs, PFCs, SF6	**Gas:**	CO2, CH4, N2O; HFCs, PFCS, SF6	**Gas:**	CH4, N2O	**Gas:**	CO2	**Gas:**	CO2	**Gas:**	CO2, CH4, N2O, HFCs, PFCs, SF6
Industry												
	1A2	Manufacturing Industries and Construction	**F10**	Industry					3T Other Energy Industries		ENERGY 01 Industry	
	2A0	Mineral Products	**F30**	Other transformation sectors					401 Iron and Steel		ENERGY 07 Other energy transformation	
	2B0	Chemical Industry	**B10CH4N2O**	Biofuel industry CH4 N2O					402 Chemical and Petrochemical		INDUS 01 Feedstocks	
	2C0	Metal Production	**B30CH4N2O**	Biofuel charcoal production CH4 N2O					403 Non-Ferrous Metals		INDUS 02 Industrial activities	
	2D0	Other Production	**I10**	Iron and steel					404 Non-Metallic Minerals			
	2G0	Other (Industrial Processes)	**I20**	Non-ferrous metals					409 Paper, Pulp and Printing			
			I30	Chemicals					405 Transport Equipment			
			I40	Building materials					406 Machinery			
			I50	Pulp and paper					407 Mining and Quarrying			
			I60	Food					408 Food and Tobacco			
			I70	Solvent use/Miscellaneous					410Wood and Wood Products			
			I80	Transport evaporation					411 Construction			
			I90	Miscellaneous industry					412 Textile and Leather			
			F60	non-energy use and feedstocks					413 Non-specified Industry			
									414 Non-Energy Use Ind/Transf/Energy			
									If the IEA data set is chosen, process emissions from industry (e.g. from cement) are not covered			
Electricity												
	1A1	Energy Industries	**F20**	Power generation					11 Public Electricity Plants		ENERGY 06 Electric power generation	
			B20CH4N2O	Biofuel power generation CH4 N2O					12 Public CHP Plants			
									13 Public Heat Plants			
									14 Own Use in Electricity, CHP and heat plants			
									21 Autoproducer Electricity Plants			
									22 Autoproducer CHP Plants			
									23 Autoproducer Heat Plants			
Domestic												
	1A3	Transport	**F40**	Residential, commercial and other sectors					5T Transport		ENERGY 02 Transport	
	1A4	Other Sectors (Fuel Combustion)	**F51**	Transport road					6T Other Sectors		ENERGY 03 Residential (households)	
	1A5	Other (Fuel Combustion)	**F54**	Transport land non-road					*MB Memo: International Marine Bunkers*		ENERGY 04 Services (commercial and public)	
	2E0	Production of Halocarbons and Sulphur Hexafluoride	**F57**	Transport air (international and domestic)					*AB Memo: International Aviation Bunkers*		ENERGY 05 Agriculture and other enduse	
	2F0	Consumption of Halocarbons and Sulphur Hexafluoride	***F58***	*Transport international shipping*							*ENERGY 09 Marine bunkers*	
	3TT	TOTAL Solvent and Other Product Use	**B40CH4N2O**	Biofuel residential CH4 N2O							FGAS	
	9TT	*TOTAL International Bunkers*	**B51CH4N2O**	Biofuel transport road CH4 N2O								
			C10	HFC-byproc.								
			C20	HFC use								
			C30	PFC-byproc.								
			C40	PFC use								
			C50	SF6 use								
	Secotors in italics are excluded when the user chooses to exclude international transport											
Fossil fuel production												
	1BT	TOTAL Fugitive Emissions from Fuels	**F70**	Coal production	02 Coal production				7T Differences due to Losses and/or Transformation		ENERGY 08 Fossil fuel production	
			F80	Oil production, transmission and handling	03 Natural gas production							
			F90	Gas production and transmission	04 Oil production							
			F95	Fossil fuel fires								
Agriculture												
	4TT	TOTAL Agriculture	**L10**	Fertiliser use	06 Manure management						LAND 10 wetland rice	
			L15	Rice cultivation	07 Enteric fermentation						LAND 11 animals	
			L20	Enteric fermentation	08 Rice production						LAND 12 animal waste	
			L30	Animal waste management (confined N2O, all CH4)	09 Agricultural soils						LAND 14 fertilizer	
			L50	Crop production							LAND 15 indirect fertilizer	
			L60	Animal waste management (deposited on soil- N2O)							LAND 16 indirect animal waste	
			L71	Atmospheric deposition							LAND 17 crop residues	
			L75	Leaching and run-off							LAND 18 biological N-fixation	
LUCF												
	5TT	TOTAL Land-Use Change & Forestry	**L41**	BB-Deforestation	10 Biomass combustion		Land-use				LAND 01 biomass burning	
			L42	BB-Savanna burning							LAND 02 burning of traditional biomass / fuelwood burning	
			L43	BB-Agricultural waste burning							LAND 03 timber pool (short lifetime)	
			L44	BB-Vegetation fires							LAND 04 timber pool (long lifetime)	
			L45	BB-deforestation post burn effects							LAND 05 carbon release by regrowing vegetation (-NEP)	
											LAND 06 agricultural waste burning	
											LAND 07 savanna burning	
											LAND 13 land clearing	
Waste												
	6TT	TOTAL Waste	**W10**	Landfills	11 Landfills						LAND 08 landfills	
			W15	Humans/pets	12 Wastewater						LAND 09 (domestic) sewage	
			W20	Waste water treatment								
			W30	Human waste disposal								
			W40	Waste incineration								
			W50	Miscelaneous waste handling (hazardous waste)								
	CO2 emissions from Biomass buring (UNFCCC sector 1A8 and EGRAR sectors B10 to B51) are not included as they are not to be included in the national totals according to teh IPCC guidelines and the UNFCCC repsoting guidelines)											

The user can specify the following:

- Whether the emissions are determined on the basis of the hierarchy (default setting for this report) or are based exclusively on the EDGAR database
- Whether to consider only CO_2, the group of CH_4 and N_2O or the group of CO_2, CH_4, N_2O, HFC, PFCs and SF_6 (default setting for this report)
- Whether the analysis should
    - exclude emissions from land use change and forestry (default setting for this report)
    - include emissions from land use change and forestry from the hierarchy
    - include emissions from land use change and forestry from Houghton
    - include emissions from land use change and forestry from EDGAR
- Whether international aviation and marine transport is included o (default setting for this report) or excluded

For population, GDP in purchase power parities and electricity demand, the country base year data was taken from UN (2002) and IEA (2002) and extended into the future applying the growth rates from the IMAGE model for the region to which the country belongs.

Emissions until 2010 are estimated as follows: It is assumed that Annex I countries implement their Kyoto targets by 2010. It is assumed that the reductions necessary to meet the Kyoto target are achieved equally in all sectors. In 2010, the level of the domestic sector is taken from the relevant reference scenario. The level of the other sectors are taken from the reference scenario and reduced, so that the Kyoto target is met. The years from the last available year to 2010 are linearly interpolated. All non-Annex I countries follow their reference scenario until 2010.

Additionally, the user can select the following:

- Whether the USA reaches in 2010
    - Its Kyoto target
    - Its national target, which we interpreted as a 23% increase of total emissions from 1990 to 2010 (default setting for this report)
    - Its reference emissions
- Whether all other Annex I countries reach in 2010
    - Their Kyoto targets
    - The lower of their Kyoto target and their reference scenario (default setting for this report)
    - Their reference emissions

As a default setting, all Annex I countries are assumed to reach the lower of their Kyoto target and their reference scenarios in 2010. Only the USA is assumed to reach only its national target which we interpreted as a 23% increase of total emission from 1990 to 2010. All non-Annex I countries follow their reference scenario until 2010. After 2010, the emission allowances per country are calculated according to the approaches.

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.

Second or third largest countries in a region are e.g. Argentina, Venezuela, United Arab Emirates and South Korea. In the Contraction and Convergence approach, the error would be small as countries follow their reference scenario only until 2010 and converge afterwards. For Common but Differentiated Convergence and Multistage, 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).

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.

Explanation of the regions

EVOC 01 USA: United States of America

EVOC 02 EU15, Old EU Member states: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom

EVOC 03 EU+12, New EU Member states: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia

EVOC 04 RWEU, Rest of Western Europe: Iceland, Liechtenstein, Monaco, Norway, San Marino, Switzerland

EVOC 05 RUS: Russian Federation

EVOC 06 REEU in Annex I, Rest of Eastern Europe in Annex I: Belarus, Croatia, Ukraine

EVOC 07 JPN: Japan

EVOC 08 RAI, Rest of Annex I: Australia, Canada, New Zealand

EVOC 09 TUR: Turkey

EVOC 10 REEU, Rest of former soviet states: Albania, Armenia, Azerbaijan, Bosnia & Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Serbia & Montenegro, Tajikistan, Turkmenistan, Uzbekistan

EVOC 11 ARG: Argentina

EVOC 12 BRZ: Brazil

EVOC 13 MEX: Mexico

EVOC 14 VEN: Venezuela

EVOC 15 RLA: Rest of Latin America: Bahamas, Barbados, Belize, Bolivia, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Saint Kitts & Nevis, Saint Lucia, Saint Vincent & Grenadines, Suriname, Trinidad & Tobago, Uruguay

EVOC 16 EGY: Egypt

EVOC 17 ZAF: South Africa

EVOC 18 NGA: Nigeria

EVOC 19 RNA, Rest of North Africa: Algeria, Libya, Morocco, Tunisia

EVOC 20 RAF, Rest of Africa: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Dem. Republic Congo, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Rwanda, Sao Tome & Principe, Senegal, Seychelles, Sierra Leone, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe

EVOC 21 SAU: Saudi Arabia

EVOC 22 ARE: United Arab Emirates

EVOC 23 RME, Rest of Middle East: Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Syria, Yemen

EVOC 24 CHN: China

EVOC 25 IND: India

EVOC 26 IDN: Indonesia

EVOC 27 KOR: Korea (South)

EVOC 28 MYS: Malaysia

EVOC 29 PHL: Philippines

EVOC 30 SGP: Singapore

EVOC 31 THA: Thailand

EVOC 32 RAA, Rest of Asia: Afghanistan, Bangladesh, Bhutan, Brunei, Cambodia, Cook Islands, Fiji, Kiribati, Korea (North), Laos, Maldives, Marshall Islands, Federated States of Micronesia, Mongolia, Myanmar, Nauru, Nepal, Niue, Pakistan, Palau, Papua New Guinea, Samoa, Solomon Islands, Sri Lanka, Taiwan, Timor-Leste (East Timor), Tonga, Tuvalu, Vanuatu, Vietnam

Figure 01 USA: United States of America

Figure 02 EU27: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom

Figure 03 FRA: France

Figure 04 GER: Germany

Figure 05 UK: United Kingdom

Figure 06 R+EEU: Belarus, Croatia, Russian Federation, Ukraine

Figure 07 JPN: Japan

Figure 08 RAI, Rest of Annex I: Australia, Canada, Iceland, Liechtenstein, Monaco, New Zealand, Norway, San Marino, Switzerland

Figure 09 REEU, Rest of former soviet states: Albania, Armenia, Azerbaijan, Belarus, Bosnia & Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Serbia & Montenegro, Tajikistan, Turkey, Turkmenistan, Uzbekistan

Figure 10 LAM, Latin America: Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts & Nevis, Saint Lucia, Saint Vincent & Grenadines, Suriname, Trinidad & Tobago, Uruguay, Venezuela

Figure 11 AFR, Africa: Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Dem. Republic Congo, Côte d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome & Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe

Figure 12 ME, Middle East: Saudi Arabia, United Arab Emirates, Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Syria, Yemen

Figure 13 SAsia, South Asia: India, Pakistan, Afghanistan, Bangladesh, Bhutan, Sri Lanka, Maldives, Nepal

Figure 14 CPAsia, Centrally Planned Asia: China, Korea (North), Mongolia

Figure 15 EAsia, East Asia: Brunei, Cambodia, Cook Islands, Fiji, Indonesia, Kiribati, Korea (South), Laos, Malaysia, Marshall Islands, Federated States of Micronesia, Myanmar, Nauru, Niue, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Taiwan, Thailand, Timor-Leste (East Timor), Tonga, Tuvalu, Vanuatu, Vietnam

APPENDIX B THE GDRS APPROACH IMPLEMENTED IN EVOC

Below the allocation of emission rights from 2010 to 2050 is described as it is implemented in EVOC and applied in this report. For comparison see also Baer et al. (2007)

The global reduction effort is calculated as BAU emissions minus emission allowances under the reduction scenario. Each country's share of the global reduction is given by the Responsibility Capacity Index (RCI).

$RCI = R^a \cdot C^b$, with a=0.4 and b=0.6 by default in this report

N^{-1} = Inverse of the standard normal cumulative distribution

P = Population

y = GDP per capita

y_{DT} = Development threshold per capity

e = Cumulative emissions per country

g = Gini coefficient

e_4 = cumulative emissions per capita and country

RCI_start_year = year when emissions are started to be cumulated, 1990 by default in this report.

$$C = P \cdot \left[y \cdot (1 - N(\text{var}_1)) - y_{DT} \cdot (1 + N(\text{var}_2)) \right]$$

$$\text{var}_1 = \frac{1}{\sqrt{\sigma_2}} \cdot \log\left(\frac{y_{DT}}{y}\right) - \frac{\sigma_2}{2}$$

$$\text{var}_2 = \frac{1}{\sqrt{\sigma_2}} \cdot \log\left(\frac{y_{DT}}{y}\right) + \frac{\sigma_2}{2}$$

$$\sigma_2 = 2 \cdot N^{-1}\left(\frac{1+g}{2}\right)^2$$

$$R = P \cdot \frac{e_4}{y} \cdot \left[y \cdot (1 - N^{-1}(\text{var}_1)) - y_{DT} \cdot (1 + N(\text{var}_2)) \right]$$

$$e_4 = \frac{e}{\left[(year_{t-1} + 1990 - RCI\_start\_year) \cdot P_{t-1} \right]}$$

Major differences in the calculation of the final emission allowances compared to the Baer et al.:

- All Kyoto gases are considered (CO_2, CH_4, N_2O, PFC, HFC, SF_6), while Baer et al. consider only CO_2.
- The RCI is calculated for each year, while Baer et al. did this only for one year.
- Cumulative emissions per capita (e_4) are calculated as total cumulative emissions (e) divided by the last year's population.
- The business-as-usual scenarios are based on the EVOC adaptation of the SRES scenarios (cp. Appendix A of this report)

- The reduction scenarios and the related stabilisation levels are based on Höhne et al. (2007) (cp. section 2.1 of this report).

Due to modelling reasons the GDRs approach, unlike the other approaches considered in this report, takes the BAU emissions in 2010 as a starting point for global effort sharing and does not take into account the Kyoto targets. The impact of this is minimal and might but might slightly increase the reduction efforts of those countries with Kyoto targets far below the BAU.

Below the Gini coefficient values per country as well as the population and GDP data from 1990 to 2050 are given as used in this implementation of the GDRs. The Gini values stay constant for all years. Population and GDP data are given as median values over all six SRES scenarios considered.

Table 8. Gini coefficent values per group or country

EVOC 01 USA	0.46	EVOC 18 NGA	0.50	Figure 02 EU27	0.31
EVOC 02 EU15	0.31	EVOC 19 RNA	0.38	Figure 03 FRA	0.28
EVOC 03 EU+12	0.32	EVOC 20 RAF	0.46	Figure 04 GER	0.31
EVOC 04 RWEU	0.29	EVOC 21 SAU	0.45	Figure 05 UK	0.35
EVOC 05 RUS	0.31	EVOC 22 ARE	0.45	Figure 06 RUS+EEU	0.31
EVOC 06 REEU in Annex I	0.31	EVOC 23 RME	0.40	Figure 07 JPN	0.32
EVOC 07 JPN	0.32	EVOC 24 CHN	0.45	Figure 08 RAI	0.30
EVOC 08 RAI	0.30	EVOC 25 IND	0.36	Figure 09 REEU	0.40
EVOC 09 TUR	0.45	EVOC 26 IDN	0.34	Figure 10 LAM	0.53
EVOC 10 REEU	0.39	EVOC 27 KOR	0.37	Figure 11 AFR	0.46
EVOC 11 ARG	0.50	EVOC 28 MYS	0.50	Figure 12 ME	0.41
EVOC 12 BRZ	0.57	EVOC 29 PHL	0.48	Figure 13 SAsia	0.35
EVOC 13 MEX	0.50	EVOC 30 SGP	0.48	Figure 14 CPAsia	0.45
EVOC 14 VEN	0.45	EVOC 31 THA	0.43	Figure 15 EAsia	0.40
EVOC 15 RLA	0.52	EVOC 32 RAA	0.36	UNFCCC Annex I	0.35
EVOC 16 EGY	0.38	Pakistan	0.31	UNFCCC Non Annex I	0.42
EVOC 17 ZAF	0.57	Figure 01 USA	0.46	World total	0.41

The Gini coefficients are based on Baer et al. (2007), WIDER (2007), CIA (CIA 2008), and own estimates.

