

Below 2°C or 1.5°C depends on rapid action from both Annex I and Non-Annex I countries

Climate Action Tracker

Policy Brief

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Summary: Next decade is critical to stay below 2°C or 1.5°C

- The UNFCCC climate talks in June 2014 are aimed at increasing emissions reduction actions in the pre-2020 period, as well as substantially improving mitigation ambition for the post 2020 period in the new climate agreement to be concluded next year.
- In order to prevent dangerous climate change and limit warming to below 2°C or 1.5°C, both Annex I and Non-Annex I countries need to both significantly increase the level of current action to reduce emissions ahead of 2020 and commit to deeper cuts in emissions than currently pledged post 2020.
- In this update the Climate Action Tracker re-evaluates the required level of global and regional levels of ambition for 2020, 2025 and 2030 limit warming to below 2°C or 1.5°C, based on a new analysis of the IPCC AR5 emissions database.
- Limiting warming below 2°C with a high chance of success means that **total GHG emissions would need to be zero between 2060 and 2080, and likely negative thereafter. CO2 emissions from fossil fuel combustion and industry would need to be zero between as early as 2045 and no later than 2065, and be negative thereafter.**
- Required emission reductions for Annex I and Non-Annex I groups depend on the economic and equity assumptions applied. For Annex I (developed) countries an equity approach based on capability to mitigate would require reductions of 25-55% below 1990 levels by 2025 and 35-55% below 1990¹ levels by 2030. Other equity approaches would require even deeper reductions.
- For Non-Annex I (developing countries) an equity approach based on capability to mitigate would require by 2025 an emissions allocation limited to 0-95% above 1990 levels, and by 2030 an emissions allocation limited to 5-90% above 1990² levels. Other equity approaches would allow higher emissions allocations. In 2010 Non-Annex I emissions were about 75-80% above 1990 levels, hence in overall terms during the

¹ 26-48% below 2010 levels

² 41% below to 8% above 2010 levels

2020s these emissions under this equity approach would need to be at the highest close to present level, or more likely, significantly below present levels.

- Rapid and deep emissions reductions are not only necessary to stay below 2° (or 1.5°C), but are feasible at modest cost. However, the window of opportunity to limit warming to below 2°C could be closed by end of the 2020s unless action is accelerated.
- Currently implemented policies are estimated by the 5th IPCC assessment report to put the world on track to a 3.7 to 4.8°C warming by 2100, confirming earlier projections carried out by the Climate Action Tracker.
- One of the main causes of the recent increased emissions growth globally is the post-2000 reversal of historic decarbonisation trends, driven in large part by the growth of coal combustion and use. In all of the studies consistent with limiting warming below 2°C **the energy sector needs to decarbonise rapidly and reduce to zero emissions as early as 2040 but no later than 2070.**
- One of the major challenges for Ministers at the UNFCCC meetings in Bonn is to take concrete steps to arrest and reverse this adverse trend in decarbonisation.

USA “Clean Power Plan” emission reductions and decarbonisation rates far from those needed for 2°C

- In light of this need for decarbonisation of the industry and energy sectors, the CAT has also analysed the US Government’s “Clean Power Plan” proposed rule leading to a 30% cut (from 2005 levels) in emissions from power plants.
 - While the proposal is welcome it is insufficient to meet the USA pledges of a 17% reduction of all greenhouse gas emissions by 2020. In 2030, US national emissions would be around 5% above 1990 levels (or 10 % below 2005 levels), far above levels required for a 2°C pathway.
 - The US “Clean Power Plan” implies an economy-wide decarbonisation rate of about 0.9% per annum, significantly lower than the 1.4% p.a. achieved in the last decade. This is not as fast as is needed for a 2°C decarbonisation pathway.
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Emission levels compatible with 2°C and 1.5°C

The Climate Action Tracker has conducted a new analysis of the mitigation scenarios assessed by IPCC WGIII, to evaluate the global emissions pathways compatible with holding warming below 2°C and returning to below 1.5°C warming by 2100. The emission pathways were selected on the basis that:

- These emission scenarios fall within historical limits until 2010. This excludes some studies whose emissions diverge significantly below historic emissions before 2010.
- They limit warming to below 2°C with a likely (66%) or high (greater than 85%) probability. The latter pathways we characterize as a return below 1.5°C by 2100
- We differentiated between “overall least-cost” mitigation scenarios, which reach long-term targets by reducing at any time over the 21st century to minimize costs,

and those that involved a “deliberate” delay in mitigation action, focusing on the former.