Table 9. Median population and GDP data from 1990 to 2050

	Population (million people)							GDP PPP (billion US$(2000))						
Region	1990	2000	2010	2020	2030	2040	2050	1990	2000	2010	2020	2030	2040	2050
EVOC 01 USA	250	282	308	333	356	376	391	7138	9672	12667	15961	19242	22983	27403
EVOC 02 EU15	366	379	393	403	411	415	413	7634	9517	11726	14774	17979	20898	24092
EVOC 03 EU+12	107	105	105	105	104	102	99	964	1053	1566	2301	3317	4520	5665
EVOC 04 RWEU	11	12	13	13	13	13	13	320	378	459	579	704	819	944
EVOC 05 RUS	148	146	146	149	150	151	148	1506	1038	1671	2578	3929	5821	8137
EVOC 06 REEU in Annex I	67	64	63	64	64	64	63	543	292	499	765	1157	1697	2344
EVOC 07 JPN	124	127	130	132	133	133	131	2913	3327	3830	4410	5012	5608	6127
EVOC 08 RAI	48	54	59	62	66	68	70	1041	1402	1830	2264	2777	3359	3970
EVOC 09 TUR	56	67	81	98	113	126	137	308	439	685	1119	1785	2744	4054
EVOC 10 REEU	91	92	96	98	98	98	96	341	257	432	657	986	1429	1944
EVOC 11 ARG	33	37	41	46	50	52	53	293	449	602	915	1356	1929	2611
EVOC 12 BRZ	149	174	198	221	238	249	254	971	1269	1777	2702	4006	5698	7713
EVOC 13 MEX	81	99	112	125	134	141	144	635	886	1217	1896	2879	4193	5807
EVOC 14 VEN	20	24	28	31	34	35	36	113	138	186	283	420	597	808
EVOC 15 RLA	153	182	209	233	251	262	268	677	933	1364	2089	3121	4474	6101
EVOC 16 EGY	56	67	82	97	112	123	133	161	242	389	664	1106	1781	2737
EVOC 17 ZAF	35	44	53	65	76	84	91	347	414	631	1074	1787	2869	4311
EVOC 18 NGA	91	118	149	185	215	238	257	80	104	191	345	610	1041	1661
EVOC 19 RNA	62	73	88	104	120	132	142	285	351	581	992	1653	2661	4089
EVOC 20 RAF	418	542	690	854	996	1100	1188	461	582	948	1706	3003	5097	8096
EVOC 21 SAU	16	21	27	33	38	42	46	191	266	408	666	1063	1634	2414
EVOC 22 ARE	2	3	5	6	7	8	8	42	67	128	209	334	513	758
EVOC 23 RME	113	142	174	209	242	268	292	497	747	1188	1941	3095	4759	7031
EVOC 24 CHN	1141	1269	1343	1395	1407	1380	1314	1932	5140	9921	16012	23936	32639	41322
EVOC 25 IND	850	1016	1181	1336	1454	1527	1564	1445	2454	4459	8033	13852	22388	33733
EVOC 26 IDN	178	206	231	252	268	277	278	404	625	959	1523	2356	3426	4683
EVOC 27 KOR	43	47	50	51	52	51	48	420	760	1245	2009	3004	4096	5186
EVOC 28 MYS	18	23	26	29	31	32	32	99	205	312	496	768	1116	1526
EVOC 29 PHL	61	76	87	95	100	104	104	237	305	460	731	1130	1643	2246
EVOC 30 SGP	3	4	5	5	5	5	5	44	95	145	231	357	520	710
EVOC 31 THA	55	61	68	74	78	81	81	249	386	629	1000	1546	2249	3073
EVOC 32 RAA	433	534	616	685	736	766	777	797	1361	2300	3864	6188	9185	12893
Pakistan	108	138	166	188	205	215	220	169	266	445	802	1383	2235	3368
Figure 01 USA	250	282	308	333	356	376	391	7138	9672	12667	15961	19242	22983	27403
Figure 02 EU27	473	484	498	508	516	518	512	8598	10570	13292	17075	21296	25418	29757
Figure 03 FRA	58	61	63	65	66	67	67	1255	1524	1889	2380	2896	3366	3881
Figure 04 GER	79	82	84	86	88	89	88	1669	2095	2494	3142	3823	4444	5123
Figure 05 UK	57	59	61	62	64	64	64	1259	1573	1970	2482	3021	3511	4048
Figure 06 RUS+EEU	215	210	209	213	215	215	211	2049	1330	2170	3342	5086	7519	10480
Figure 07 JPN	124	127	130	132	133	133	131	2913	3327	3830	4410	5012	5608	6127
Figure 08 RAI	60	66	71	75	79	82	83	1361	1781	2289	2843	3482	4178	4914
Figure 09 REEU	157	170	187	206	222	234	243	703	744	1197	1900	2960	4453	6389
Figure 10 LAM	436	516	589	655	706	739	755	2688	3676	5145	7885	11782	16890	23041
Figure 11 AFR	661	844	1062	1306	1519	1677	1811	1334	1693	2740	4781	8159	13449	20894
Figure 12 ME	131	166	206	248	286	318	346	730	1080	1723	2817	4492	6906	10203
Figure 13 SAsia	1113	1351	1578	1785	1943	2040	2090	1799	3013	5411	9748	16809	27168	40934
Figure 14 CPAsia	1163	1294	1369	1422	1434	1406	1339	1935	5144	9928	16023	23952	32661	41349
Figure 15 EAsia	505	592	659	715	755	776	775	1892	3174	5092	8129	12399	17598	23399
UNFCCC Annex I	1193	1250	1311	1373	1425	1462	1478	22445	27164	35034	44904	56137	68798	83218
UNFCCC Non Annex I	4029	4771	5463	6121	6624	6932	7087	10365	17543	29415	47753	74776	110871	155282
World total	5278	6092	6857	7587	8152	8503	8677	33087	45156	65049	93837	132664	182088	241627

APPENDIX C RESULTS FOR 2020 AND 2050 IN TABLES

This appendix includes the results (median, minimum and maximum) of the calculations from section 3. All calculations meet the global emission reference points for each emission stabilisation level described in section 2.1, Figure 4. The global median of each calculation meets these reference points with a maximum deviation of ± 0.6 percentage points. Generally, due to high uncertainty, figures are often given rounded with no or just one decimal place. Therefore, sums may not always add up to 100%.

International transport (aviation and marine bunkers as reported in the national inventories under the UNFCCC (www.unfccc.int)) is considered.

Table 10. Emission allowances in 2020 under different effort sharing options for a global emission stabilisation level of 450 ppmv CO_2eq including international transport.

450 ppmv CO_2eq.	Emissions in Mt CO_2eq.		GDRs Values as % of 1990			CDC Values as % of 1990			Multistage (per capita) Values as % of 1990			Triptych Values as % of 1990			C&C 2050 convergence Values as % of 1990			Reference Values as % of 1990		
Year	1990	2010	2020			2020			2020			2020			2020			2020		
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7759	-68.33%	-60.82%	-48.00%	-9.89%	-9.67%	-8.74%	-42.91%	-42.66%	-42.41%	-11.60%	-10.36%	-10.19%	-21.43%	-20.24%	-17.97%	12.00%	21.77%	27.16%
EVOC 02 EU15	4457	4099	-77.46%	-69.60%	-58.65%	-35.23%	-34.10%	-33.74%	-38.55%	-38.21%	-38.02%	-33.71%	-32.77%	-32.37%	-35.60%	-34.86%	-33.01%	2.10%	15.18%	20.07%
EVOC 03 EU+12	1442	1126	-44.39%	-42.57%	-38.54%	-48.91%	-45.09%	-42.45%	-50.65%	-48.13%	-46.08%	-45.71%	-40.20%	-35.29%	-47.54%	-44.45%	-42.92%	-16.25%	-1.88%	11.03%
EVOC 04 RWEU	117	114	-107.04%	-93.94%	-77.77%	-31.32%	-30.10%	-29.70%	-33.22%	-32.86%	-32.67%	-29.05%	-28.01%	-27.61%	-30.62%	-29.87%	-27.89%	3.03%	15.59%	21.09%
EVOC 05 RUS	2904	2103	-45.36%	-37.91%	-36.75%	-51.35%	-48.32%	-47.05%	-57.35%	-55.95%	-54.95%	-50.80%	-47.26%	-43.89%	-51.87%	-50.28%	-49.70%	-28.00%	-14.36%	-5.16%
EVOC 06 REEU in Annex I	1095	558	-57.59%	-50.42%	-49.52%	-64.87%	-62.85%	-61.99%	-64.20%	-63.12%	-62.14%	-63.30%	-59.46%	-55.75%	-63.38%	-62.28%	-61.89%	-48.61%	-38.49%	-31.74%
EVOC 07 JPN	1313	1234	-84.63%	-75.94%	-67.81%	-34.34%	-33.01%	-32.99%	-34.58%	-34.08%	-33.89%	-33.14%	-32.21%	-31.63%	-33.08%	-32.39%	-30.43%	-6.41%	9.78%	13.77%
EVOC 08 RAI	1119	1117	-39.75%	-31.69%	-21.69%	-28.04%	-27.52%	-26.64%	-47.60%	-47.33%	-47.15%	-28.04%	-27.12%	-26.96%	-34.95%	-34.02%	-32.14%	21.91%	36.89%	41.82%
EVOC 09 TUR	183	383	93.84%	98.20%	122.33%	76.44%	86.66%	94.55%	70.53%	76.39%	77.64%	68.62%	84.00%	88.69%	80.95%	85.70%	90.81%	162.47%	194.83%	203.52%
EVOC 10 REEU	856	798	-15.18%	-1.27%	4.06%	-35.79%	-31.63%	-29.67%	-40.07%	-32.69%	-29.47%	-32.57%	-26.70%	-20.75%	-32.80%	-30.32%	-29.32%	-5.01%	12.52%	24.32%
EVOC 11 ARG	237	409	33.96%	37.08%	54.67%	30.39%	35.13%	41.70%	17.88%	34.02%	38.29%	30.01%	36.84%	40.11%	22.95%	25.06%	29.61%	114.19%	141.79%	149.38%
EVOC 12 BRZ	680	1215	55.51%	58.11%	77.97%	38.62%	43.49%	50.81%	37.65%	54.98%	58.07%	45.96%	54.61%	59.48%	39.78%	41.96%	47.19%	115.51%	140.66%	144.84%
EVOC 13 MEX	377	665	40.95%	53.35%	67.27%	36.92%	42.77%	48.90%	33.29%	57.03%	68.87%	29.66%	37.27%	39.91%	39.60%	42.83%	46.91%	111.26%	144.65%	159.60%
EVOC 14 VEN	204	372	126.56%	157.49%	165.02%	35.64%	40.58%	47.99%	36.40%	57.41%	65.87%	41.45%	51.33%	53.28%	23.69%	25.40%	30.44%	151.06%	188.24%	204.06%
EVOC 15 RLA	694	1432	102.54%	124.33%	136.31%	56.25%	65.06%	72.45%	52.12%	68.93%	75.71%	62.31%	76.61%	79.34%	55.39%	60.54%	65.70%	141.70%	178.09%	185.77%
EVOC 16 EGY	115	263	178.40%	214.43%	224.43%	103.89%	113.45%	119.62%	203.84%	248.79%	269.26%	86.71%	101.08%	105.56%	129.95%	135.29%	138.70%	203.84%	248.79%	269.26%
EVOC 17 ZAF	337	498	16.01%	21.73%	36.89%	27.34%	28.54%	28.88%	10.66%	16.99%	32.09%	16.41%	23.96%	25.88%	10.19%	10.52%	14.29%	72.07%	97.25%	106.89%
EVOC 18 NGA	191	442	175.35%	258.28%	283.91%	115.41%	122.79%	129.11%	177.77%	262.30%	289.32%	114.33%	133.11%	143.83%	138.20%	145.04%	149.44%	177.77%	262.30%	289.32%
EVOC 19 RNA	204	420	110.77%	142.52%	146.12%	72.19%	83.88%	84.54%	81.96%	114.71%	130.33%	60.03%	74.26%	78.77%	77.96%	84.35%	85.34%	156.16%	199.27%	219.37%
EVOC 20 RAF	559	1056	156.24%	203.43%	214.38%	124.51%	143.11%	150.99%	153.78%	191.39%	205.41%	90.06%	106.90%	112.10%	163.14%	167.80%	171.81%	165.12%	215.60%	230.53%
EVOC 21 SAU	232	521	115.33%	130.11%	143.07%	73.53%	86.76%	90.67%	50.30%	70.61%	77.68%	69.94%	88.72%	94.17%	44.89%	49.77%	52.36%	181.46%	216.05%	228.73%
EVOC 22 ARE	103	243	124.72%	143.70%	151.95%	79.58%	91.55%	97.37%	28.81%	45.85%	50.87%	71.28%	83.23%	88.04%	41.94%	45.15%	49.28%	193.35%	229.49%	244.42%
EVOC 23 RME	613	1409	135.77%	157.78%	165.58%	85.98%	100.36%	104.79%	78.11%	93.09%	102.05%	76.58%	92.18%	97.55%	72.29%	78.40%	81.35%	184.57%	219.87%	233.41%
EVOC 24 CHN	3591	8188	92.54%	112.93%	121.92%	58.79%	71.88%	75.38%	55.38%	89.94%	106.56%	59.18%	88.53%	93.93%	73.54%	79.27%	82.70%	144.01%	194.52%	218.12%
EVOC 25 IND	1086	2337	150.79%	198.55%	212.60%	122.77%	134.89%	142.21%	163.73%	234.95%	262.22%	61.28%	94.13%	101.95%	152.97%	166.06%	167.30%	163.73%	234.95%	262.22%
EVOC 26 IDN	279	657	151.32%	194.85%	204.14%	88.39%	101.97%	103.10%	161.98%	218.97%	233.98%	75.79%	99.53%	103.78%	137.46%	142.95%	146.55%	161.98%	218.97%	233.98%
EVOC 27 KOR	300	714	37.18%	49.12%	64.61%	56.83%	72.07%	74.88%	42.70%	74.57%	93.63%	63.58%	97.64%	103.95%	54.15%	61.59%	63.66%	162.15%	219.17%	253.02%
EVOC 28 MYS	64	161	66.81%	80.84%	113.62%	79.60%	96.37%	100.64%	71.97%	116.54%	122.69%	73.41%	97.19%	99.22%	87.95%	95.76%	102.38%	171.62%	237.76%	245.70%
EVOC 29 PHL	80	155	70.68%	81.59%	93.19%	105.38%	118.99%	121.63%	120.28%	164.26%	176.39%	58.95%	79.46%	83.56%	139.32%	143.18%	145.98%	120.28%	164.26%	176.39%
EVOC 30 SGP	28	62	-14.37%	2.93%	29.90%	48.68%	63.85%	65.94%	35.04%	69.97%	81.18%	53.75%	81.07%	85.45%	40.87%	48.18%	52.65%	147.21%	210.80%	228.28%
EVOC 31 THA	169	438	127.27%	154.43%	167.88%	88.73%	103.32%	104.67%	88.08%	131.74%	145.23%	96.00%	133.52%	140.80%	97.71%	104.03%	107.71%	194.54%	258.33%	275.96%
EVOC 32 RAA	766	1464	113.45%	149.46%	163.65%	66.88%	82.06%	86.20%	82.85%	115.90%	129.38%	46.41%	67.42%	72.13%	109.81%	115.26%	116.23%	117.16%	157.55%	174.42%
Pakistan	145	129	151.74%	202.11%	222.74%	130.00%	149.11%	159.11%	153.19%	209.60%	233.55%	68.55%	101.92%	109.99%	159.15%	169.83%	170.78%	153.19%	209.60%	233.55%
Figure 01 USA	6308	7759	-68.33%	-60.82%	-48.00%	-9.89%	-9.67%	-8.74%	-42.91%	-42.66%	-42.41%	-11.60%	-10.36%	-10.19%	-21.43%	-20.24%	-17.97%	12.00%	21.77%	27.16%
Figure 02 EU27	5899	5225	-68.76%	-62.59%	-55.16%	-38.57%	-36.65%	-36.14%	-41.51%	-40.64%	-39.99%	-36.64%	-34.66%	-33.11%	-37.68%	-37.23%	-36.16%	-1.48%	10.99%	17.86%
Figure 03 FRA	592	592	-90.12%	-79.57%	-65.93%	-29.21%	-27.95%	-27.54%	-30.10%	-29.73%	-29.54%	-27.86%	-26.64%	-26.23%	-28.65%	-27.88%	-25.84%	0.63%	12.45%	17.33%
Figure 04 GER	1253	990	-78.82%	-72.99%	-64.63%	-44.64%	-43.66%	-43.35%	-48.79%	-48.47%	-48.31%	-43.43%	-42.65%	-42.29%	-45.59%	-44.94%	-43.37%	-15.82%	-4.52%	-0.61%
Figure 05 UK	789	686	-88.19%	-80.10%	-69.20%	-38.92%	-37.84%	-37.50%	-42.71%	-42.36%	-42.18%	-37.05%	-36.31%	-35.97%	-39.69%	-38.98%	-37.24%	-10.88%	0.53%	5.07%
Figure 06 RUS+EEU	3998	2662	-48.71%	-41.23%	-40.45%	-55.05%	-52.30%	-51.14%	-59.22%	-57.91%	-56.92%	-54.22%	-50.60%	-47.14%	-55.02%	-53.56%	-53.04%	-33.65%	-20.97%	-12.44%
Figure 07 JPN	1313	1234	-84.63%	-75.94%	-67.81%	-34.34%	-33.01%	-32.99%	-34.58%	-34.08%	-33.89%	-33.14%	-32.21%	-31.63%	-33.08%	-32.39%	-30.43%	-6.41%	9.78%	13.77%
Figure 08 RAI	1237	1231	-46.13%	-37.59%	-27.88%	-28.35%	-27.77%	-26.93%	-46.24%	-45.96%	-45.77%	-28.14%	-27.20%	-27.02%	-34.54%	-33.62%	-31.74%	20.27%	35.00%	39.31%
Figure 09 REEU	1172	1262	0.67%	11.13%	13.02%	-20.80%	-15.31%	-14.17%	-24.39%	-18.19%	-15.51%	-19.54%	-12.79%	-7.02%	-17.66%	-14.57%	-14.16%	19.95%	36.26%	47.12%
Figure 10 LAM	2192	4093	72.53%	85.62%	99.06%	42.81%	49.02%	56.09%	39.23%	58.64%	62.85%	46.19%	56.78%	58.86%	41.38%	44.59%	49.54%	126.24%	157.96%	166.31%
Figure 11 AFR	1406	2680	120.40%	161.62%	167.72%	91.33%	101.18%	106.03%	116.35%	155.41%	165.89%	71.08%	85.35%	90.32%	109.75%	112.09%	115.63%	146.37%	193.88%	210.39%
Figure 12 ME	949	2174	129.57%	150.48%	158.59%	82.24%	96.08%	100.53%	65.94%	84.71%	88.35%	74.38%	90.36%	95.68%	62.28%	67.78%	70.77%	184.77%	219.99%	233.39%
Figure 13 SAsia	1355	2871	147.39%	193.91%	208.17%	122.40%	136.01%	143.90%	158.32%	225.25%	250.99%	61.88%	93.28%	100.67%	161.94%	174.41%	175.58%	158.32%	225.25%	250.99%
Figure 14 CPAsia	3779	8363	87.55%	108.04%	116.57%	54.07%	66.76%	70.19%	50.48%	84.01%	100.02%	53.90%	82.10%	87.34%	68.33%	73.90%	77.25%	136.46%	185.53%	208.26%
Figure 15 EAsia	1230	2945	110.28%	142.87%	148.30%	79.67%	94.25%	95.59%	99.50%	140.36%	154.91%	76.83%	105.46%	110.78%	101.73%	107.76%	110.78%	166.44%	222.00%	242.67%
UNFCCC Annex I	19203	18701	-60.10%	-55.10%	-48.67%	-30.67%	-28.95%	-28.74%	-44.56%	-43.86%	-43.30%	-30.22%	-28.29%	-26.86%	-33.88%	-33.68%	-32.24%	-1.24%	11.45%	17.22%
UNFCCC Non Annex I	11268	22989	106.68%	116.85%	124.80%	67.80%	75.45%	78.40%	80.15%	100.64%	117.56%	58.60%	74.11%	81.09%	80.55%	82.89%	83.23%	149.96%	176.39%	201.54%
World total	30706	42206	10.00%	10.00%	10.00%	6.68%	10.22%	11.47%	2.09%	10.03%	16.83%	3.60%	9.99%	13.73%	10.00%	10.00%	10.00%	55.55%	70.61%	86.56%

Table 11. Emission allowances in 2050 under different effort sharing options for a global emission stabilisation level of 450 ppmv CO_2eq including international transport.

450 ppmv CO_2eq.	Emissions in Mt CO_2eq.		GDRs Values as % of 1990			CDC Values as % of 1990			Multistage (per capita) Values as % of 1990			Triptych Values as % of 1990			C&C 2050 convergence Values as % of 1990			Reference Values as % of 1990		
Year	1990	2010	2050			2050			2050			2050			2050			2050		
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7759	-152.76%	-126.25%	-108.32%	-89.22%	-88.11%	-87.18%	-94.33%	-93.74%	-93.25%	-87.69%	-85.09%	-84.92%	-88.74%	-86.57%	-86.57%	-16.95%	11.04%	35.99%
EVOC 02 EU15	4457	4099	-165.93%	-136.74%	-116.71%	-84.13%	-82.47%	-81.57%	-91.65%	-90.78%	-90.30%	-86.13%	-83.28%	-82.30%	-83.82%	-80.20%	-80.20%	-30.12%	2.15%	28.18%
EVOC 03 EU+12	1442	1126	-136.34%	-115.07%	-96.14%	-86.80%	-86.68%	-85.45%	-93.05%	-92.99%	-92.34%	-84.38%	-80.71%	-77.26%	-87.22%	-84.95%	-84.95%	-27.06%	1.24%	23.95%
EVOC 04 RWEU	117	114	-211.32%	-171.02%	-140.37%	-80.93%	-78.91%	-77.82%	-89.96%	-88.89%	-88.32%	-73.80%	-67.31%	-63.95%	-80.50%	-76.14%	-76.14%	-27.73%	5.02%	30.43%
EVOC 05 RUS	2904	2103	-109.08%	-95.16%	-83.31%	-90.55%	-90.13%	-87.42%	-95.03%	-94.81%	-93.38%	-88.54%	-84.08%	-81.38%	-90.10%	-88.85%	-88.85%	-28.18%	5.41%	28.67%
EVOC 06 REEU in Annex I	1095	558	-101.57%	-92.70%	-75.97%	-88.95%	-88.49%	-85.48%	-94.18%	-93.94%	-92.36%	-88.45%	-83.68%	-81.35%	-88.42%	-87.00%	-87.00%	-46.45%	-20.07%	-2.05%
EVOC 07 JPN	1313	1234	-171.31%	-144.67%	-121.05%	-82.71%	-80.85%	-80.11%	-90.90%	-89.92%	-89.53%	-86.36%	-83.73%	-82.72%	-82.54%	-78.37%	-78.37%	-40.09%	-15.39%	8.31%
EVOC 08 RAI	1119	1117	-117.13%	-102.78%	-91.80%	-89.18%	-88.35%	-87.18%	-94.31%	-93.87%	-93.25%	-84.44%	-80.45%	-79.89%	-88.75%	-86.84%	-86.84%	-4.23%	25.99%	52.28%
EVOC 09 TUR	183	383	-23.95%	23.17%	62.72%	35.19%	43.93%	97.57%	-28.85%	-24.25%	3.99%	21.99%	70.65%	81.46%	41.59%	62.61%	73.46%	301.20%	516.65%	582.13%
EVOC 10 REEU	856	798	-54.20%	-46.31%	-21.67%	-78.01%	-76.94%	-72.28%	-85.44%	-84.90%	-80.41%	-76.39%	-68.67%	-64.76%	-77.64%	-75.00%	-75.00%	-3.30%	40.05%	70.70%
EVOC 11 ARG	237	409	-119.09%	-105.15%	-64.56%	-56.63%	-56.63%	-38.70%	-77.17%	-77.17%	-67.74%	-40.81%	-29.06%	-19.57%	-51.00%	-51.00%	-46.18%	131.58%	212.33%	282.87%
EVOC 12 BRZ	680	1215	-79.88%	-57.13%	-27.96%	-30.53%	-30.53%	-1.82%	-63.44%	-63.44%	-48.33%	-10.94%	6.08%	22.39%	-21.51%	-21.51%	-13.80%	139.89%	216.43%	278.19%
EVOC 13 MEX	377	665	-119.38%	-101.02%	-63.40%	-27.41%	-27.41%	2.59%	-61.80%	-61.80%	-46.01%	-21.66%	-8.30%	-1.82%	-17.99%	-17.99%	-9.93%	128.62%	243.02%	339.29%
EVOC 14 VEN	204	372	84.35%	107.79%	176.65%	-67.15%	-67.15%	-53.58%	-82.71%	-82.71%	-75.57%	-30.83%	-12.06%	-9.24%	-62.89%	-62.89%	-59.24%	195.50%	291.55%	414.35%
EVOC 15 RLA	694	1432	37.20%	50.02%	91.17%	-23.89%	-22.51%	6.47%	-51.08%	-31.22%	29.85%	-13.21%	2.63%	29.41%	-17.52%	-17.52%	-9.42%	157.02%	269.67%	345.53%
EVOC 16 EGY	115	263	246.76%	321.41%	362.60%	161.03%	167.08%	289.62%	31.07%	96.89%	520.58%	91.85%	137.46%	150.65%	129.90%	153.20%	180.06%	453.43%	762.43%	997.46%
EVOC 17 ZAF	337	498	-30.38%	24.87%	39.74%	-45.85%	-45.85%	-35.22%	-71.50%	-71.50%	-65.90%	-29.89%	-18.46%	-7.85%	-45.03%	-38.83%	-32.15%	188.39%	317.20%	464.57%
EVOC 18 NGA	191	442	615.03%	790.39%	1072.75%	211.97%	218.90%	283.23%	49.19%	122.84%	468.17%	143.68%	162.79%	177.49%	155.34%	184.17%	215.18%	657.56%	892.35%	1279.97%
EVOC 19 RNA	204	420	78.19%	100.26%	115.29%	49.90%	54.87%	115.35%	29.55%	53.78%	101.09%	15.90%	46.86%	55.39%	42.50%	56.95%	73.60%	335.64%	555.31%	713.42%
EVOC 20 RAF	559	1056	469.36%	644.19%	809.64%	305.08%	338.48%	350.19%	326.17%	420.97%	468.88%	186.71%	212.00%	219.83%	270.73%	312.59%	357.63%	546.60%	805.33%	1091.76%
EVOC 21 SAU	232	521	105.03%	134.88%	153.44%	-67.47%	-65.36%	-52.45%	-82.88%	-81.77%	-74.97%	-24.19%	15.97%	34.24%	-65.93%	-60.87%	-58.25%	315.48%	537.52%	615.67%
EVOC 22 ARE	103	243	174.16%	223.20%	269.23%	-90.65%	-90.04%	-86.33%	-95.08%	-94.76%	-92.80%	-54.74%	-31.36%	-20.08%	-90.20%	-88.75%	-88.00%	411.85%	600.80%	710.89%
EVOC 23 RME	613	1409	150.06%	196.94%	240.63%	-11.21%	-2.53%	30.74%	-43.30%	-39.97%	-1.74%	-4.43%	32.24%	42.97%	-6.28%	7.63%	14.81%	341.63%	539.52%	621.16%
EVOC 24 CHN	3591	8188	-21.40%	-12.22%	47.70%	-31.22%	-31.22%	7.52%	-63.80%	-63.80%	-43.41%	-30.44%	-10.61%	-0.64%	-22.29%	-22.29%	-5.60%	181.49%	296.98%	454.80%
EVOC 25 IND	1086	2337	135.62%	200.91%	273.96%	248.80%	265.67%	308.20%	331.04%	414.39%	647.37%	95.06%	142.12%	188.34%	190.76%	208.22%	208.22%	474.72%	659.25%	1108.45%
EVOC 26 IDN	279	657	71.43%	87.37%	165.79%	136.40%	142.45%	206.56%	161.04%	227.02%	320.85%	39.00%	61.57%	71.87%	117.20%	117.72%	125.87%	248.05%	352.42%	554.71%
EVOC 27 KOR	300	714	-76.26%	-39.79%	-30.21%	-69.45%	-69.45%	-52.25%	-83.92%	-83.92%	-74.87%	-55.34%	-31.52%	-9.26%	-65.48%	-65.48%	-58.07%	236.73%	375.13%	570.02%
EVOC 28 MYS	64	161	-156.61%	-112.76%	-82.40%	-12.18%	-12.18%	17.24%	-53.78%	-53.78%	-38.30%	13.01%	43.91%	84.95%	-1.02%	-0.78%	2.93%	225.34%	360.27%	479.73%
EVOC 29 PHL	80	155	-65.16%	-48.63%	-21.38%	192.23%	220.40%	234.36%	186.33%	266.41%	363.18%	66.11%	102.12%	116.87%	169.93%	170.57%	180.69%	240.07%	332.63%	517.57%
EVOC 30 SGP	28	62	-196.24%	-38.22%	-13.05%	-64.04%	-64.04%	-52.00%	-81.08%	-81.08%	-74.74%	-18.43%	29.43%	74.23%	-59.47%	-59.38%	-57.86%	300.03%	435.81%	709.12%
EVOC 31 THA	169	438	30.89%	81.22%	144.12%	-5.91%	-5.91%	25.61%	-50.48%	-50.48%	-33.89%	31.15%	63.57%	96.70%	6.05%	6.30%	10.28%	361.79%	489.16%	798.29%
EVOC 32 RAA	766	1464	123.97%	189.14%	236.82%	97.40%	125.16%	130.47%	96.19%	161.52%	202.56%	41.06%	65.44%	86.25%	115.83%	119.60%	119.72%	222.91%	317.98%	499.63%
Pakistan	145	129	209.98%	263.61%	360.13%	271.40%	287.61%	298.98%	274.42%	438.89%	530.28%	109.34%	161.12%	209.70%	204.78%	223.09%	223.09%	399.23%	534.46%	894.02%
Figure 01 USA	6308	7759	-152.76%	-126.25%	-108.32%	-89.22%	-88.11%	-87.18%	-94.33%	-93.74%	-93.25%	-87.69%	-85.09%	-84.92%	-88.74%	-86.57%	-86.57%	-16.95%	11.04%	35.99%
Figure 02 EU27	5899	5225	-151.90%	-133.87%	-113.17%	-84.78%	-83.50%	-82.52%	-91.99%	-91.32%	-90.80%	-85.70%	-82.65%	-81.07%	-84.65%	-81.36%	-81.36%	-25.35%	1.92%	27.14%
Figure 03 FRA	592	592	-179.22%	-147.50%	-123.03%	-80.65%	-78.61%	-77.50%	-89.82%	-88.74%	-88.16%	-84.70%	-80.93%	-79.78%	-80.24%	-75.83%	-75.83%	-27.36%	4.79%	28.41%
Figure 04 GER	1253	990	-152.54%	-128.80%	-112.75%	-87.78%	-86.49%	-85.79%	-93.57%	-92.89%	-92.52%	-89.01%	-86.95%	-86.30%	-87.52%	-84.74%	-84.74%	-44.07%	-17.64%	4.97%
Figure 05 UK	789	686	-170.46%	-142.18%	-121.72%	-85.94%	-84.45%	-83.64%	-92.60%	-91.82%	-91.39%	-88.61%	-86.45%	-85.66%	-85.64%	-82.43%	-82.43%	-39.66%	-11.82%	10.73%
Figure 06 RUS+EEU	3998	2662	-107.02%	-94.49%	-83.00%	-90.11%	-89.68%	-86.89%	-94.80%	-94.57%	-93.10%	-88.51%	-83.97%	-81.38%	-89.64%	-88.34%	-88.34%	-33.18%	-1.57%	20.26%
Figure 07 JPN	1313	1234	-171.31%	-144.67%	-121.05%	-82.71%	-80.85%	-80.11%	-90.90%	-89.92%	-89.53%	-86.36%	-83.73%	-82.72%	-82.54%	-78.37%	-78.37%	-40.09%	-15.39%	8.31%
Figure 08 RAI	1237	1231	-126.07%	-109.26%	-96.41%	-88.40%	-87.46%	-86.29%	-93.89%	-93.40%	-92.78%	-83.43%	-79.14%	-78.49%	-87.96%	-85.83%	-85.83%	-5.36%	24.20%	50.21%
Figure 09 REEU	1172	1262	-54.04%	-43.17%	-16.20%	-61.19%	-58.97%	-46.72%	-77.10%	-76.24%	-68.31%	-62.04%	-48.27%	-43.56%	-59.84%	-54.42%	-53.45%	48.11%	108.54%	142.91%
Figure 10 LAM	2192	4093	-27.12%	-14.33%	-3.20%	-34.11%	-33.68%	-7.23%	-62.52%	-56.23%	-27.80%	-18.46%	-2.47%	11.73%	-26.67%	-26.67%	-19.47%	147.65%	246.86%	323.21%
Figure 11 AFR	1406	2680	302.85%	407.69%	516.36%	160.14%	177.32%	206.48%	125.98%	197.36%	265.50%	101.51%	117.07%	129.82%	143.27%	160.70%	180.41%	437.48%	658.79%	904.19%
Figure 12 ME	949	2174	142.46%	186.89%	214.57%	-33.62%	-27.43%	-2.36%	-58.32%	-56.16%	-29.57%	-14.74%	20.10%	33.97%	-30.01%	-19.62%	-14.26%	342.88%	545.71%	629.59%
Figure 13 SAsia	1355	2871	143.20%	195.44%	277.98%	250.43%	273.98%	302.67%	320.08%	403.23%	616.61%	103.97%	146.65%	190.25%	212.71%	231.50%	231.50%	451.43%	620.80%	1040.56%
Figure 14 CPAsia	3779	8363	-18.06%	-9.39%	48.45%	-33.35%	-33.35%	4.18%	-64.92%	-64.92%	-45.17%	-32.13%	-12.69%	-2.80%	-24.70%	-24.70%	-8.54%	172.45%	284.86%	437.11%
Figure 15 EAsia	1230	2945	55.15%	79.63%	112.82%	40.35%	44.74%	79.21%	31.95%	65.00%	96.09%	11.39%	35.63%	57.92%	35.45%	35.45%	42.51%	257.43%	371.88%	578.27%
UNFCCC Annex I	19203	18701	-134.47%	-120.54%	-104.97%	-86.37%	-85.24%	-83.38%	-92.82%	-92.23%	-91.25%	-85.82%	-82.08%	-80.74%	-85.72%	-83.33%	-83.33%	-17.80%	12.05%	34.40%
UNFCCC Non Annex I	11268	22989	65.10%	87.93%	112.61%	30.84%	37.01%	66.97%	20.71%	48.57%	67.98%	9.77%	29.71%	43.04%	32.96%	32.96%	37.09%	272.52%	381.71%	556.56%
World total	30706	42206	-40.00%	-40.00%	-40.00%	-42.14%	-39.79%	-27.50%	-50.42%	-39.89%	-32.96%	-49.61%	-40.28%	-34.35%	-40.00%	-40.00%	-40.00%	90.79%	150.79%	229.89%

Table 12. Emission allowances in 2020 under different effort sharing options for a global emission stabilisation level of 550 ppmv CO_2eq including international transport.