As a consequence of these selection criteria, the detailed results differ from those presented in the IPCC WGIII Summary for Policy Makers. We confirm the broad findings of WGIII: that limiting warming to 2°C implies halving global GHG emissions in 2010 (49 GtCO₂e) by 2050 and reaching very low or even negative levels by 2100.

However, for CO₂ emissions from the industry and energy sector, emissions must reach zero much earlier, from around 2045. In this report we have generally compared emissions to 1990 levels to enable easy cross comparison with previous assessments. The emission levels consistent with 2°C and 1.5°C pathways are displayed in Table 1 and Figure 1.

The lowest of the AR5 scenarios (RCP2.6) indicates global warming can be limited to close to 1.5°C above pre-industrial levels. Negative emissions play a larger role than in the 2°C scenarios. It is as likely as not that

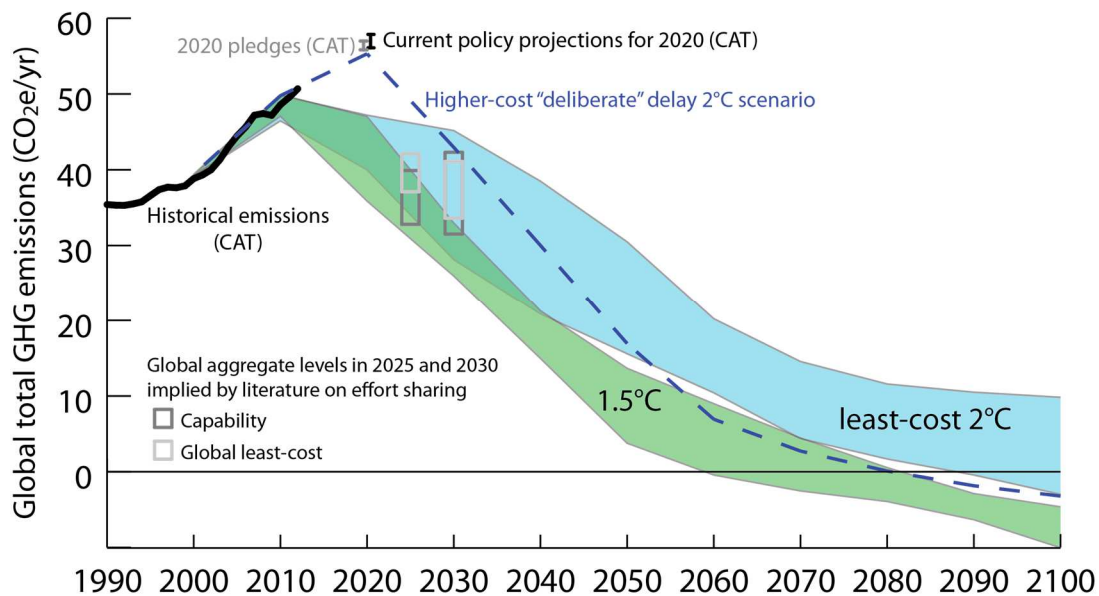


Figure 1: Timeline for global emissions (in Gt CO₂-equivalents per year) to peak and decline towards zero for 2°C and 1.5°C long-term temperature limits. The dashed line indicates the medium of the few scenarios from IPCC AR5 WG3 that reach emission levels in 2020 close to those implied by the Cancun pledges, while still reaching later-century deep reductions sufficient to hold warming below 2°C. Source: Own calculations based on IPCC database (10-90% range of AR5 WG3 emission scenarios that are not deliberately forced to reach 2020 emission levels comparable to those implied by the Cancun pledges and do hold warming below 2°C in >66% of climate-model runs) and scenarios that hold warming below 1.5°C by 2100 in >50% of climate-model runs.