650 ppmv CO_2eq.	Emissions in Mt CO_2eq.		GDRs Values as % of 1990			CDC Values as % of 1990			Multistage (per capita) Values as % of 1990			Triptych Values as % of 1990			C&C 2050 convergence Values as % of 1990			Reference Values as % of 1990		
Year	1990	2010	2020			2020			2020			2020			2020			2020		
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7759	-19.00%	-9.50%	6.63%	6.26%	6.55%	7.71%	11.26%	11.38%	11.51%	1.59%	3.91%	4.14%	7.14%	8.76%	11.86%	12.00%	21.77%	27.16%
EVOC 02 EU15	4457	4099	-27.21%	-18.18%	-4.04%	-19.03%	-17.54%	-16.98%	-12.14%	-12.08%	-12.03%	-19.42%	-17.28%	-16.42%	-12.18%	-11.18%	-8.65%	2.10%	15.18%	20.07%
EVOC 03 EU+12	1442	1126	-20.02%	-16.87%	-10.74%	-35.79%	-31.26%	-28.36%	-30.12%	-25.51%	-21.55%	-31.33%	-24.00%	-16.83%	-28.46%	-24.26%	-22.17%	-16.25%	-1.88%	11.03%
EVOC 04 RWEU	117	114	-42.24%	-26.58%	-5.74%	-13.01%	-11.36%	-10.74%	-7.03%	-6.96%	-6.91%	-4.07%	4.25%	9.19%	-5.39%	-4.37%	-1.67%	3.03%	15.59%	21.09%
EVOC 05 RUS	2904	2103	-30.07%	-22.27%	-20.28%	-40.58%	-36.90%	-35.60%	-34.10%	-31.66%	-29.12%	-38.99%	-32.39%	-26.74%	-34.37%	-32.20%	-31.41%	-28.00%	-14.36%	-5.16%
EVOC 06 REEU in Annex I	1095	558	-49.67%	-42.62%	-40.02%	-54.98%	-52.40%	-51.58%	-52.43%	-50.80%	-48.98%	-52.98%	-46.91%	-41.55%	-50.06%	-48.56%	-48.03%	-48.61%	-38.49%	-31.74%
EVOC 07 JPN	1313	1234	-33.94%	-23.55%	-11.60%	-17.04%	-15.22%	-15.10%	-9.70%	-9.62%	-9.57%	-17.08%	-14.99%	-13.95%	-8.75%	-7.80%	-5.14%	-6.41%	9.78%	13.77%
EVOC 08 RAI	1119	1117	2.04%	10.97%	25.94%	-14.05%	-13.39%	-12.26%	-7.93%	-7.87%	-7.77%	-14.41%	-11.74%	-11.29%	-11.30%	-10.02%	-7.47%	21.91%	36.89%	41.82%
EVOC 09 TUR	183	383	145.86%	154.83%	179.17%	146.75%	160.14%	172.60%	160.86%	171.09%	190.44%	144.19%	167.85%	177.68%	146.75%	153.23%	160.20%	162.47%	194.83%	203.52%
EVOC 10 REEU	856	798	-6.21%	7.76%	14.88%	-17.10%	-11.39%	-8.08%	-18.53%	-7.04%	-0.16%	-14.08%	-5.20%	3.04%	-8.37%	-4.98%	-3.62%	-5.01%	12.52%	24.32%
EVOC 11 ARG	237	409	94.35%	97.50%	121.15%	65.23%	70.36%	79.56%	75.77%	82.47%	101.77%	74.58%	88.80%	92.33%	67.66%	70.54%	76.74%	114.19%	141.79%	149.38%
EVOC 12 BRZ	680	1215	101.10%	105.16%	128.29%	115.51%	138.85%	144.74%	94.40%	113.66%	144.84%	103.42%	118.58%	125.44%	90.60%	93.58%	100.71%	115.51%	140.66%	144.84%
EVOC 13 MEX	377	665	94.14%	109.66%	126.39%	111.26%	144.65%	159.60%	111.26%	144.65%	159.60%	91.11%	104.65%	114.90%	90.36%	94.77%	100.33%	111.26%	144.65%	159.60%
EVOC 14 VEN	204	372	145.22%	178.08%	185.92%	66.48%	72.04%	81.76%	83.05%	111.87%	124.00%	91.23%	109.52%	114.69%	68.67%	71.00%	77.87%	151.06%	188.24%	204.06%
EVOC 15 RLA	694	1432	132.22%	156.30%	169.42%	112.36%	135.88%	139.84%	107.38%	139.27%	146.58%	136.35%	163.52%	167.48%	111.90%	118.92%	125.95%	141.70%	178.09%	185.77%
EVOC 16 EGY	115	263	197.79%	239.06%	248.99%	203.84%	248.79%	269.26%	203.84%	248.79%	269.26%	205.00%	228.65%	245.83%	213.56%	220.85%	225.50%	203.84%	248.79%	269.26%
EVOC 17 ZAF	337	498	58.45%	67.43%	85.28%	62.78%	63.69%	64.24%	42.27%	64.81%	73.95%	62.86%	76.49%	84.87%	50.26%	50.71%	55.85%	72.07%	97.25%	106.89%
EVOC 18 NGA	191	442	177.20%	261.17%	286.83%	177.77%	262.30%	289.32%	177.77%	262.30%	289.32%	206.28%	233.84%	251.85%	224.82%	234.14%	240.14%	177.77%	262.30%	289.32%
EVOC 19 RNA	204	420	145.24%	183.07%	186.21%	143.28%	177.19%	193.47%	141.79%	182.58%	201.93%	136.24%	156.73%	169.14%	142.67%	151.38%	152.74%	156.16%	199.27%	219.37%
EVOC 20 RAF	559	1056	162.98%	212.13%	222.99%	160.60%	205.85%	219.51%	160.78%	210.50%	225.03%	209.99%	228.15%	236.79%	258.83%	265.18%	270.65%	165.12%	215.60%	230.53%
EVOC 21 SAU	232	521	165.47%	183.13%	199.00%	106.83%	122.17%	127.44%	104.96%	132.85%	143.14%	130.88%	157.67%	171.77%	97.58%	104.23%	107.76%	181.46%	216.05%	228.73%
EVOC 22 ARE	103	243	176.75%	197.73%	210.79%	105.37%	118.96%	125.75%	109.93%	138.64%	151.14%	109.86%	127.56%	138.16%	93.55%	97.94%	103.56%	193.35%	229.49%	244.42%
EVOC 23 RME	613	1409	172.72%	198.36%	206.44%	140.45%	161.80%	165.37%	137.62%	169.56%	182.18%	140.24%	163.60%	174.95%	134.94%	143.28%	147.30%	184.57%	219.87%	233.41%
EVOC 24 CHN	3591	8188	133.61%	165.75%	173.94%	144.01%	189.42%	193.88%	144.01%	157.77%	180.34%	123.14%	162.52%	175.04%	136.65%	144.46%	149.14%	144.01%	194.52%	218.12%
EVOC 25 IND	1086	2337	160.59%	222.79%	239.21%	163.73%	234.95%	262.22%	163.73%	234.95%	262.22%	178.29%	236.22%	262.69%	244.96%	262.81%	264.50%	163.73%	234.95%	262.22%
EVOC 26 IDN	279	657	159.40%	211.07%	220.74%	161.98%	218.97%	233.98%	161.98%	218.97%	233.98%	175.07%	209.25%	225.56%	223.80%	231.30%	236.20%	161.98%	218.97%	233.98%
EVOC 27 KOR	300	714	130.64%	152.93%	175.26%	92.22%	109.37%	113.36%	90.56%	134.93%	161.77%	106.17%	154.32%	169.67%	110.21%	120.36%	123.18%	162.15%	219.17%	253.02%
EVOC 28 MYS	64	161	145.43%	167.17%	210.05%	171.62%	206.99%	214.87%	171.62%	193.88%	202.23%	144.98%	189.37%	212.80%	156.29%	166.95%	175.98%	171.62%	237.76%	245.70%
EVOC 29 PHL	80	155	108.10%	131.93%	145.30%	120.28%	164.26%	176.39%	120.28%	164.26%	176.39%	168.28%	195.57%	208.85%	226.35%	231.61%	235.42%	120.28%	164.26%	176.39%
EVOC 30 SGP	28	62	105.56%	123.11%	163.74%	83.14%	100.21%	102.70%	79.53%	128.65%	144.07%	99.04%	144.07%	162.02%	92.09%	102.07%	108.16%	147.21%	210.80%	228.28%
EVOC 31 THA	169	438	177.98%	218.15%	234.63%	194.54%	232.18%	238.04%	194.54%	214.50%	232.81%	179.48%	235.60%	256.06%	169.61%	178.22%	183.24%	194.54%	258.33%	275.96%
EVOC 32 RAA	766	1464	116.29%	154.85%	169.40%	102.57%	133.00%	142.95%	100.79%	137.96%	153.44%	133.71%	166.37%	181.24%	186.11%	193.53%	194.86%	117.16%	157.55%	174.42%
Pakistan	145	129	152.84%	207.07%	228.57%	153.19%	209.60%	233.55%	153.19%	209.60%	233.55%	193.01%	256.96%	287.76%	253.39%	267.95%	269.25%	153.19%	209.60%	233.55%
Figure 01 USA	6308	7759	-19.00%	-9.50%	6.63%	6.26%	6.55%	7.71%	11.26%	11.38%	11.51%	1.59%	3.91%	4.14%	7.14%	8.76%	11.86%	12.00%	21.77%	27.16%
Figure 02 EU27	5899	5225	-24.00%	-17.46%	-7.95%	-23.13%	-20.68%	-20.18%	-16.54%	-15.38%	-14.36%	-22.33%	-18.93%	-16.53%	-15.01%	-14.41%	-12.94%	-1.48%	10.99%	17.86%
Figure 03 FRA	592	592	-35.09%	-22.95%	-5.81%	-10.49%	-8.79%	-8.15%	-3.89%	-3.83%	-3.78%	-12.21%	-9.11%	-7.99%	-2.71%	-1.65%	1.13%	0.63%	12.45%	17.33%
Figure 04 GER	1253	990	-38.34%	-31.71%	-19.52%	-31.48%	-30.21%	-29.74%	-24.81%	-24.75%	-24.70%	-31.18%	-29.59%	-29.01%	-25.80%	-24.92%	-22.77%	-15.82%	-4.52%	-0.61%
Figure 05 UK	789	686	-40.28%	-30.88%	-17.17%	-24.11%	-22.69%	-22.17%	-17.02%	-16.96%	-16.90%	-25.13%	-23.39%	-22.57%	-17.76%	-16.80%	-14.42%	-10.88%	0.53%	5.07%
Figure 06 RUS+EEU	3998	2662	-35.44%	-27.84%	-25.74%	-44.52%	-41.14%	-39.97%	-39.12%	-36.90%	-34.56%	-42.82%	-36.36%	-30.79%	-38.67%	-36.68%	-35.96%	-33.65%	-20.97%	-12.44%
Figure 07 JPN	1313	1234	-33.94%	-23.55%	-11.60%	-17.04%	-15.22%	-15.10%	-9.70%	-9.62%	-9.57%	-17.08%	-14.99%	-13.95%	-8.75%	-7.80%	-5.14%	-6.41%	9.78%	13.77%
Figure 08 RAI	1237	1231	-2.16%	7.41%	22.41%	-13.95%	-13.20%	-12.12%	-7.85%	-7.78%	-7.69%	-13.41%	-10.22%	-9.35%	-10.74%	-9.49%	-6.92%	20.27%	35.00%	39.31%
Figure 09 REEU	1172	1262	17.65%	27.72%	31.20%	5.34%	12.78%	14.57%	8.25%	18.39%	22.09%	7.20%	18.03%	26.15%	12.28%	16.50%	17.06%	19.95%	36.26%	47.12%
Figure 10 LAM	2192	4093	113.20%	128.44%	144.45%	103.88%	126.45%	130.97%	104.89%	124.49%	135.48%	107.48%	127.34%	130.64%	92.79%	97.17%	103.92%	126.24%	157.96%	166.31%
Figure 11 AFR	1406	2680	140.10%	184.66%	190.33%	140.83%	178.71%	191.89%	135.41%	181.65%	197.75%	164.93%	182.20%	193.24%	186.02%	189.22%	194.04%	146.37%	193.88%	210.39%
Figure 12 ME	949	2174	171.39%	195.01%	205.09%	128.41%	147.44%	151.78%	126.62%	157.21%	169.24%	134.64%	157.85%	170.16%	121.30%	128.79%	132.86%	184.77%	219.99%	233.39%
Figure 13 SAsia	1355	2871	155.67%	214.78%	231.14%	158.32%	225.25%	250.99%	158.32%	225.25%	250.99%	183.77%	239.32%	265.02%	257.19%	274.20%	275.79%	158.32%	225.25%	250.99%
Figure 14 CPAsia	3779	8363	126.94%	158.25%	166.02%	136.30%	180.57%	184.77%	136.18%	150.28%	172.02%	115.29%	152.97%	164.96%	129.54%	137.13%	141.70%	136.46%	185.53%	208.26%
Figure 15 EAsia	1230	2945	152.38%	193.34%	201.36%	141.49%	173.48%	179.69%	138.24%	180.03%	198.33%	154.69%	196.51%	213.26%	175.09%	183.30%	187.43%	166.44%	222.00%	242.67%
UNFCCC Annex I	19203	18701	-19.98%	-14.42%	-4.20%	-15.49%	-13.34%	-13.15%	-9.49%	-8.48%	-7.67%	-16.08%	-12.53%	-10.25%	-9.83%	-9.56%	-7.59%	-1.24%	11.45%	17.22%
UNFCCC Non Annex I	11268	22989	139.83%	156.46%	165.37%	134.58%	157.99%	170.12%	134.02%	148.11%	170.37%	133.23%	155.30%	170.77%	146.20%	149.40%	149.85%	149.96%	176.39%	201.54%
World total	30706	42206	50.00%	50.00%	50.00%	41.21%	49.97%	55.22%	44.23%	50.05%	59.07%	41.08%	49.81%	57.69%	50.00%	50.00%	50.00%	55.55%	70.61%	86.56%

Table 13. Emission allowances in 2050 under different effort sharing options for a global emission stabilisation level of 550 ppmv CO_2eq including international transport.

650 ppmv CO_2eq.	Emissions in Mt CO_2eq.		GDRs Values as % of 1990 2050			CDC Values as % of 1990 2050			Multistage (per capita) Values as % of 1990 2050			Triptych Values as % of 1990 2050			C&C 2050 convergence Values as % of 1990 2050			Reference Values as % of 1990 2050		
Year	1990	2010																		
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7759	-84.36%	-71.66%	-48.87%	-72.77%	-69.96%	-67.60%	-71.78%	-70.23%	-69.63%	-66.90%	-57.69%	-56.82%	-72.79%	-67.54%	-67.54%	-16.95%	11.04%	35.99%
EVOC 02 EU15	4457	4099	-94.54%	-83.69%	-55.29%	-59.90%	-55.72%	-53.45%	-62.14%	-58.39%	-56.35%	-64.51%	-56.42%	-53.18%	-60.91%	-52.15%	-52.15%	-30.12%	2.15%	28.18%
EVOC 03 EU+12	1442	1126	-87.90%	-64.28%	-42.40%	-66.65%	-66.35%	-63.24%	-68.45%	-67.57%	-65.42%	-59.56%	-49.63%	-40.15%	-69.12%	-63.63%	-63.63%	-27.06%	1.24%	23.95%
EVOC 04 RWEU	117	114	-120.78%	-101.70%	-63.94%	-51.85%	-46.76%	-43.99%	-54.62%	-50.08%	-47.49%	-33.91%	-15.71%	-5.73%	-52.87%	-42.35%	-42.35%	-27.73%	5.02%	30.43%
EVOC 05 RUS	2904	2103	-65.43%	-51.32%	-39.25%	-76.12%	-75.07%	-68.22%	-77.16%	-75.72%	-70.21%	-70.94%	-59.92%	-52.93%	-76.08%	-73.06%	-73.06%	-28.18%	5.41%	28.67%
EVOC 06 REEU in Annex I	1095	558	-68.50%	-61.33%	-47.62%	-72.08%	-70.92%	-63.32%	-73.82%	-72.74%	-65.62%	-71.29%	-58.19%	-51.09%	-72.03%	-68.57%	-68.57%	-46.45%	-20.07%	-2.05%
EVOC 07 JPN	1313	1234	-102.43%	-93.72%	-68.24%	-56.32%	-51.62%	-49.76%	-59.05%	-54.65%	-52.90%	-64.10%	-55.15%	-50.85%	-57.80%	-47.72%	-47.72%	-40.09%	-15.39%	8.31%
EVOC 08 RAI	1119	1117	-59.50%	-47.56%	-34.41%	-72.67%	-70.58%	-67.62%	-73.03%	-71.12%	-69.46%	-59.61%	-49.71%	-48.56%	-72.80%	-68.20%	-68.20%	-4.23%	25.99%	52.28%
EVOC 09 TUR	183	383	159.33%	216.49%	290.44%	241.52%	263.61%	399.13%	220.18%	240.89%	367.94%	200.64%	321.59%	350.47%	242.17%	292.97%	319.20%	301.20%	516.65%	582.13%
EVOC 10 REEU	856	798	-20.06%	-6.65%	9.94%	-49.31%	-46.25%	-36.94%	-50.98%	-48.98%	-38.00%	-44.96%	-26.14%	-15.96%	-45.97%	-39.58%	-39.58%	-3.30%	40.05%	70.70%
EVOC 11 ARG	237	409	0.35%	31.77%	65.44%	9.58%	9.58%	54.86%	2.73%	2.73%	45.18%	37.60%	65.48%	84.40%	18.42%	18.42%	30.06%	131.58%	212.33%	282.87%
EVOC 12 BRZ	680	1215	30.97%	64.27%	100.10%	96.15%	102.80%	172.63%	64.54%	90.22%	132.53%	108.29%	148.90%	182.27%	89.68%	89.68%	108.31%	139.89%	216.43%	278.19%
EVOC 13 MEX	377	665	20.29%	42.39%	96.48%	105.06%	112.28%	183.98%	71.92%	101.34%	220.22%	92.40%	124.42%	141.52%	98.19%	98.19%	117.66%	128.62%	243.02%	339.29%
EVOC 14 VEN	204	372	164.09%	184.23%	267.94%	-17.01%	-17.01%	17.28%	-22.20%	-16.64%	9.95%	58.86%	105.05%	114.54%	-10.31%	-10.31%	-1.50%	195.50%	291.55%	414.35%
EVOC 15 RLA	694	1432	114.32%	142.54%	198.97%	59.15%	100.96%	141.29%	57.00%	86.24%	137.08%	100.62%	137.59%	191.45%	99.32%	99.32%	118.91%	157.02%	269.67%	345.53%
EVOC 16 EGY	115	263	383.83%	542.93%	568.64%	453.43%	659.33%	727.44%	453.43%	739.99%	833.26%	363.46%	476.82%	510.37%	455.59%	511.91%	576.82%	453.43%	762.43%	997.46%
EVOC 17 ZAF	337	498	110.65%	168.22%	174.91%	36.79%	36.79%	63.66%	28.25%	28.25%	53.43%	73.39%	102.40%	128.24%	32.84%	47.84%	63.97%	188.39%	317.20%	464.57%
EVOC 18 NGA	191	442	643.85%	841.79%	1152.66%	657.56%	701.62%	722.36%	657.56%	808.22%	1059.13%	442.13%	482.72%	517.77%	517.07%	586.74%	661.68%	657.56%	892.35%	1279.97%
EVOC 19 RNA	204	420	253.55%	299.54%	323.91%	233.67%	313.35%	378.19%	228.87%	318.48%	411.98%	176.02%	252.14%	273.01%	244.38%	279.30%	319.53%	335.64%	555.31%	713.42%
EVOC 20 RAF	559	1056	520.66%	729.94%	912.90%	486.61%	619.26%	746.47%	497.13%	706.18%	929.14%	537.35%	592.89%	602.18%	795.93%	897.10%	1005.95%	546.60%	805.33%	1091.76%
EVOC 21 SAU	232	521	241.50%	295.77%	352.96%	-17.81%	-12.49%	20.12%	-22.95%	-17.20%	12.61%	87.22%	188.60%	234.18%	-17.65%	-5.43%	0.89%	315.48%	537.52%	615.67%
EVOC 22 ARE	103	243	335.55%	399.89%	428.44%	-76.37%	-74.84%	-65.46%	-71.93%	-69.35%	-65.76%	5.77%	64.79%	92.78%	-76.32%	-72.81%	-70.99%	411.85%	600.80%	710.89%
EVOC 23 RME	613	1409	281.26%	336.46%	396.28%	116.78%	148.41%	218.79%	107.58%	128.52%	208.12%	129.61%	220.02%	247.81%	126.48%	160.10%	177.47%	341.63%	539.52%	621.16%
EVOC 24 CHN	3591	8188	114.97%	130.84%	170.46%	92.09%	100.75%	211.46%	76.55%	89.60%	242.06%	71.70%	118.77%	146.53%	87.80%	87.80%	128.12%	181.49%	296.98%	454.80%
EVOC 25 IND	1086	2337	357.29%	430.23%	529.79%	474.72%	659.25%	896.25%	474.72%	659.25%	1048.03%	372.71%	494.69%	612.14%	602.67%	644.87%	644.87%	474.72%	659.25%	1108.45%
EVOC 26 IDN	279	657	194.03%	234.53%	263.18%	248.05%	352.42%	554.71%	248.05%	352.42%	521.98%	229.38%	284.39%	313.08%	424.90%	426.15%	445.85%	248.05%	352.42%	554.71%
EVOC 27 KOR	300	714	99.09%	130.05%	168.91%	-22.82%	-22.82%	20.64%	-22.88%	-11.41%	13.10%	34.75%	98.48%	155.53%	-16.59%	-16.59%	1.32%	236.73%	375.13%	570.02%
EVOC 28 MYS	64	161	10.83%	68.08%	175.59%	145.08%	151.38%	243.85%	107.99%	120.86%	275.96%	167.99%	244.58%	346.19%	139.20%	139.77%	148.75%	225.34%	360.27%	479.73%
EVOC 29 PHL	80	155	106.64%	126.08%	157.22%	240.07%	332.63%	517.57%	240.07%	332.63%	517.57%	300.68%	385.44%	426.04%	552.33%	553.87%	578.34%	240.07%	332.63%	517.57%
EVOC 30 SGP	28	62	1.43%	158.64%	172.53%	-9.16%	-9.16%	21.27%	-14.84%	-8.10%	13.69%	103.64%	223.53%	334.72%	-2.06%	-1.83%	1.85%	300.03%	435.81%	709.12%
EVOC 31 THA	169	438	207.05%	289.86%	353.25%	162.84%	169.61%	267.68%	127.81%	144.23%	330.86%	210.79%	295.39%	378.01%	156.28%	156.89%	166.50%	361.79%	489.16%	798.29%
EVOC 32 RAA	766	1464	190.97%	257.40%	329.46%	169.95%	231.86%	345.96%	171.00%	234.96%	358.35%	232.34%	287.22%	335.57%	421.58%	430.69%	431.00%	222.91%	317.98%	499.63%
Pakistan	145	129	341.43%	412.91%	526.20%	399.23%	534.46%	894.02%	399.23%	534.46%	894.02%	400.72%	535.47%	659.52%	636.56%	680.80%	680.80%	399.23%	534.46%	894.02%
Figure 01 USA	6308	7759	-84.36%	-71.66%	-48.87%	-72.77%	-69.96%	-67.60%	-71.78%	-70.23%	-69.63%	-66.90%	-57.69%	-56.82%	-72.79%	-67.54%	-67.54%	-16.95%	11.04%	35.99%
Figure 02 EU27	5899	5225	-92.92%	-79.70%	-54.92%	-61.55%	-58.32%	-55.84%	-63.68%	-60.63%	-58.57%	-63.27%	-54.76%	-50.00%	-62.92%	-54.95%	-54.95%	-25.35%	1.92%	27.14%
Figure 03 FRA	592	592	-103.81%	-88.74%	-56.32%	-51.12%	-45.96%	-43.15%	-54.18%	-49.33%	-46.71%	-63.41%	-54.24%	-51.27%	-52.26%	-41.59%	-41.59%	-27.36%	4.79%	28.41%
Figure 04 GER	1253	990	-93.64%	-85.98%	-63.28%	-69.13%	-65.87%	-64.10%	-71.06%	-68.00%	-66.34%	-70.89%	-64.19%	-61.25%	-69.85%	-63.12%	-63.12%	-44.07%	-17.64%	4.97%
Figure 05 UK	789	686	-102.65%	-91.61%	-64.34%	-64.47%	-60.72%	-58.68%	-66.69%	-63.17%	-61.26%	-69.25%	-62.05%	-59.11%	-65.30%	-57.55%	-57.55%	-39.66%	-11.82%	10.73%
Figure 06 RUS+EEU	3998	2662	-66.27%	-54.06%	-42.76%	-75.02%	-73.93%	-66.88%	-76.24%	-74.90%	-68.95%	-71.03%	-59.45%	-52.44%	-74.97%	-71.83%	-71.83%	-33.18%	-1.57%	20.26%
Figure 07 JPN	1313	1234	-102.43%	-93.72%	-68.24%	-56.32%	-51.62%	-49.76%	-59.05%	-54.65%	-52.90%	-64.10%	-55.15%	-50.85%	-57.80%	-47.72%	-47.72%	-40.09%	-15.39%	8.31%
Figure 08 RAI	1237	1231	-65.32%	-52.96%	-37.93%	-70.70%	-68.32%	-65.37%	-71.28%	-69.13%	-67.37%	-57.17%	-46.48%	-44.50%	-70.91%	-65.75%	-65.75%	-5.36%	24.20%	50.21%
Figure 09 REEU	1172	1262	9.31%	21.18%	46.83%	-5.51%	0.36%	29.51%	-9.59%	-5.46%	23.52%	-9.00%	24.91%	37.27%	-2.96%	10.16%	12.50%	48.11%	108.54%	142.91%
Figure 10 LAM	2192	4093	78.41%	89.38%	131.38%	69.54%	82.53%	137.50%	61.11%	70.59%	128.24%	91.46%	129.68%	157.37%	77.20%	77.20%	94.61%	147.65%	246.86%	323.21%
Figure 11 AFR	1406	2680	390.39%	528.83%	648.25%	368.90%	458.46%	506.18%	372.09%	511.54%	640.21%	359.88%	393.58%	421.49%	487.91%	530.03%	577.66%	437.48%	658.79%	904.19%
Figure 12 ME	949	2174	278.03%	333.42%	387.06%	62.82%	84.74%	139.24%	56.10%	71.68%	130.47%	105.75%	192.14%	227.59%	69.14%	94.24%	107.21%	342.88%	545.71%	629.59%
Figure 13 SAsia	1355	2871	345.07%	408.93%	503.45%	451.42%	620.11%	866.18%	451.42%	620.40%	991.13%	392.18%	503.25%	614.01%	655.72%	701.12%	701.12%	451.43%	620.80%	1040.56%
Figure 14 CPAsia	3779	8363	109.20%	128.01%	163.93%	86.31%	94.63%	201.72%	71.69%	84.57%	231.70%	65.83%	111.42%	137.92%	81.96%	81.96%	121.03%	172.45%	284.86%	437.11%
Figure 15 EAsia	1230	2945	186.20%	225.90%	253.87%	128.04%	182.83%	240.11%	128.83%	184.41%	233.93%	175.01%	233.34%	291.67%	227.34%	227.34%	244.40%	257.43%	371.88%	578.27%
UNFCCC Annex I	19203	18701	-80.21%	-65.98%	-49.41%	-65.56%	-62.72%	-58.01%	-66.60%	-64.21%	-60.61%	-63.27%	-52.57%	-48.54%	-65.49%	-59.71%	-59.71%	-17.80%	12.05%	34.40%
UNFCCC Non Annex I	11268	22989	201.88%	227.31%	248.49%	170.90%	225.18%	242.23%	162.39%	230.27%	269.19%	162.46%	208.84%	243.88%	221.31%	221.31%	231.31%	272.52%	381.71%	556.56%
World total	30706	42206	45.00%	45.00%	45.00%	24.17%	44.74%	50.57%	18.62%	45.34%	59.54%	22.30%	45.34%	61.21%	45.00%	45.00%	45.00%	90.79%	150.79%	229.89%