		2020	2025	2030	2050	Zero emissions	2100
Stay below 2°C during 21st century with <i>likely</i> (more than 66%) probability							
Total GHG below 1990		25 to 10% above 1990	to 25% above 1990	20% above to 25% below 1990	20 to 60% below 1990		75 to 105% below 1990
GtCO ₂ e/yr		40 to 47	35 to 46	28 to 45	16 to 31	2090 or later	-3 to 10
CO ₂ emissions from fossil fuel and industry		26 to 35	21 to 34	16 to 33	3 to 19	2060 or later	-15 to 2
Below 1.5°C by 2100 with at least 50% probability– and stay below 2°C with at least 85% probability							
Below 1990		25% above to 5% below	10% above to 15% below	10-30% below	65-90% below		110-125% below
GtCO ₂ e/yr		36 to 47	31 to 40	26 to 33	4 to 14	2060-2080	-10 to -5
CO ₂ emissions from fossil fuel and industry		21 to 31	17 to 26	13 to 20	-8 to 4	2045-2065	-17 to -9

Table 1: Global emissions pathway to 2°C and 1.5°C for 2020, 2025, 2030, 2050 and 2100 Source: Climate Action Tracker; calculations based on the scenarios assessed by IPCC Working Group 3 in AR5. Range represent 10-90% range for AR5 WG3 “no delay” emission scenarios, i.e. those for which the energy-economic models are not deliberately forced to reach 2020 emission levels comparable to those implied by the Cancun pledges. Likely 2°C scenarios hold warming below 2°C with over 66% probability over the whole of the 21st century. 1.5°C scenarios hold warming below 1.5°C by 2100 with over 50% probability and hold warming below 2°C with over 85% probability over the whole of the 21st century. Probabilities refer to the percentage of climate model runs within a large ensemble of runs, with varying sensitivity and carbon-cycle characteristics, that hold warming below 2 or 1.5°C.

sustained globally negative emissions after 2050 will be required to achieve the reductions in atmospheric CO₂ in RCP2.6 (AR5, WG1).

The global GHG emissions compatible with below 2°C or 1.5°C follow a steep declining pathway for the period 2020 through 2050. During the 2020s and early 2030s the 1.5°C emission pathways overlap with the lower part of the 2°C emission ranges, before diverging:

- In 2020, global emissions should have peaked and drop below 47 GtCO₂ (25% above 1990 emissions; just below 2010 emissions) and safer, as low as 40 GtCO₂, which is 10% above 1990 emission levels and 15% below 2010 levels

- By 2025, emissions should have returned to 35-46 GtCO₂eq (5% below to 25% above 1990 emission levels; 5-30% below 2010) for 2°C pathways and 31-40 GtCO₂eq (10% above to 15% below 1990 emission levels; 15-35 below 2010) for 1.5°C pathways
- By 2030, should have returned to 28-45 GtCO₂eq (20% above to 25% below 1990 emission levels; 5-40% below 2010) for 2°C pathways and 26-33 GtCO₂eq (10-30% below 1990 emission levels; 35-45% below 2010) for 1.5°C pathways