Table 14. Emission allowances in 2020 under different effort sharing options for a global emission stabilisation level of 650 ppmv CO_2eq including international transport.

550 ppmv CO_2eq.	Emissions in Mt CO_2eq.		GDRs Values as % of 1990			CDC Values as % of 1990			Multistage (per capita) Values as % of 1990			Triptych Values as % of 1990			C&C 2050 convergence Values as % of 1990			Reference Values as % of 1990		
Year	1990	2010	2020			2020			2020			2020			2020			2020		
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7759	-43.79%	-35.28%	-21.80%	1.77%	2.02%	3.07%	-24.73%	-24.52%	-24.23%	-6.06%	-4.16%	-3.93%	-7.14%	-5.74%	-3.05%	12.00%	21.77%	27.16%
EVOC 02 EU15	4457	4099	-52.55%	-44.09%	-31.70%	-26.47%	-25.19%	-24.77%	-27.95%	-27.72%	-27.54%	-27.12%	-25.55%	-24.92%	-23.89%	-23.02%	-20.83%	2.10%	15.18%	20.07%
EVOC 03 EU+12	1442	1126	-31.97%	-29.68%	-24.59%	-41.97%	-37.67%	-34.69%	-42.38%	-39.12%	-36.35%	-39.00%	-32.59%	-26.52%	-38.00%	-34.35%	-32.54%	-16.25%	-1.88%	11.03%
EVOC 04 RWEU	117	114	-75.21%	-60.91%	-42.42%	-21.95%	-20.55%	-20.09%	-22.63%	-22.40%	-22.22%	-15.81%	-12.04%	-10.08%	-18.01%	-17.12%	-14.78%	3.03%	15.59%	21.09%
EVOC 05 RUS	2904	2103	-37.63%	-29.77%	-28.81%	-44.89%	-41.46%	-40.04%	-48.29%	-46.61%	-45.08%	-44.97%	-39.68%	-34.94%	-43.12%	-41.24%	-40.56%	-28.00%	-14.36%	-5.16%
EVOC 06 REEU in Annex I	1095	558	-53.58%	-46.47%	-44.71%	-60.03%	-57.73%	-56.78%	-59.25%	-57.97%	-56.66%	-58.35%	-53.55%	-48.99%	-56.72%	-55.42%	-54.96%	-48.61%	-38.49%	-31.74%
EVOC 07 JPN	1313	1234	-59.51%	-49.95%	-41.11%	-25.40%	-23.88%	-23.85%	-24.34%	-24.01%	-23.84%	-25.62%	-24.09%	-23.26%	-20.91%	-20.10%	-17.79%	-6.41%	9.78%	13.77%
EVOC 08 RAI	1119	1117	-18.82%	-10.33%	2.18%	-18.64%	-18.05%	-17.05%	-33.46%	-33.25%	-33.05%	-21.77%	-19.78%	-19.46%	-23.12%	-22.02%	-19.80%	21.91%	36.89%	41.82%
EVOC 09 TUR	183	383	120.04%	126.69%	150.98%	102.41%	114.06%	123.22%	83.34%	89.52%	91.09%	106.85%	126.06%	134.28%	113.85%	119.46%	125.50%	162.47%	194.83%	203.52%
EVOC 10 REEU	856	798	-10.63%	3.32%	9.54%	-25.97%	-21.21%	-18.49%	-29.32%	-20.73%	-16.25%	-23.49%	-16.00%	-8.82%	-20.59%	-17.65%	-16.47%	-5.01%	12.52%	24.32%
EVOC 11 ARG	237	409	64.18%	67.32%	87.97%	48.19%	53.51%	61.04%	44.28%	57.59%	79.35%	53.21%	64.37%	67.54%	45.30%	47.80%	53.17%	114.19%	141.79%	149.38%
EVOC 12 BRZ	680	1215	78.71%	81.78%	103.32%	58.36%	63.80%	72.28%	76.98%	99.27%	103.24%	73.06%	85.40%	90.93%	65.19%	67.77%	73.95%	115.51%	140.66%	144.84%
EVOC 13 MEX	377	665	67.65%	81.60%	96.93%	56.55%	63.11%	70.25%	71.37%	101.90%	117.12%	62.68%	73.73%	81.07%	64.98%	68.80%	73.62%	111.26%	144.65%	159.60%
EVOC 14 VEN	204	372	136.03%	167.94%	175.62%	53.72%	59.27%	67.73%	58.94%	83.61%	93.93%	67.93%	82.53%	86.37%	46.18%	48.20%	54.15%	151.06%	188.24%	204.06%
EVOC 15 RLA	694	1432	117.49%	140.25%	153.00%	101.12%	116.64%	120.93%	88.38%	114.02%	118.42%	99.88%	121.55%	124.20%	83.64%	89.73%	95.82%	141.70%	178.09%	185.77%
EVOC 16 EGY	115	263	188.25%	226.93%	236.90%	203.84%	248.79%	269.26%	203.84%	248.79%	269.26%	149.15%	168.54%	180.60%	171.75%	178.07%	182.10%	203.84%	248.79%	269.26%
EVOC 17 ZAF	337	498	37.35%	44.70%	61.20%	44.84%	46.18%	46.53%	26.46%	46.49%	54.63%	40.77%	51.95%	57.73%	30.23%	30.61%	35.07%	72.07%	97.25%	106.89%
EVOC 18 NGA	191	442	176.29%	259.75%	285.40%	177.77%	262.30%	289.32%	177.77%	262.30%	289.32%	157.65%	181.48%	196.30%	181.51%	189.59%	194.79%	177.77%	262.30%	289.32%
EVOC 19 RNA	204	420	128.19%	163.00%	166.37%	113.12%	132.33%	137.48%	136.75%	169.47%	185.09%	99.89%	117.44%	126.64%	110.31%	117.87%	119.04%	156.16%	199.27%	219.37%
EVOC 20 RAF	559	1056	159.66%	207.84%	218.74%	156.56%	201.53%	215.16%	158.12%	206.06%	219.60%	145.84%	162.82%	169.91%	210.99%	216.49%	221.23%	165.12%	215.60%	230.53%
EVOC 21 SAU	232	521	140.60%	156.82%	171.28%	96.16%	111.08%	115.55%	76.42%	100.26%	109.03%	103.49%	126.59%	137.19%	71.24%	77.00%	80.06%	181.46%	216.05%	228.73%
EVOC 22 ARE	103	243	150.94%	170.92%	181.62%	102.30%	115.77%	122.34%	64.79%	86.68%	95.63%	93.15%	107.89%	116.55%	67.75%	71.55%	76.42%	193.35%	229.49%	244.42%
EVOC 23 RME	613	1409	154.35%	178.18%	186.14%	118.14%	133.45%	137.77%	114.39%	143.07%	153.65%	110.04%	129.19%	138.74%	103.62%	110.84%	114.32%	184.57%	219.87%	233.41%
EVOC 24 CHN	3591	8188	115.20%	139.56%	148.16%	81.52%	96.24%	100.34%	99.78%	146.85%	165.58%	89.69%	124.45%	134.03%	105.09%	111.86%	115.92%	144.01%	194.52%	218.12%
EVOC 25 IND	1086	2337	155.79%	210.86%	226.11%	163.73%	234.95%	262.22%	163.73%	234.95%	262.22%	117.53%	164.88%	183.69%	198.97%	214.43%	215.90%	163.73%	234.95%	262.22%
EVOC 26 IDN	279	657	155.43%	203.09%	212.58%	161.98%	218.97%	233.98%	161.98%	218.97%	233.98%	124.72%	154.76%	166.09%	180.63%	187.13%	191.38%	161.98%	218.97%	233.98%
EVOC 27 KOR	300	714	83.79%	100.25%	119.63%	77.71%	94.86%	98.09%	65.85%	103.62%	126.49%	83.01%	124.62%	136.37%	82.18%	90.98%	93.42%	162.15%	219.17%	253.02%
EVOC 28 MYS	64	161	106.23%	124.01%	161.84%	105.19%	124.06%	128.90%	121.11%	147.47%	154.51%	112.23%	148.73%	163.54%	122.12%	131.36%	139.18%	171.62%	237.76%	245.70%
EVOC 29 PHL	80	155	89.60%	106.96%	119.46%	120.28%	164.26%	176.39%	120.28%	164.26%	176.39%	111.52%	136.20%	145.71%	182.83%	187.40%	190.70%	120.28%	164.26%	176.39%
EVOC 30 SGP	28	62	44.73%	62.05%	95.77%	68.55%	85.62%	87.98%	56.67%	98.22%	111.58%	78.46%	116.07%	128.41%	66.48%	75.12%	80.40%	147.21%	210.80%	228.28%
EVOC 31 THA	169	438	152.89%	186.53%	201.51%	115.69%	132.12%	133.62%	150.16%	197.95%	215.30%	137.51%	185.44%	200.47%	133.66%	141.13%	145.48%	194.54%	258.33%	275.96%
EVOC 32 RAA	766	1464	114.96%	152.19%	166.56%	95.80%	123.15%	131.86%	95.15%	126.82%	141.38%	88.19%	116.12%	126.82%	147.96%	154.40%	155.55%	117.16%	157.55%	174.42%
Pakistan	145	129	152.30%	204.64%	225.71%	153.19%	209.60%	233.55%	153.19%	209.60%	233.55%	130.02%	181.52%	203.07%	206.27%	218.89%	220.01%	153.19%	209.60%	233.55%
Figure 01 USA	6308	7759	-43.79%	-35.28%	-21.80%	1.77%	2.02%	3.07%	-24.73%	-24.52%	-24.23%	-6.06%	-4.16%	-3.93%	-7.14%	-5.74%	-3.05%	12.00%	21.77%	27.16%
Figure 02 EU27	5899	5225	-46.53%	-40.16%	-31.77%	-30.26%	-28.08%	-27.51%	-31.48%	-30.52%	-29.70%	-30.03%	-27.32%	-25.33%	-26.35%	-25.82%	-24.55%	-1.48%	10.99%	17.86%
Figure 03 FRA	592	592	-62.95%	-51.58%	-36.19%	-19.56%	-18.12%	-17.65%	-19.29%	-19.06%	-18.88%	-20.45%	-18.21%	-17.42%	-15.68%	-14.76%	-12.35%	0.63%	12.45%	17.33%
Figure 04 GER	1253	990	-58.69%	-52.45%	-42.50%	-37.21%	-36.10%	-35.74%	-39.25%	-39.04%	-38.88%	-38.16%	-36.97%	-36.49%	-35.70%	-34.93%	-33.07%	-15.82%	-4.52%	-0.61%
Figure 05 UK	789	686	-64.48%	-55.73%	-43.42%	-30.71%	-29.47%	-29.07%	-32.41%	-32.18%	-32.01%	-31.68%	-30.48%	-29.87%	-28.73%	-27.89%	-25.83%	-10.88%	0.53%	5.07%
Figure 06 RUS+EEU	3998	2662	-42.00%	-34.35%	-33.21%	-49.04%	-45.92%	-44.63%	-51.28%	-49.72%	-48.25%	-48.63%	-43.48%	-38.79%	-46.85%	-45.12%	-44.50%	-33.65%	-20.97%	-12.44%
Figure 07 JPN	1313	1234	-59.51%	-49.95%	-41.11%	-25.40%	-23.88%	-23.85%	-24.34%	-24.01%	-23.84%	-25.62%	-24.09%	-23.26%	-20.91%	-20.10%	-17.79%	-6.41%	9.78%	13.77%
Figure 08 RAI	1237	1231	-24.17%	-15.13%	-2.75%	-18.96%	-18.29%	-17.34%	-32.43%	-32.22%	-32.03%	-21.20%	-19.05%	-18.57%	-22.64%	-21.56%	-19.33%	20.27%	35.00%	39.31%
Figure 09 REEU	1172	1262	9.24%	19.51%	22.20%	-8.92%	-2.63%	-1.00%	-13.91%	-6.75%	-3.06%	-6.21%	2.74%	9.80%	-2.69%	0.96%	1.45%	19.95%	36.26%	47.12%
Figure 10 LAM	2192	4093	92.98%	107.14%	121.90%	70.13%	78.88%	85.70%	75.71%	99.68%	104.86%	77.15%	93.19%	95.30%	67.08%	70.88%	76.73%	126.24%	157.96%	166.31%
Figure 11 AFR	1406	2680	130.33%	173.24%	179.12%	130.49%	166.03%	177.85%	129.83%	174.55%	186.68%	116.72%	132.63%	141.12%	147.88%	150.65%	154.83%	146.37%	193.88%	210.39%
Figure 12 ME	949	2174	150.61%	172.90%	182.01%	111.04%	126.05%	130.65%	99.70%	126.46%	136.39%	106.60%	126.23%	135.94%	91.79%	98.28%	101.81%	184.77%	219.99%	233.39%
Figure 13 SAsia	1355	2871	151.61%	204.51%	219.83%	158.32%	225.25%	250.99%	158.32%	225.25%	250.99%	120.57%	166.04%	184.24%	209.56%	224.31%	225.68%	158.32%	225.25%	250.99%
Figure 14 CPAsia	3779	8363	109.28%	133.35%	141.52%	76.12%	90.40%	94.40%	94.07%	139.06%	157.09%	83.18%	116.49%	125.68%	98.94%	105.51%	109.47%	136.46%	185.53%	208.26%
Figure 15 EAsia	1230	2945	131.36%	168.10%	174.82%	120.22%	149.68%	155.12%	121.25%	162.76%	179.38%	114.59%	150.76%	162.86%	138.41%	145.53%	149.10%	166.44%	222.00%	242.67%
UNFCCC Annex I	19203	18701	-40.12%	-34.84%	-26.52%	-21.48%	-19.52%	-19.29%	-32.00%	-31.25%	-30.52%	-23.75%	-20.93%	-19.02%	-21.85%	-21.62%	-19.92%	-1.24%	11.45%	17.22%
UNFCCC Non Annex I	11268	22989	123.40%	136.79%	145.22%	100.74%	114.22%	123.08%	109.52%	133.31%	154.17%	95.19%	114.47%	126.44%	113.37%	116.14%	116.54%	149.96%	176.39%	201.54%
World total	30706	42206	30.00%	30.00%	30.00%	24.81%	29.98%	34.03%	21.01%	30.31%	38.65%	21.80%	29.46%	35.61%	30.00%	30.00%	30.00%	55.55%	70.61%	86.56%

Table 15. Emission allowances in 2050 under different effort sharing options for a global emission stabilisation level of 650 ppmv CO_2eq including international transport.