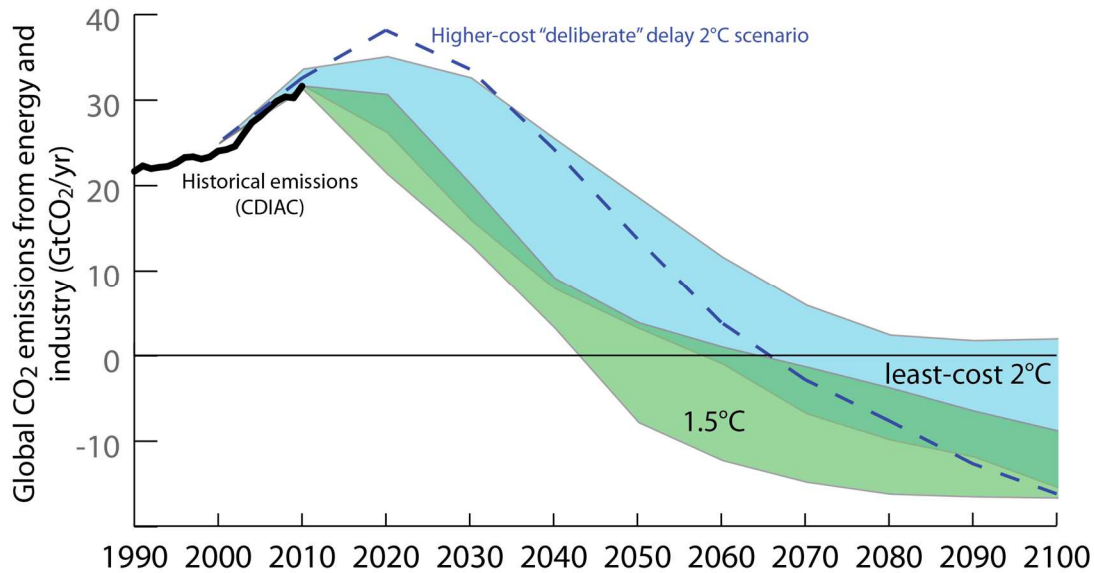


Figure 2: Total global CO₂ emissions from energy and industry 2005 – 2100 compatible with a 2°C pathway. Source: Own calculations based on IPCC database (10-90% range of AR5 WG3 emission scenarios that are not deliberately forced to reach 2020 emission levels comparable to those implied by the Cancun pledges and do hold warming below 2°C in >66% of climate-model runs) and scenarios that hold warming below 1.5°C by 2100 in >50% of climate-model runs.

- In 2050, emissions should be 16-31 GtCO₂eq (20-60% below 1990 emission levels; 35-65% below 2010) for 2°C pathways and 4-14 GtCO₂eq (65-90% below 1990 emission levels; 70-90% below 2010) for 1.5°C pathways

Limiting warming below 2°C with a likely probability implies that total GHG emissions eventually have to decline towards zero by 2100 and CO₂ emissions from fossil fuel and industry would need to be zero as soon as the late 2050s.

Bringing warming back to 1.5°C implies faster emission reductions and an earlier approach to zero GHG and CO₂ emissions: total GHG emissions would need to be zero between 2060 and 2080. CO₂ emissions from fossil fuel and industry would need to be zero by the 2040s and no later than 2070, and negative thereafter. These emission reductions would ensure that there would be a high chance >85% of limiting warming below 2°C, significantly better than the “likely” 2°C pathway described above.

Comparing Figure 2 below with Figure 1 illustrates that for CO₂ emissions, the picture

looks quite different than is the case for all GHG gases.

A 2°C pathway requires a full decarbonisation of the energy sector by around 2060, the year when CO₂ emissions from industry and energy use reach zero in the low emission scenarios. For such low emission scenarios, IPCC WG3 noted that global CO₂ emissions from the energy supply sector are projected to decline over the next decades and are characterized by reductions of 90% or more below 2010 levels between 2040 and 2070. Emissions in many of these scenarios are projected to decline to below zero thereafter (IPCC AR5, WG3, SPM).

The IPCC AR5 warns that “*Delays in mitigation through 2030 or beyond could substantially increase mitigation costs in the decades that follow and the second-half of the century*”.

Delayed action also implies increased use of technologies that can provide ‘negative emission’, primarily bio-energy combined with carbon capture and storage (BECCS).

Without this assumption, many models cannot achieve the 2°C target if Governments delay ambitious action until 2020, or even 2030. Mitigation scenarios without this option are

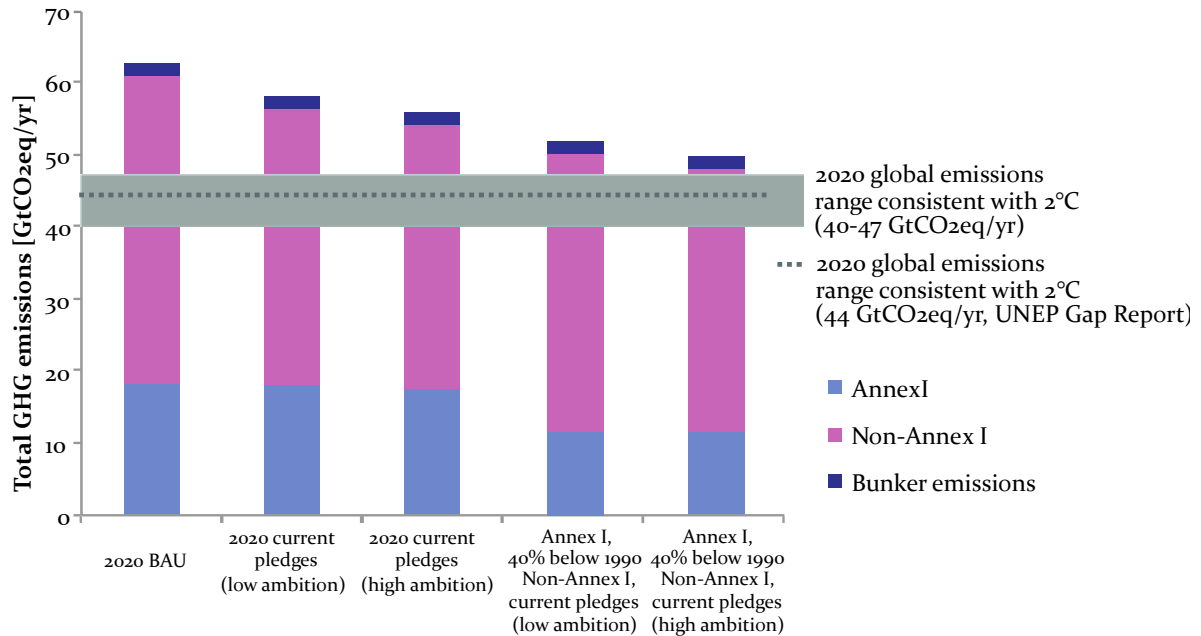


Figure 3: Effect of Annex I increasing mitigation efforts to 40% reduction below 1990 level in relation to 2020 global emissions level consistent 2 and 1.5°C. The emissions gap is the result of total global emissions (top of the bar) and the 44GtCO₂eq level, depicted by the grey dotted line.

found in the lower half of the emission ranges around 2020-2030 and at the upper end by the end of the 21st century.

In other words, very high ambition is required in the near term to still stay within a cumulative CO₂ emissions budget, because compensation of higher near-term emissions through late-century very deep reductions is not possible.

Deeper emission commitments by all parties needed

The results from the scientific research clearly show that international cooperation is a prerequisite for effective mitigation action. The endeavour to stay below 2°C will not be achieved if individual agents advance their own interests independently.

In relation to the discussion in increasing mitigation action ahead of 2020 the numbers show that further action is needed by both Annex I and non-Annex I countries to close the ‘emissions gap’.

Some parties to the UNFCCC have argued that if Annex I countries would reduce emissions by 40%, this would be sufficient to close the so-called emission gap in 2020. Figure 3 below shows the contribution of Annex I and Non

Annex I Parties to 2020 levels of emissions. If Annex I Parties reduce emissions by 40% below 1990 levels, the emissions gap would remain in 2020 and would need to be closed by additional efforts from the major emitters in the Non-Annex I group.

Mitigation costs keeping warming below 2°C are modest

The costs of keeping warming levels below 2°C by the end of this century are modest. Estimates of average global macro-economic costs over the century show that loss in total global consumption is limited compared to the overall expected economic growth. It is important to recall that these cost estimates do not take co-benefits of climate action into account.

Under a cost-effective approach, assuming a global and unique carbon price, macro-economic costs equal an average annual reduction of consumption of about 0.04-0.14 % per year.

Given that the baseline increase of consumption over the 21st century projected in the models is **1.6-3% per year**, this means that annual economic growth in 2030 would be 1.4%-3.0% instead of 1.6-3.0%.

In 2050, growth rates are 1.5%-2.9% instead of 1.6-3% and in 2100; the annual growth rate with mitigation action consistent with the 2C pathway is 1.5%-3.0% instead of 1.6-3.0% (IPCC AR5, WG3, Chapter 6, p. 8)

This means that with mitigation action, GDP would grow by 43-107% in 2030 in relation to 2005, instead of 49-109% without mitigation action. In 2050, world GDP is projected to be 92-271% larger than in 2005 with implemented climate policy, against 104%-278% in the baseline scenario. In 2100, the economy is projected to grow by 302-1508% instead of 352-1558%, compared to 2005 levels. The differences in final global consumption of goods are marginal as displayed in Figure 4 below.

Final Consumption of Goods (2005=100)

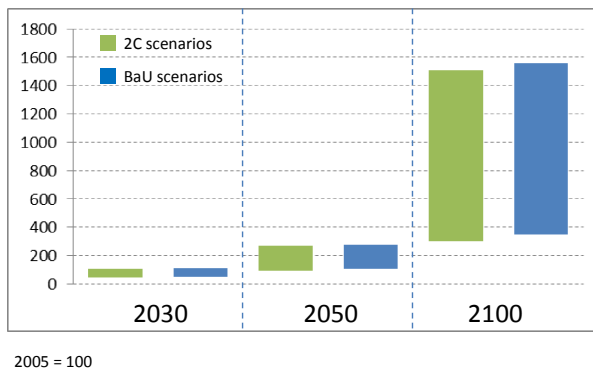


Figure 4: Final total global consumption of goods in 2030, 2050 and 2100, with and without mitigation action required to stay below 2°C.
Source: Own elaboration based on IPCC numbers.