550 ppmv CO_2eq.	Emissions in Mt CO_2eq.		GDRs Values as % of 1990			CDC Values as % of 1990			Multistage (per capita) Values as % of 1990			Triptych Values as % of 1990			C&C 2050 convergence Values as % of 1990			Reference Values as % of 1990		
Year	1990	2010	2050			2050			2050			2050			2050			2050		
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7759	-124.95%	-107.82%	-88.62%	-84.12%	-82.48%	-81.10%	-91.49%	-90.50%	-89.88%	-82.54%	-78.98%	-78.33%	-83.11%	-79.85%	-79.85%	-16.95%	11.04%	35.99%
EVOC 02 EU15	4457	4099	-139.80%	-117.67%	-96.11%	-76.61%	-74.17%	-72.85%	-87.22%	-86.00%	-85.45%	-78.57%	-74.53%	-73.52%	-75.73%	-70.30%	-70.30%	-30.12%	2.15%	28.18%
EVOC 03 EU+12	1442	1126	-119.35%	-97.50%	-77.67%	-80.55%	-80.37%	-78.56%	-89.37%	-88.85%	-88.46%	-77.23%	-72.58%	-68.51%	-80.84%	-77.43%	-77.43%	-27.06%	1.24%	23.95%
EVOC 04 RWEU	117	114	-177.64%	-146.00%	-113.70%	-71.91%	-68.93%	-67.32%	-84.88%	-83.17%	-82.49%	-63.27%	-54.96%	-51.35%	-70.75%	-64.22%	-64.22%	-27.73%	5.02%	30.43%
EVOC 05 RUS	2904	2103	-93.96%	-79.61%	-67.39%	-86.07%	-85.46%	-81.46%	-92.54%	-91.73%	-90.07%	-83.48%	-77.56%	-74.72%	-85.15%	-83.28%	-83.28%	-28.18%	5.41%	28.67%
EVOC 06 REEU in Annex I	1095	558	-89.63%	-81.27%	-65.43%	-83.71%	-83.04%	-78.61%	-91.27%	-90.89%	-88.54%	-82.81%	-76.38%	-73.53%	-82.64%	-80.49%	-80.49%	-46.45%	-20.07%	-2.05%
EVOC 07 JPN	1313	1234	-145.40%	-126.76%	-102.68%	-74.52%	-71.78%	-70.69%	-86.35%	-84.76%	-84.30%	-78.08%	-74.25%	-73.20%	-73.81%	-67.55%	-67.55%	-40.09%	-15.39%	8.31%
EVOC 08 RAI	1119	1117	-92.97%	-86.28%	-72.23%	-84.06%	-82.84%	-81.11%	-91.46%	-90.55%	-89.88%	-78.68%	-73.77%	-72.81%	-83.12%	-80.26%	-80.26%	-4.23%	25.99%	52.28%
EVOC 09 TUR	183	383	37.26%	94.55%	141.98%	99.22%	112.11%	191.16%	6.73%	13.63%	55.98%	92.02%	163.74%	168.59%	112.38%	143.91%	160.19%	301.20%	516.65%	582.13%
EVOC 10 REEU	856	798	-41.49%	-31.58%	-9.87%	-68.60%	-66.47%	-60.38%	-77.23%	-75.06%	-66.68%	-65.45%	-55.03%	-50.95%	-66.46%	-62.50%	-62.50%	-3.30%	40.05%	70.70%
EVOC 11 ARG	237	409	-76.30%	-63.81%	-22.99%	-36.08%	-36.08%	-9.67%	-65.76%	-65.76%	-51.61%	-18.06%	-4.63%	11.12%	-26.50%	-26.50%	-19.27%	131.58%	212.33%	282.87%
EVOC 12 BRZ	680	1215	-42.42%	-12.28%	10.29%	2.38%	2.38%	44.68%	-41.30%	14.78%	160.46%	25.20%	44.79%	71.33%	17.73%	17.73%	29.30%	139.89%	216.43%	278.19%
EVOC 13 MEX	377	665	-68.37%	-57.25%	-8.54%	9.92%	10.18%	55.14%	-38.37%	-26.07%	149.06%	16.91%	35.87%	42.43%	23.01%	23.01%	35.10%	128.62%	243.02%	339.29%
EVOC 14 VEN	204	372	115.13%	135.78%	211.29%	-51.59%	-51.59%	-31.59%	-74.07%	-72.61%	-63.35%	-8.14%	15.02%	19.07%	-44.33%	-44.33%	-38.86%	195.50%	291.55%	414.35%
EVOC 15 RLA	694	1432	64.85%	82.79%	129.14%	20.33%	27.44%	67.24%	23.24%	30.74%	77.66%	23.89%	41.98%	79.38%	23.72%	23.72%	35.87%	157.02%	269.67%	345.53%
EVOC 16 EGY	115	263	298.52%	406.55%	432.05%	332.17%	350.96%	512.08%	342.74%	532.22%	595.33%	200.63%	266.57%	288.71%	244.85%	279.81%	320.10%	453.43%	762.43%	997.46%
EVOC 17 ZAF	337	498	17.09%	74.19%	86.23%	-20.20%	-20.20%	-4.53%	-57.25%	-55.27%	-20.37%	2.45%	14.75%	25.74%	-17.55%	-8.24%	1.78%	188.39%	317.20%	464.57%
EVOC 18 NGA	191	442	626.28%	810.43%	1103.95%	382.79%	406.91%	487.23%	506.05%	584.64%	745.81%	260.37%	287.64%	297.07%	283.01%	326.25%	372.76%	657.56%	892.35%	1279.97%
EVOC 19 RNA	204	420	156.28%	166.33%	190.09%	129.39%	159.87%	229.58%	107.83%	140.06%	288.32%	82.51%	127.91%	137.97%	113.76%	135.42%	160.40%	335.64%	555.31%	713.42%
EVOC 20 RAF	559	1056	488.86%	673.35%	848.88%	425.60%	496.26%	555.74%	439.23%	518.91%	616.44%	347.38%	380.76%	401.47%	456.09%	518.89%	586.45%	546.60%	805.33%	1091.76%
EVOC 21 SAU	232	521	154.56%	192.34%	221.47%	-52.06%	-48.95%	-29.93%	-74.32%	-72.65%	-62.46%	1.98%	53.50%	75.40%	-48.89%	-41.30%	-37.38%	315.48%	537.52%	615.67%
EVOC 22 ARE	103	243	233.40%	287.44%	327.16%	-86.21%	-85.32%	-79.85%	-92.61%	-91.67%	-89.21%	-43.33%	-13.53%	-0.06%	-85.30%	-83.12%	-82.00%	411.85%	600.80%	710.89%
EVOC 23 RME	613	1409	203.06%	246.69%	295.45%	36.34%	47.07%	96.94%	12.67%	30.12%	65.88%	43.37%	96.04%	103.60%	40.57%	61.44%	72.22%	341.63%	539.52%	621.16%
EVOC 24 CHN	3591	8188	28.96%	36.28%	89.11%	1.37%	2.72%	78.74%	-34.92%	-31.66%	166.05%	6.24%	35.94%	42.33%	16.57%	16.57%	41.59%	181.49%	296.98%	454.80%
EVOC 25 IND	1086	2337	217.44%	300.61%	344.36%	414.13%	464.81%	486.73%	359.77%	549.53%	758.17%	236.73%	284.65%	336.69%	336.14%	362.33%	362.33%	474.72%	659.25%	1108.45%
EVOC 26 IDN	279	657	123.25%	144.39%	191.51%	241.78%	297.04%	314.31%	178.44%	294.11%	423.77%	128.93%	164.30%	172.89%	225.80%	226.58%	238.80%	248.05%	352.42%	554.71%
EVOC 27 KOR	300	714	-22.68%	13.59%	23.08%	-54.98%	-54.98%	-29.63%	-74.67%	-71.80%	-62.30%	-30.96%	-4.67%	20.70%	-48.23%	-48.23%	-37.11%	236.73%	375.13%	570.02%
EVOC 28 MYS	64	161	-103.37%	-57.17%	1.01%	29.42%	29.42%	77.21%	-22.15%	-14.15%	177.02%	62.37%	98.22%	144.23%	48.47%	48.82%	54.39%	225.34%	360.27%	479.73%
EVOC 29 PHL	80	155	-8.87%	17.56%	38.77%	240.07%	320.11%	412.16%	240.07%	284.28%	394.05%	177.19%	229.84%	239.82%	304.89%	305.85%	321.04%	240.07%	332.63%	517.57%
EVOC 30 SGP	28	62	-131.99%	18.74%	31.88%	-47.01%	-47.01%	-29.26%	-71.61%	-69.63%	-62.10%	12.45%	65.43%	116.95%	-39.21%	-39.07%	-36.78%	300.03%	435.81%	709.12%
EVOC 31 THA	169	438	93.52%	151.44%	216.88%	38.66%	38.66%	104.46%	-15.06%	-6.78%	250.98%	87.35%	126.73%	164.83%	59.07%	59.45%	65.42%	361.79%	489.16%	798.29%
EVOC 32 RAA	766	1464	149.39%	222.31%	271.32%	148.42%	189.75%	230.80%	125.96%	184.86%	259.78%	131.31%	168.00%	183.80%	223.74%	229.40%	229.59%	222.91%	317.98%	499.63%
Pakistan	145	129	265.09%	338.28%	396.22%	399.23%	456.87%	521.77%	299.38%	457.61%	695.22%	265.75%	312.43%	367.83%	357.17%	384.63%	384.63%	399.23%	534.46%	894.02%
Figure 01 USA	6308	7759	-124.95%	-107.82%	-88.62%	-84.12%	-82.48%	-81.10%	-91.49%	-90.50%	-89.88%	-82.54%	-78.98%	-78.33%	-83.11%	-79.85%	-79.85%	-16.95%	11.04%	35.99%
Figure 02 EU27	5899	5225	-127.80%	-115.26%	-93.50%	-77.57%	-75.69%	-74.24%	-87.73%	-86.70%	-86.18%	-78.24%	-74.06%	-72.30%	-76.98%	-72.04%	-72.04%	-25.35%	1.92%	27.14%
Figure 03 FRA	592	592	-150.73%	-126.16%	-100.38%	-71.49%	-68.47%	-66.84%	-84.73%	-83.11%	-82.24%	-75.80%	-70.69%	-69.66%	-70.37%	-63.75%	-63.75%	-27.36%	4.79%	28.41%
Figure 04 GER	1253	990	-131.18%	-113.29%	-96.15%	-81.99%	-80.09%	-79.06%	-90.35%	-89.14%	-88.78%	-83.25%	-80.31%	-79.72%	-81.29%	-77.11%	-77.11%	-44.07%	-17.64%	4.97%
Figure 05 UK	789	686	-145.54%	-123.84%	-102.02%	-79.27%	-77.09%	-75.90%	-88.90%	-87.57%	-87.09%	-82.13%	-78.84%	-77.69%	-78.46%	-73.65%	-73.65%	-39.66%	-11.82%	10.73%
Figure 06 RUS+EEU	3998	2662	-92.78%	-80.06%	-68.40%	-85.43%	-84.79%	-80.68%	-92.19%	-91.50%	-89.65%	-83.30%	-77.24%	-74.41%	-84.46%	-82.51%	-82.51%	-33.18%	-1.57%	20.26%
Figure 07 JPN	1313	1234	-145.40%	-126.76%	-102.68%	-74.52%	-71.78%	-70.69%	-86.35%	-84.76%	-84.30%	-78.08%	-74.25%	-73.20%	-73.81%	-67.55%	-67.55%	-40.09%	-15.39%	8.31%
Figure 08 RAI	1237	1231	-101.01%	-91.94%	-76.21%	-82.91%	-81.52%	-79.80%	-90.83%	-89.85%	-89.18%	-77.21%	-71.77%	-71.18%	-81.94%	-78.74%	-78.74%	-5.36%	24.20%	50.21%
Figure 09 REEU	1172	1262	-31.72%	-20.44%	6.41%	-43.54%	-39.87%	-22.38%	-64.27%	-62.69%	-49.58%	-42.32%	-22.78%	-18.94%	-39.77%	-31.62%	-30.17%	48.11%	108.54%	142.91%
Figure 10 LAM	2192	4093	8.68%	22.59%	42.77%	0.19%	2.56%	40.66%	-24.12%	-0.93%	88.56%	15.78%	34.26%	57.54%	9.99%	9.99%	20.79%	147.65%	246.86%	323.21%
Figure 11 AFR	1406	2680	334.84%	450.26%	564.28%	268.89%	312.80%	326.69%	289.66%	345.57%	398.49%	208.55%	233.25%	239.82%	264.91%	291.05%	320.62%	437.48%	658.79%	904.19%
Figure 12 ME	949	2174	198.57%	239.28%	275.69%	1.37%	9.16%	46.65%	-20.07%	-8.28%	17.60%	23.80%	72.48%	85.41%	4.98%	20.56%	28.61%	342.88%	545.71%	629.59%
Figure 13 SAsia	1355	2871	217.95%	291.44%	329.80%	400.34%	452.93%	491.28%	346.44%	522.36%	717.20%	250.80%	297.24%	345.96%	369.07%	397.24%	397.24%	451.43%	620.80%	1040.56%
Figure 14 CPAsia	3779	8363	30.34%	36.74%	87.82%	-1.69%	-0.34%	73.11%	-36.37%	-33.83%	157.77%	3.27%	32.24%	38.57%	12.94%	12.94%	37.19%	172.45%	284.86%	437.11%
Figure 15 EAsia	1230	2945	100.84%	124.26%	160.27%	88.78%	124.10%	132.25%	67.90%	102.43%	145.01%	71.82%	107.33%	127.03%	103.17%	103.18%	113.76%	257.43%	371.88%	578.27%
UNFCCC Annex I	19203	18701	-112.30%	-102.57%	-86.02%	-79.91%	-78.25%	-75.51%	-89.16%	-88.12%	-86.87%	-79.04%	-73.87%	-72.47%	-78.58%	-74.99%	-74.99%	-17.80%	12.05%	34.40%
UNFCCC Non Annex I	11268	22989	114.50%	138.99%	153.45%	88.65%	106.66%	140.02%	73.29%	121.45%	181.60%	68.75%	97.93%	108.06%	99.43%	99.43%	105.64%	272.52%	381.71%	556.56%
World total	30706	42206	-10.00%	-10.00%	-10.00%	-16.25%	-9.53%	4.65%	-28.65%	-10.24%	12.97%	-23.01%	-9.65%	-4.88%	-10.00%	-10.00%	-10.00%	90.79%	150.79%	229.89%

Table 16. Median share in the global reduction effort due to the Responsibility-Capability-Index (RCI) under the GDRs approach from 2010 to 2050 for the stabilisation of global emissions at 450 ppmv CO_2eq

450 ppmv	2020			2030			2040			2050		
	min	median	max	min	median	max	min	median	max	min	median	max
EVOC 01 USA	26.0%	26.5%	26.5%	20.0%	21.0%	21.0%	15.0%	17.0%	17.0%	13.0%	14.0%	14.0%
EVOC 02 EU15	19.0%	19.0%	19.0%	15.0%	15.0%	15.0%	11.0%	12.0%	12.0%	9.0%	10.0%	10.0%
EVOC 03 EU+12	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
EVOC 04 RWEU	1.0%	1.0%	1.0%	0.0%	0.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EVOC 05 RUS	3.0%	4.0%	4.0%	4.0%	4.5%	4.5%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%
EVOC 06 REEU in Ann	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 07 JPN	5.0%	6.0%	6.0%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
EVOC 08 RAI	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%
EVOC 09 TUR	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 10 REEU	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 11 ARG	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 12 BRZ	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
EVOC 13 MEX	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 14 VEN	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%
EVOC 15 RLA	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 16 EGY	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 17 ZAF	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 18 NGA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EVOC 19 RNA	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%
EVOC 20 RAF	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%
EVOC 21 SAU	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 22 ARE	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 23 RME	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%
EVOC 24 CHN	11.0%	15.0%	15.0%	12.0%	19.0%	19.0%	14.0%	20.0%	20.0%	15.0%	20.0%	20.0%
EVOC 25 IND	1.0%	2.0%	2.0%	2.0%	4.5%	4.5%	3.0%	7.5%	7.5%	4.0%	10.5%	10.5%
EVOC 26 IDN	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%	1.0%	1.5%	1.5%
EVOC 27 KOR	2.0%	3.0%	3.0%	2.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 28 MYS	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%	0.0%	0.0%	0.0%
EVOC 29 PHL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%
EVOC 30 SGP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EVOC 31 THA	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 32 RAA	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.5%	1.5%	1.0%	2.0%	2.0%
Pakistan	0.0%	0.1%	0.1%	0.0%	0.3%	0.3%	0.1%	0.5%	0.5%	0.1%	0.9%	0.9%
Figure 01 USA	26.0%	26.5%	26.5%	20.0%	21.0%	21.0%	15.0%	17.0%	17.0%	13.0%	14.0%	14.0%
Figure 02 EU27	22.0%	22.0%	22.0%	18.0%	18.0%	18.0%	15.0%	15.5%	15.5%	12.0%	13.0%	13.0%
Figure 03 FRA	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	1.0%	1.5%	1.5%
Figure 04 GER	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%
Figure 05 UK	3.0%	3.0%	3.0%	2.0%	2.5%	2.5%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Figure 06 RUS+EEU	4.0%	4.5%	4.5%	4.0%	5.5%	5.5%	5.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Figure 07 JPN	5.0%	6.0%	6.0%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Figure 08 RAI	4.0%	4.5%	4.5%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	2.0%	3.0%	3.0%
Figure 09 REEU	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	3.0%	3.0%	2.0%	3.0%	3.0%
Figure 10 LAM	7.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	9.0%	9.0%	8.0%	9.0%	9.0%
Figure 11 AFR	2.0%	2.5%	2.5%	3.0%	4.0%	4.0%	4.0%	5.0%	5.0%	5.0%	7.0%	7.0%
Figure 12 ME	3.0%	3.0%	3.0%	4.0%	4.0%	4.0%	4.0%	5.0%	5.0%	4.0%	5.0%	5.0%
Figure 13 SAsia	1.0%	2.0%	2.0%	2.0%	5.5%	5.5%	3.0%	9.0%	9.0%	4.0%	12.0%	12.0%
Figure 14 CPAsia	11.0%	15.0%	15.0%	12.0%	19.0%	19.0%	14.0%	20.0%	20.0%	15.0%	20.0%	20.0%
Figure 15 EAsia	4.0%	5.0%	5.0%	5.0%	6.0%	6.0%	5.0%	7.0%	7.0%	5.0%	7.0%	7.0%
UNFCCC Annex I	63.0%	63.5%	63.5%	52.0%	54.0%	54.0%	44.0%	45.5%	45.5%	38.0%	40.5%	40.5%
UNFCCC Non Annex I	30.0%	36.0%	36.0%	36.0%	46.0%	46.0%	42.0%	54.0%	54.0%	48.0%	59.5%	59.5%
World total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 17. Median share in the global reduction effort due to the Responsibility-Capability-Index (RCI) under the GDRs approach from 2010 to 2050 for the stabilisation of global emissions at 550 ppmv CO_2eq