Regional distribution of emission reductions on the pathway to stay below 2°C

The overall emissions pathways to stay below 2°C in 2025 span a range of 35Gt – 46 GtCO₂e/yr, which by 2030 reduces to 28-45 GtCO₂e/yr. This translates into global emissions cuts of approximately 5% below 1990 to 25% above 1990 by 2025 and 25% below 1990 to 20% above 1990 by 2030³. It

should be noted the feasible emissions pathways cannot be at the top of both the 2025 and 2030 ranges. The task now is to share this fixed global emission level amongst all countries.

This condition could be met, for example, if all individual countries were to reduce their emissions by the same percentage, let's say 30% below today's level in 2030.

This is highly unlikely since the basic principle of the United Nations Framework Convention on Climate Change is that "Parties should protect the climate system [...] on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities." This means, that depending on each country's responsibility and capability, countries' emissions cuts would diverge from the global average.

If some countries manage to reduce more than 30%, other countries can reduce less or even increase their emissions. Developed countries currently emit two thirds of the total greenhouse gas emissions of all developing countries. As a rule of thumb, three percentage points additional reduction to 30% by all developed countries would give room for two percentage points less reduction below 30% for all developing countries, if the same global total is to be reached.

One way to differentiate between reductions of countries would be to assume that they would need to happen where they are the cheapest.

Global models provide such scenarios where total global costs are minimised. Results for such a case depend on the model used and the assumptions on costs. Illustrative results of such scenarios are provided in Table 2 and Table 3 as Option "global least cost".

Reductions for developing countries as a whole would be less stringent than a 30% flat rate, because these calculations take into account the growth in consumption in

³ 5-30% below 2010 by 2025 and 5-40% below 2010 by 2030

developing countries. For Latin America, however, it would be more than 30%, because some models assume large potential to reduce emissions from deforestation at relatively low costs.

A second way to look at it is to distribute differentiated reductions across countries based on their responsibility and/or capability, building on the Convention principles.

Below we show several options for how emission reductions can be distributed among

different groups of countries or regions. We here draw upon the summary of these studies in the IPCC AR5⁴, which is based on Höhne et al. 2013⁵. They find a large variation across different options, reflecting that there are many ways to share emission reductions.

Taking a broad average over all possible ways to share the reductions based on the principles, emission targets for OECD1990 countries would be roughly half of current emissions by 2030.

Option	Annex I			Non-Annex I			
	Total	OECD90	EIT	Total	LAM	MAF	ASIA
Relative to 2010							
Global least cost	-33% to -40%	-30% to -35%	-39% to -53%	3% to -32%	-23% to -75%	21% to -22%	2% to -26%
Average	-28% to -73%	-32% to -79%	-20% to -59%	15% to -28%	-12% to -54%	-10% to 26%	17% to -28%
Equal cumulative per capita	-75% to -85%	-76% to -84%	-72% to -85%	4% to -12%	-15% to -71%	n.a.	12% to -13%
Capability	-20% to -50%	-19% to -52%	-23% to -44%	10% to -42%	-16% to -66%	-9% to 47%	3% to -48%
Relative to 1990							
Global least cost	-39% to -46%	-26% to -31%	-60% to -69%	21% to 81%	-11% to -71%	62% to 152%	37% to 90%
Average	-35% to -76%	-27% to -78%	-47% to -72%	28% to 104%	1% to -47%	89% to 164%	34% to 119%
Equal cumulative per capita	-77% to -86%	-74% to -83%	-82% to -90%	55% to 83%	-3% to -67%	n.a.	63% to 109%
Capability	-27% to -54%	-14% to -49%	-48% to -63%	2% to 94%	-3% to -61%	91% to 207%	-3% to 93%

Table 2: 2025 Regional distribution of emission reductions for illustrative cases (relative difference to 1990 and 2010 emissions in 2025) staying within atmospheric GHG concentrations keeping temperature increase below 2°C above preindustrial levels.

The same exercise could be done for 1.5°C, however data for sharing efforts under these scenarios are less available.