550 ppmv	2020			2030			2040			2050		
	min	median	max	min	median	max	min	median	max	min	median	max
EVOC 01 USA	26.0%	26.5%	26.5%	20.0%	21.0%	21.0%	16.0%	17.0%	17.0%	13.0%	14.0%	14.0%
EVOC 02 EU15	19.0%	19.0%	19.0%	15.0%	15.5%	15.5%	11.0%	12.5%	12.5%	9.0%	10.5%	10.5%
EVOC 03 EU+12	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
EVOC 04 RWEU	1.0%	1.0%	1.0%	0.0%	1.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EVOC 05 RUS	3.0%	4.0%	4.0%	4.0%	4.5%	4.5%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%
EVOC 06 REEU in Ann	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 07 JPN	6.0%	6.0%	6.0%	4.0%	4.5%	4.5%	3.0%	3.5%	3.5%	3.0%	3.0%	3.0%
EVOC 08 RAI	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%
EVOC 09 TUR	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 10 REEU	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 11 ARG	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 12 BRZ	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
EVOC 13 MEX	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 14 VEN	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%
EVOC 15 RLA	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 16 EGY	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 17 ZAF	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 18 NGA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EVOC 19 RNA	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%
EVOC 20 RAF	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%
EVOC 21 SAU	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 22 ARE	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%
EVOC 23 RME	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%
EVOC 24 CHN	11.0%	15.0%	15.0%	12.0%	19.0%	19.0%	13.0%	20.0%	20.0%	14.0%	20.0%	20.0%
EVOC 25 IND	1.0%	2.0%	2.0%	1.0%	4.5%	4.5%	2.0%	7.5%	7.5%	4.0%	10.5%	10.5%
EVOC 26 IDN	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 27 KOR	2.0%	3.0%	3.0%	2.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 28 MYS	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 29 PHL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%
EVOC 30 SGP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EVOC 31 THA	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 32 RAA	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.5%	1.5%	1.0%	2.0%	2.0%
Pakistan	0.0%	0.1%	0.1%	0.0%	0.3%	0.3%	0.1%	0.5%	0.5%	0.1%	0.8%	0.8%
Figure 01 USA	26.0%	26.5%	26.5%	20.0%	21.0%	21.0%	16.0%	17.0%	17.0%	13.0%	14.0%	14.0%
Figure 02 EU27	22.0%	22.0%	22.0%	18.0%	18.5%	18.5%	15.0%	15.5%	15.5%	12.0%	13.0%	13.0%
Figure 03 FRA	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	1.0%	1.5%	1.5%
Figure 04 GER	4.0%	4.0%	4.0%	3.0%	3.5%	3.5%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%
Figure 05 UK	3.0%	3.0%	3.0%	2.0%	2.5%	2.5%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Figure 06 RUS+EEU	4.0%	4.5%	4.5%	4.0%	5.5%	5.5%	5.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Figure 07 JPN	6.0%	6.0%	6.0%	4.0%	4.5%	4.5%	3.0%	3.5%	3.5%	3.0%	3.0%	3.0%
Figure 08 RAI	4.0%	4.5%	4.5%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	2.0%	3.0%	3.0%
Figure 09 REEU	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.5%	2.5%	2.0%	3.0%	3.0%
Figure 10 LAM	7.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	9.0%	9.0%	8.0%	9.0%	9.0%
Figure 11 AFR	2.0%	2.0%	2.0%	3.0%	4.0%	4.0%	4.0%	5.0%	5.0%	5.0%	6.5%	6.5%
Figure 12 ME	3.0%	3.0%	3.0%	4.0%	4.0%	4.0%	4.0%	5.0%	5.0%	4.0%	5.0%	5.0%
Figure 13 SAsia	1.0%	2.0%	2.0%	2.0%	5.5%	5.5%	3.0%	8.5%	8.5%	4.0%	12.0%	12.0%
Figure 14 CPAsia	11.0%	15.0%	15.0%	12.0%	19.0%	19.0%	13.0%	20.0%	20.0%	14.0%	20.0%	20.0%
Figure 15 EAsia	4.0%	5.0%	5.0%	5.0%	6.0%	6.0%	5.0%	7.0%	7.0%	5.0%	7.0%	7.0%
UNFCCC Annex I	63.0%	64.5%	64.5%	53.0%	54.0%	54.0%	44.0%	46.5%	46.5%	38.0%	40.5%	40.5%
UNFCCC Non Annex I	30.0%	35.5%	35.5%	36.0%	45.5%	45.5%	42.0%	53.5%	53.5%	47.0%	59.5%	59.5%
World total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 18. Median share in the global reduction effort due to the Responsibility-Capability-Index (RCI) under the GDRs approach from 2010 to 2050 for the stabilisation of global emissions at 650 ppmv CO_2eq

650 ppmv	2020			2030			2040			2050		
	min	median	max	min	median	max	min	median	max	min	median	max
EVOC 01 USA	26.0%	26.5%	26.5%	20.0%	21.0%	21.0%	16.0%	17.0%	17.0%	13.0%	15.0%	15.0%
EVOC 02 EU15	19.0%	19.0%	19.0%	15.0%	15.5%	15.5%	12.0%	12.5%	12.5%	10.0%	10.5%	10.5%
EVOC 03 EU+12	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
EVOC 04 RWEU	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EVOC 05 RUS	3.0%	4.0%	4.0%	4.0%	4.5%	4.5%	4.0%	4.5%	4.5%	5.0%	5.0%	5.0%
EVOC 06 REEU in Ann	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 07 JPN	6.0%	6.0%	6.0%	4.0%	4.5%	4.5%	3.0%	3.5%	3.5%	3.0%	3.0%	3.0%
EVOC 08 RAI	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%
EVOC 09 TUR	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 10 REEU	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 11 ARG	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 12 BRZ	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
EVOC 13 MEX	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 14 VEN	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%
EVOC 15 RLA	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 16 EGY	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 17 ZAF	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%
EVOC 18 NGA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EVOC 19 RNA	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%
EVOC 20 RAF	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%
EVOC 21 SAU	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 22 ARE	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%
EVOC 23 RME	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	3.0%	3.0%	2.0%	3.0%	3.0%
EVOC 24 CHN	11.0%	15.0%	15.0%	12.0%	19.0%	19.0%	13.0%	20.0%	20.0%	14.0%	20.0%	20.0%
EVOC 25 IND	1.0%	2.0%	2.0%	1.0%	4.5%	4.5%	2.0%	7.5%	7.5%	3.0%	10.0%	10.0%
EVOC 26 IDN	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 27 KOR	2.0%	3.0%	3.0%	2.0%	3.0%	3.0%	2.0%	3.0%	3.0%	2.0%	2.0%	2.0%
EVOC 28 MYS	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 29 PHL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%
EVOC 30 SGP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EVOC 31 THA	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
EVOC 32 RAA	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	1.5%	1.5%	1.0%	2.0%	2.0%
Pakistan	0.0%	0.1%	0.1%	0.0%	0.2%	0.2%	0.1%	0.5%	0.5%	0.1%	0.8%	0.8%
Figure 01 USA	26.0%	26.5%	26.5%	20.0%	21.0%	21.0%	16.0%	17.0%	17.0%	13.0%	15.0%	15.0%
Figure 02 EU27	22.0%	22.0%	22.0%	18.0%	19.0%	19.0%	15.0%	15.5%	15.5%	12.0%	13.5%	13.5%
Figure 03 FRA	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	1.0%	1.5%	1.5%
Figure 04 GER	4.0%	4.0%	4.0%	3.0%	3.5%	3.5%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%
Figure 05 UK	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Figure 06 RUS+EEU	4.0%	4.5%	4.5%	4.0%	5.5%	5.5%	5.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Figure 07 JPN	6.0%	6.0%	6.0%	4.0%	4.5%	4.5%	3.0%	3.5%	3.5%	3.0%	3.0%	3.0%
Figure 08 RAI	4.0%	4.5%	4.5%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Figure 09 REEU	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.5%	2.5%	2.0%	3.0%	3.0%
Figure 10 LAM	7.0%	7.0%	7.0%	8.0%	8.0%	8.0%	8.0%	9.0%	9.0%	8.0%	9.0%	9.0%
Figure 11 AFR	2.0%	2.0%	2.0%	3.0%	3.0%	3.0%	3.0%	5.0%	5.0%	4.0%	6.0%	6.0%
Figure 12 ME	3.0%	3.0%	3.0%	3.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	5.0%	5.0%
Figure 13 SAsia	1.0%	2.0%	2.0%	2.0%	5.0%	5.0%	2.0%	8.0%	8.0%	4.0%	11.5%	11.5%
Figure 14 CPAsia	11.0%	15.0%	15.0%	12.0%	19.0%	19.0%	13.0%	20.0%	20.0%	14.0%	20.0%	20.0%
Figure 15 EAsia	4.0%	5.0%	5.0%	5.0%	6.0%	6.0%	5.0%	7.0%	7.0%	5.0%	7.0%	7.0%
UNFCCC Annex I	64.0%	64.5%	64.5%	53.0%	55.0%	55.0%	45.0%	47.0%	47.0%	39.0%	41.5%	41.5%
UNFCCC Non Annex I	30.0%	35.5%	35.5%	35.0%	45.0%	45.0%	41.0%	52.5%	52.5%	46.0%	58.5%	58.5%
World total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 19. Cumulative emission allowances per capita for different (groups of) countries under the GDRs, CDC, Multistage, Triptych and C&C approaches between 2010 and 2050 for stabilisation at 450 ppmv CO_2eq as average per year

450 ppmv CO2eq	Cumulative emission allowances from 2010-2050 [t CO2eq per capita] divided by number of years														
	GDRs			CDC			Multistage (per capita)			Triptych			C&C 2050 convergence		
	min	median	max	min	median	max	min	median	max	min	median	max	min	median	max
EVOC 01 USA	1.2	3.0	5.7	11.5	11.5	11.7	8.2	8.3	8.3	11.4	11.7	11.7	10.5	10.7	10.9
EVOC 02 EU15	-0.4	0.8	2.4	5.7	5.8	5.9	5.2	5.3	5.3	5.7	5.9	5.9	5.7	5.9	6.0
EVOC 03 EU+12	3.2	4.5	5.8	5.7	5.9	6.2	5.2	5.4	5.6	6.0	6.6	7.1	5.7	6.1	6.2
EVOC 04 RWEU	-3.3	-1.9	0.1	4.9	5.1	5.1	4.5	4.6	4.6	5.3	5.5	5.7	5.0	5.2	5.2
EVOC 05 RUS	6.7	8.0	9.5	7.2	7.5	7.8	6.3	6.5	6.7	7.4	8.1	8.6	7.2	7.4	7.5
EVOC 06 REEU in Annex I	4.9	5.8	7.4	4.8	5.0	5.3	4.6	4.7	4.8	5.0	5.6	6.1	5.0	5.2	5.2
EVOC 07 JPN	-0.8	0.3	1.6	5.3	5.4	5.5	5.0	5.0	5.1	5.2	5.4	5.4	5.4	5.6	5.7
EVOC 08 RAI	6.4	7.7	8.9	9.8	9.9	10.0	7.8	7.9	7.9	10.1	10.4	10.5	9.2	9.4	9.6
EVOC 09 TUR	2.6	2.9	3.5	2.7	2.9	3.3	2.3	2.3	2.5	2.6	3.0	3.1	2.8	3.0	3.1
EVOC 10 REEU	6.4	7.5	8.3	4.6	4.8	5.0	4.1	4.5	4.8	4.8	5.3	5.7	4.7	4.9	5.0
EVOC 11 ARG	4.1	4.5	5.4	5.0	5.1	5.6	4.3	4.7	5.0	5.3	5.7	5.9	4.9	5.0	5.2
EVOC 12 BRZ	3.2	3.5	4.2	3.4	3.5	3.9	3.1	3.3	3.5	3.8	4.1	4.3	3.6	3.6	3.7
EVOC 13 MEX	2.5	3.0	3.6	3.4	3.5	3.9	3.0	3.3	3.6	3.3	3.6	3.7	3.5	3.6	3.7
EVOC 14 VEN	13.4	15.9	17.6	6.3	6.5	7.0	6.0	6.6	7.1	7.4	8.1	8.2	6.1	6.1	6.4
EVOC 15 RLA	5.0	5.8	6.3	3.7	3.9	4.3	3.4	3.8	4.6	3.9	4.3	4.6	3.8	3.9	4.0
EVOC 16 EGY	3.2	3.8	4.0	2.4	2.5	3.0	2.4	2.9	4.7	2.0	2.3	2.4	2.4	2.5	2.6
EVOC 17 ZAF	4.6	5.6	6.1	4.7	4.7	4.9	3.8	4.0	4.4	4.7	5.0	5.3	4.3	4.4	4.6
EVOC 18 NGA	3.9	5.4	6.3	2.3	2.4	2.6	2.0	2.7	4.0	2.1	2.2	2.3	2.2	2.3	2.5
EVOC 19 RNA	3.6	4.1	4.2	2.9	3.1	3.5	2.9	3.3	3.7	2.6	2.9	3.0	2.9	3.1	3.2
EVOC 20 RAF	2.1	2.6	2.9	1.7	1.8	1.8	1.8	2.1	2.2	1.3	1.4	1.4	1.7	1.8	1.9
EVOC 21 SAU	13.2	15.0	15.9	7.9	8.4	8.8	6.9	7.5	7.9	8.9	10.4	11.0	7.1	7.4	7.5
EVOC 22 ARE	37.6	43.7	49.0	18.9	19.9	20.5	14.9	16.2	16.7	20.4	22.7	23.7	16.1	16.5	16.8
EVOC 23 RME	6.3	7.3	7.8	4.0	4.3	4.6	3.6	3.8	4.3	3.9	4.5	4.7	3.9	4.1	4.2
EVOC 24 CHN	4.0	4.5	5.1	3.5	3.7	4.1	3.1	3.6	4.0	3.5	4.1	4.2	3.8	3.8	4.1
EVOC 25 IND	2.0	2.4	2.6	2.1	2.2	2.3	2.4	3.0	3.7	1.4	1.6	1.8	2.0	2.1	2.1
EVOC 26 IDN	2.5	2.9	3.2	2.3	2.4	2.6	2.7	3.3	3.8	1.8	2.0	2.1	2.4	2.5	2.5
EVOC 27 KOR	5.8	7.0	7.7	7.1	7.5	8.0	6.4	7.3	8.0	7.6	9.1	9.8	7.1	7.3	7.5
EVOC 28 MYS	1.9	2.3	3.2	3.3	3.5	3.8	2.9	3.3	3.5	3.4	3.9	4.3	3.5	3.6	3.7
EVOC 29 PHL	1.0	1.1	1.2	1.9	2.1	2.1	2.0	2.4	2.7	1.4	1.5	1.6	2.0	2.0	2.0
EVOC 30 SGP	1.2	5.0	5.9	6.4	6.8	7.1	5.7	6.6	7.0	7.5	9.2	10.3	6.3	6.5	6.6
EVOC 31 THA	4.3	5.2	5.7	3.6	3.7	4.0	3.2	3.7	3.9	4.0	4.6	5.0	3.8	3.8	3.9
EVOC 32 RAA	2.4	2.9	3.2	1.9	2.1	2.2	2.0	2.4	2.7	1.6	1.8	1.9	2.2	2.3	2.3
Pakistan	2.1	2.5	2.8	2.0	2.1	2.2	2.1	2.8	3.1	1.4	1.6	1.8	2.0	2.0	2.0
Figure 01 USA	1.2	3.0	5.7	11.5	11.5	11.7	8.2	8.3	8.3	11.4	11.7	11.7	10.5	10.7	10.9
Figure 02 EU27	0.5	1.5	2.9	5.7	5.8	5.9	5.2	5.3	5.3	5.7	6.0	6.1	5.7	5.9	6.0
Figure 03 FRA	-1.5	-0.3	1.3	5.0	5.2	5.2	4.7	4.7	4.8	5.0	5.1	5.2	5.1	5.3	5.4
Figure 04 GER	-0.1	1.1	2.7	6.3	6.4	6.5	5.7	5.7	5.8	6.3	6.5	6.5	6.2	6.4	6.5
Figure 05 UK	-1.5	-0.2	1.6	6.0	6.1	6.2	5.4	5.5	5.5	5.9	6.1	6.2	5.9	6.1	6.2
Figure 06 RUS+EEU	6.1	7.3	8.8	6.5	6.8	7.1	5.8	5.9	6.1	6.7	7.3	7.8	6.5	6.8	6.8
Figure 07 JPN	-0.8	0.3	1.6	5.3	5.4	5.5	5.0	5.0	5.1	5.2	5.4	5.4	5.4	5.6	5.7
Figure 08 RAI	4.8	6.1	7.4	9.0	9.1	9.2	7.3	7.3	7.4	9.3	9.6	9.7	8.5	8.7	8.9
Figure 09 REEU	4.5	5.0	5.7	3.6	3.8	4.1	3.2	3.4	3.6	3.6	4.1	4.3	3.7	3.9	4.0
Figure 10 LAM	4.4	4.9	5.3	3.8	3.9	4.3	3.4	3.8	4.2	4.0	4.4	4.6	3.9	3.9	4.1
Figure 11 AFR	2.7	3.4	3.7	2.1	2.2	2.3	2.1	2.5	2.8	1.8	1.9	1.9	2.1	2.2	2.2
Figure 12 ME	8.0	9.2	9.8	4.9	5.2	5.6	4.3	4.6	5.0	5.0	5.7	6.0	4.6	4.8	4.9
Figure 13 SAsia	1.9	2.2	2.4	1.9	2.0	2.1	2.2	2.7	3.4	1.3	1.5	1.7	2.0	2.1	2.1
Figure 14 CPAsia	4.1	4.6	5.2	3.5	3.7	4.1	3.1	3.6	4.0	3.5	4.1	4.3	3.8	3.9	4.1
Figure 15 EAsia	3.2	3.8	4.0	2.9	3.0	3.2	3.0	3.5	3.8	2.7	3.1	3.2	3.0	3.1	3.1
UNFCCC Annex I	2.1	3.2	4.4	7.2	7.4	7.5	5.9	6.0	6.1	7.2	7.6	7.7	7.0	7.1	7.2
UNFCCC Non Annex I	3.4	3.7	3.9	2.8	2.9	3.1	2.8	3.2	3.4	2.5	2.8	3.0	2.9	2.9	2.9
World total	3.6	3.7	3.7	3.6	3.7	3.9	3.4	3.7	3.9	3.4	3.7	3.8	3.7	3.7	3.7

Table 20. Cumulative emission allowances per capita for different (groups of) countries under the GDRs, CDC, Multistage, Triptych and C&C approaches between 2010 and 2050 for stabilisation at 550 ppmv CO_2eq as average per year

550 ppmv CO2eq	Cumulative emission allowances from 2010-2050 [t CO2eq per capita] divided by number of years														
	GDRs			CDC			Multistage (per capita)			Triptych			C&C 2050 convergence		
	min	median	max	min	median	max	min	median	max	min	median	max	min	median	max
EVOC 01 USA	4.7	6.5	9.3	12.8	12.9	13.1	10.0	10.1	10.2	12.2	12.6	12.7	12.1	12.4	12.7
EVOC 02 EU15	1.8	3.0	4.6	6.5	6.6	6.7	5.9	6.0	6.0	6.3	6.6	6.7	6.6	6.9	7.0
EVOC 03 EU+12	5.1	6.4	7.7	6.5	6.8	7.1	6.0	6.2	6.4	6.8	7.5	8.1	6.7	7.1	7.3
EVOC 04 RWEU	-1.1	0.5	2.5	5.6	5.8	5.9	5.2	5.2	5.3	6.2	6.6	6.9	5.9	6.1	6.2
EVOC 05 RUS	8.6	10.0	11.4	8.1	8.5	8.9	7.4	7.6	7.8	8.3	9.3	9.9	8.4	8.7	8.8
EVOC 06 REEU in Annex I	6.1	7.0	8.4	5.6	5.8	6.2	5.2	5.3	5.6	5.8	6.6	7.2	5.9	6.2	6.2
EVOC 07 JPN	1.2	2.3	3.5	6.0	6.2	6.3	5.7	5.7	5.8	5.9	6.1	6.2	6.3	6.6	6.7
EVOC 08 RAI	9.4	10.7	12.3	10.9	11.0	11.2	9.2	9.3	9.3	11.0	11.5	11.6	10.6	10.9	11.1
EVOC 09 TUR	3.2	3.6	4.2	3.3	3.5	4.1	2.6	2.7	3.0	3.3	3.9	4.0	3.5	3.7	3.9
EVOC 10 REEU	7.0	8.2	9.0	5.3	5.6	5.9	4.9	5.3	5.8	5.5	6.2	6.6	5.6	5.9	5.9
EVOC 11 ARG	5.6	6.0	7.2	5.8	5.9	6.6	5.2	5.5	6.3	6.3	6.8	7.1	5.9	6.0	6.2
EVOC 12 BRZ	4.0	4.3	5.1	4.1	4.2	4.7	3.9	4.8	6.5	4.5	4.9	5.3	4.3	4.4	4.6
EVOC 13 MEX	3.4	3.9	4.6	4.1	4.1	4.7	3.7	4.3	6.4	4.2	4.6	4.7	4.3	4.4	4.6
EVOC 14 VEN	14.2	16.9	18.7	7.3	7.4	8.1	6.9	7.7	8.2	8.7	9.7	9.9	7.2	7.3	7.6
EVOC 15 RLA	5.5	6.4	7.0	4.8	5.1	5.6	4.7	5.1	5.7	4.9	5.3	5.8	4.6	4.7	4.9
EVOC 16 EGY	3.4	4.2	4.4	3.6	3.9	4.6	3.6	4.6	4.9	2.8	3.1	3.3	3.1	3.2	3.4
EVOC 17 ZAF	5.9	7.0	7.5	5.5	5.5	5.8	4.4	4.9	5.7	5.8	6.2	6.6	5.2	5.4	5.6
EVOC 18 NGA	4.0	5.4	6.4	3.2	3.6	4.0	3.6	4.2	4.9	2.7	2.9	3.0	2.8	3.0	3.2
EVOC 19 RNA	4.1	4.7	4.9	3.8	4.2	4.7	3.8	4.3	5.4	3.4	3.8	4.0	3.7	3.9	4.0
EVOC 20 RAF	2.2	2.7	3.0	2.0	2.3	2.5	2.0	2.4	2.6	1.8	1.9	2.0	2.2	2.4	2.5
EVOC 21 SAU	15.2	17.2	18.2	9.0	9.5	10.1	7.9	8.6	9.1	10.5	12.4	13.3	8.3	8.7	8.9
EVOC 22 ARE	42.6	49.5	54.4	20.9	22.0	22.8	17.7	19.4	20.2	22.7	25.6	27.0	18.4	18.8	19.2
EVOC 23 RME	7.0	8.1	8.6	4.9	5.2	5.7	4.6	5.1	5.6	4.8	5.6	5.8	4.7	5.0	5.2
EVOC 24 CHN	4.8	5.3	5.9	4.1	4.3	5.1	4.0	4.6	6.8	4.3	5.0	5.2	4.6	4.6	4.9
EVOC 25 IND	2.3	2.7	2.9	2.7	3.1	3.3	2.5	3.3	4.1	2.0	2.3	2.5	2.6	2.7	2.7
EVOC 26 IDN	2.7	3.1	3.4	3.1	3.6	3.7	2.8	3.6	4.2	2.4	2.7	2.8	3.1	3.1	3.2
EVOC 27 KOR	8.5	9.7	10.9	8.0	8.5	9.2	7.2	8.4	9.3	8.7	10.5	11.4	8.3	8.5	8.9
EVOC 28 MYS	2.8	3.3	4.4	3.9	4.1	4.5	3.6	4.0	5.6	4.2	4.9	5.4	4.2	4.3	4.5
EVOC 29 PHL	1.3	1.4	1.5	2.1	2.5	2.9	2.1	2.4	2.8	1.9	2.2	2.2	2.6	2.6	2.7
EVOC 30 SGP	4.1	7.8	8.8	7.3	7.7	8.2	6.4	7.6	8.1	8.8	10.9	12.3	7.4	7.6	7.8
EVOC 31 THA	5.1	6.2	6.7	4.2	4.4	5.0	4.2	4.7	7.1	4.9	5.7	6.2	4.6	4.7	4.8
EVOC 32 RAA	2.5	3.0	3.4	2.3	2.6	2.8	2.2	2.6	3.0	2.2	2.5	2.6	2.9	2.9	2.9
Pakistan	2.2	2.6	3.0	2.5	2.8	3.1	2.2	2.8	3.6	2.0	2.3	2.6	2.5	2.7	2.7
Figure 01 USA	4.7	6.5	9.3	12.8	12.9	13.1	10.0	10.1	10.2	12.2	12.6	12.7	12.1	12.4	12.7
Figure 02 EU27	2.6	3.6	5.1	6.5	6.7	6.8	6.0	6.0	6.1	6.4	6.8	7.0	6.7	7.0	7.0
Figure 03 FRA	0.4	1.7	3.3	5.8	5.9	6.0	5.3	5.4	5.4	5.6	5.9	5.9	6.0	6.3	6.4
Figure 04 GER	2.2	3.4	5.1	7.1	7.3	7.4	6.5	6.6	6.6	7.0	7.2	7.3	7.2	7.5	7.7
Figure 05 UK	0.8	2.2	4.1	6.8	7.0	7.0	6.2	6.3	6.3	6.6	6.8	6.9	6.9	7.2	7.3
Figure 06 RUS+EEU	7.9	9.1	10.5	7.4	7.7	8.1	6.7	6.9	7.2	7.6	8.5	9.1	7.7	7.9	8.0
Figure 07 JPN	1.2	2.3	3.5	6.0	6.2	6.3	5.7	5.7	5.8	5.9	6.1	6.2	6.3	6.6	6.7
Figure 08 RAI	7.7	9.0	10.6	10.0	10.2	10.3	8.5	8.6	8.7	10.2	10.7	10.8	9.8	10.1	10.3
Figure 09 REEU	5.2	5.7	6.3	4.3	4.5	4.9	3.7	4.0	4.3	4.4	5.0	5.3	4.5	4.8	4.8
Figure 10 LAM	5.2	5.7	6.3	4.6	4.8	5.3	4.4	5.1	6.2	4.9	5.4	5.7	4.7	4.7	5.0
Figure 11 AFR	2.9	3.6	3.9	2.6	3.0	3.1	2.7	3.1	3.4	2.4	2.5	2.6	2.7	2.8	2.9
Figure 12 ME	8.9	10.3	10.9	5.8	6.1	6.7	5.3	5.9	6.4	6.0	6.9	7.3	5.5	5.8	6.0
Figure 13 SAsia	2.1	2.4	2.7	2.5	2.8	3.0	2.3	3.0	3.6	1.9	2.2	2.4	2.5	2.7	2.7
Figure 14 CPAsia	4.9	5.4	6.0	4.1	4.3	5.1	4.0	4.6	6.8	4.3	5.0	5.2	4.6	4.7	4.9
Figure 15 EAsia	3.7	4.3	4.6	3.5	4.0	4.1	3.4	3.9	4.3	3.4	3.9	4.1	3.7	3.8	3.9
UNFCCC Annex I	4.4	5.5	6.8	8.1	8.3	8.5	7.0	7.1	7.2	8.0	8.5	8.7	8.2	8.4	8.5
UNFCCC Non Annex I	3.9	4.2	4.4	3.4	3.7	3.9	3.4	3.9	4.5	3.2	3.6	3.8	3.6	3.6	3.7
World total	4.4	4.5	4.5	4.3	4.5	4.8	4.0	4.5	5.0	4.1	4.5	4.6	4.5	4.5	4.5

Table 21. Cumulative emission allowances per capita for different (groups of) countries under the GDRs, CDC, Multistage, Triptych and C&C approaches between 2010 and 2050 for stabilisation at 650 ppmv CO_2eq as average per year

650 ppmv CO2eq	Cumulative emission allowances from 2010-2050 [t CO2eq per capita] divided by number of years														
	GDRs			CDC			Multistage (per capita)			Triptych			C&C 2050 convergence		
	min	median	max	min	median	max	min	median	max	min	median	max	min	median	max
EVOC 01 USA	9.4	11.7	14.6	14.0	14.2	14.4	14.5	14.6	14.6	14.0	14.8	14.9	14.0	14.5	14.8
EVOC 02 EU15	4.7	6.0	7.9	7.6	7.8	7.9	7.8	8.0	8.1	7.3	7.8	8.0	7.9	8.3	8.4
EVOC 03 EU+12	7.9	9.2	10.5	7.6	7.9	8.3	7.9	8.3	8.6	8.3	9.3	10.3	8.0	8.6	8.7
EVOC 04 RWEU	2.0	3.7	5.9	6.7	7.0	7.1	6.9	7.0	7.1	7.7	8.7	9.2	7.0	7.4	7.5
EVOC 05 RUS	11.5	12.9	14.2	9.3	9.7	10.3	9.8	10.2	10.8	9.8	11.3	12.3	9.9	10.3	10.4
EVOC 06 REEU in Annex I	7.8	8.7	9.8	6.8	7.1	7.6	6.9	7.1	7.7	7.0	8.3	9.3	7.2	7.5	7.6
EVOC 07 JPN	3.8	5.0	6.3	7.1	7.4	7.5	7.4	7.6	7.6	6.8	7.3	7.5	7.5	7.9	8.0
EVOC 08 RAI	13.5	15.2	17.2	12.0	12.2	12.5	12.5	12.7	12.8	12.9	13.7	13.8	12.3	12.7	12.9
EVOC 09 TUR	4.2	4.5	5.2	4.6	4.8	5.8	4.5	4.8	5.7	4.3	5.2	5.5	4.6	4.9	5.2
EVOC 10 REEU	7.9	9.2	9.9	6.3	6.7	7.1	6.2	6.8	7.4	6.6	7.6	8.3	6.8	7.2	7.2
EVOC 11 ARG	7.8	8.4	9.8	7.1	7.2	8.2	7.2	7.3	8.6	7.8	8.7	9.1	7.3	7.4	7.7
EVOC 12 BRZ	5.1	5.5	6.5	5.9	6.3	7.2	5.3	5.8	6.7	5.9	6.6	7.0	5.5	5.5	5.9
EVOC 13 MEX	4.7	5.4	6.2	5.8	6.4	7.4	5.5	6.3	7.8	5.4	6.0	6.3	5.5	5.5	5.8
EVOC 14 VEN	15.5	18.3	20.2	8.4	8.6	9.7	8.8	9.8	10.8	10.9	12.6	12.9	8.7	8.7	9.1
EVOC 15 RLA	6.3	7.2	7.9	5.4	6.2	6.7	5.3	6.1	6.7	6.2	6.9	7.6	5.8	5.9	6.2
EVOC 16 EGY	3.8	4.7	4.9	4.1	5.1	5.5	4.1	5.4	5.9	3.7	4.3	4.5	4.1	4.4	4.7
EVOC 17 ZAF	7.8	8.9	9.7	6.9	6.9	7.3	6.3	6.8	7.4	7.5	8.3	8.9	6.5	6.8	7.2
EVOC 18 NGA	4.0	5.5	6.5	4.1	4.6	4.8	4.1	5.0	6.0	3.5	3.8	4.0	3.8	4.1	4.4
EVOC 19 RNA	4.8	5.7	5.8	4.7	5.5	6.1	4.7	5.6	6.4	4.3	5.0	5.2	4.8	5.1	5.4
EVOC 20 RAF	2.2	2.8	3.1	2.2	2.6	2.9	2.2	2.8	3.3	2.4	2.6	2.6	3.1	3.3	3.6
EVOC 21 SAU	17.9	20.4	21.9	10.1	10.7	11.7	10.0	10.9	12.0	13.3	16.6	18.1	9.9	10.3	10.6
EVOC 22 ARE	49.7	57.8	62.2	21.7	22.8	23.9	22.3	24.6	25.8	26.8	31.6	34.1	20.8	21.4	21.9
EVOC 23 RME	7.9	9.2	9.7	5.9	6.5	7.2	5.8	6.4	7.3	6.0	7.2	7.6	6.0	6.4	6.6
EVOC 24 CHN	5.9	6.6	7.2	5.8	6.5	7.6	5.6	5.9	7.7	5.3	6.3	6.7	5.7	5.8	6.2
EVOC 25 IND	2.5	3.1	3.4	2.9	3.7	4.5	2.9	3.7	4.9	2.6	3.2	3.6	3.5	3.7	3.7
EVOC 26 IDN	2.9	3.5	3.7	3.1	3.8	4.7	3.1	3.8	4.6	3.1	3.5	3.7	4.1	4.2	4.3
EVOC 27 KOR	12.6	14.0	15.9	9.1	9.6	10.7	9.1	10.6	12.0	10.8	13.6	15.4	9.8	10.1	10.6
EVOC 28 MYS	4.2	4.8	6.3	5.5	5.9	6.8	5.2	5.6	6.9	5.4	6.5	7.6	5.3	5.4	5.6
EVOC 29 PHL	1.7	1.8	2.0	2.1	2.6	3.2	2.1	2.6	3.2	2.5	2.9	3.1	3.5	3.5	3.6
EVOC 30 SGP	8.8	12.4	14.2	8.5	8.9	9.6	8.2	9.7	10.6	11.3	15.0	17.8	8.9	9.1	9.4
EVOC 31 THA	6.3	7.7	8.2	6.1	6.6	7.5	5.8	6.2	7.9	6.4	7.7	8.6	5.8	5.9	6.0
EVOC 32 RAA	2.6	3.2	3.6	2.4	2.8	3.3	2.4	2.9	3.4	2.8	3.2	3.5	3.9	3.9	3.9
Pakistan	16.6	20.6	25.7	24.7	25.0	25.5	25.6	25.8	25.8	24.6	26.1	26.2	24.8	25.7	26.2
Figure 01 USA	9.4	11.7	14.6	14.0	14.2	14.4	14.5	14.6	14.6	14.0	14.8	14.9	14.0	14.5	14.8
Figure 02 EU27	5.4	6.7	8.3	7.6	7.8	8.0	7.8	8.0	8.2	7.5	8.1	8.4	8.0	8.3	8.4
Figure 03 FRA	3.1	4.5	6.3	6.9	7.1	7.2	7.1	7.2	7.3	6.4	6.8	7.0	7.2	7.6	7.7
Figure 04 GER	5.4	6.7	8.7	8.2	8.5	8.6	8.6	8.7	8.8	8.1	8.6	8.8	8.6	9.0	9.1
Figure 05 UK	4.0	5.5	7.6	7.9	8.1	8.3	8.2	8.4	8.5	7.6	8.0	8.2	8.2	8.6	8.8
Figure 06 RUS+EEU	10.4	11.7	12.8	8.5	8.9	9.5	8.9	9.2	9.9	9.0	10.4	11.4	9.1	9.5	9.5
Figure 07 JPN	3.8	5.0	6.3	7.1	7.4	7.5	7.4	7.6	7.6	6.8	7.3	7.5	7.5	7.9	8.0
Figure 08 RAI	11.6	13.3	15.1	11.1	11.3	11.6	11.6	11.7	11.8	12.0	12.9	13.1	11.4	11.8	12.0
Figure 09 REEU	6.2	6.7	7.3	5.4	5.7	6.4	5.4	5.8	6.5	5.4	6.4	6.8	5.7	6.0	6.1
Figure 10 LAM	6.3	6.9	7.7	6.0	6.5	7.2	5.9	6.3	7.2	6.3	7.1	7.4	5.9	6.0	6.3
Figure 11 AFR	3.1	3.9	4.2	3.0	3.5	3.8	3.0	3.7	4.3	3.1	3.3	3.5	3.7	3.8	4.0
Figure 12 ME	10.2	11.8	12.5	6.9	7.4	8.2	6.7	7.4	8.4	7.5	9.0	9.6	6.8	7.3	7.5
Figure 13 SAsia	2.3	2.8	3.1	2.6	3.3	4.0	2.6	3.3	4.4	2.5	3.0	3.4	3.5	3.7	3.7
Figure 14 CPAsia	5.9	6.7	7.3	5.8	6.5	7.6	5.7	6.0	7.8	5.3	6.3	6.7	5.7	5.8	6.2
Figure 15 EAsia	4.3	5.1	5.4	3.9	4.5	4.9	3.9	4.6	5.0	4.3	5.0	5.5	4.8	4.9	5.0
UNFCCC Annex I	7.5	8.9	10.3	9.3	9.5	9.8	9.6	9.8	10.0	9.3	10.1	10.5	9.6	10.0	10.1
UNFCCC Non Annex I	4.6	4.9	5.2	4.2	4.8	5.0	4.2	4.7	5.2	4.2	4.7	5.0	4.7	4.7	4.8
World total	5.6	5.6	5.7	5.2	5.6	5.8	5.1	5.6	6.0	5.1	5.6	6.0	5.6	5.6	5.6