Source: Own analysis based on supplemental data from Höhne et al. 2013

⁴ IPCC AR5, working group III, Figure 6.28 and 6.29, www.mitigation2014.org

⁵ Niklas Höhne, Michel den Elzen & Donovan Escalante (2014) Regional GHG reduction targets based on effort

sharing: a comparison of studies, Climate Policy, 14:1, 122-147, DOI:10.1080/14693062.2014.849452

Targets for Economies in Transition (EIT) would be approximately 2/3 of current levels. Emissions targets in Asia would be similar to current levels, for the Middle East and Africa (MAF) slightly above the 2010 level and in Latin America (LAM) well below the 2010 level (Option "Average"). Compared to the "global least cost" option, developing countries as a group would have to reduce less: their mitigation potential is larger than their responsibility and capability.

To cover the extremes of the spectrum, we also show the results for two categories of approaches to share reductions. One extreme approach is "equal cumulative per capita emissions", i.e. equal carbon budgets for countries. In this case, developed countries would have to reduce significantly more, because they have already used most of their per capita carbon budget in the past.

Another extreme approach is sharing emission reductions according to capability, which is defined as equal mitigation costs per GDP. In this case, developed countries would have to reduce a lot less, but still more than the 30% we started from.

When the regions are added up to groups of Annex I and non-Annex I countries, Annex I countries will need to reduce emissions beyond the 30% average under all options. Some approaches suggest very strong additional reductions (Table 3).

A related question is where international financial flows should support mitigation actions. Trading of emission allowances may be necessary as expected emission reductions of developed countries go beyond mitigation potentials.

Option	Annex I			Non-Annex I			
	Total	OECD90	EIT	Total	LAM	MAF	ASIA
Relative to 2010							
Global least cost	-33% to -41%	-30% to -35%	-39% to -57%	2% to -32%	-25% to -75%	21% to -22%	2% to -27%
Average	-36% to -65%	-39% to -69%	-28% to -54%	-28% to 11%	-18% to -51%	-7% to 38%	7% to -31%
Equal cumulative per capita	-81% to -85%	-82% to -85%	-80% to -85%	1% to -12%	-35% to -75%	n.a.	10% to -15%
Capability	-26% to -48%	-28% to -49%	-23% to -47%	8% to -41%	-15% to -58%	-7% to 48%	-1% to -49%
Relative to 1990							
Global least cost	-39% to -47%	-26% to -31%	-60% to -71%	20% to 80%	-14% to -71%	62% to 152%	37% to 90%
Average	-42% to -68%	-35% to -67%	-52% to -69%	26% to 95%	-6% to -44%	93% to 189%	29% to 100%
Equal cumulative per capita	-83% to -86%	-81% to -84%	-86% to -90%	56% to 78%	-25% to -71%	n.a.	58% to 105%
Capability	-33% to -53%	-23% to -46%	-48% to -65%	4% to 90%	-2% to -52%	94% to 210%	-4% to 85%

Table 3: 2030 Regional distribution of emission reductions for illustrative cases (relative difference to 1990 and 2010 emissions in 2030) staying within atmospheric GHG concentrations keeping temperature increase below 2°C above preindustrial levels. As there is no data for MAF, we use the same reduction as in the second option for this region when adding up the total non-Annex I. The same exercise could be done for 1.5°C, however data for sharing efforts under these scenarios are less available.

Source: Own elaboration based on data from Höhne et al. 2013

Changing the negative trend: Reversal of current re-carbonisation is critical - and possible

From 2000-2010, the energy sector saw a reversal of the decarbonisation trend that took place over the preceding 30 years from 1970 - 2000.

This is a critical observation compared with the fact that global CO₂ emissions from energy and industry will have to decrease to zero around 2060 to keep warming below 2°C as shown in Figure 2 above.

The IPCC's interpretation of this development is that economic growth and population

consumption of final goods per capita, which is directly linked to GDP growth.

Therefore reducing GDP growth in order to meet a climate target is an option of last resort for these models. The only parameters that can actually be changed are therefore carbon intensity and energy intensity. Achieving the 2°C targets hence requires substantial efforts in these two areas.

Carbon intensity

Figure 5 illustrates how carbon intensity has increased over the past ten years. The figure shows historical development of carbon intensity from 1970 to 2010. It also draws the

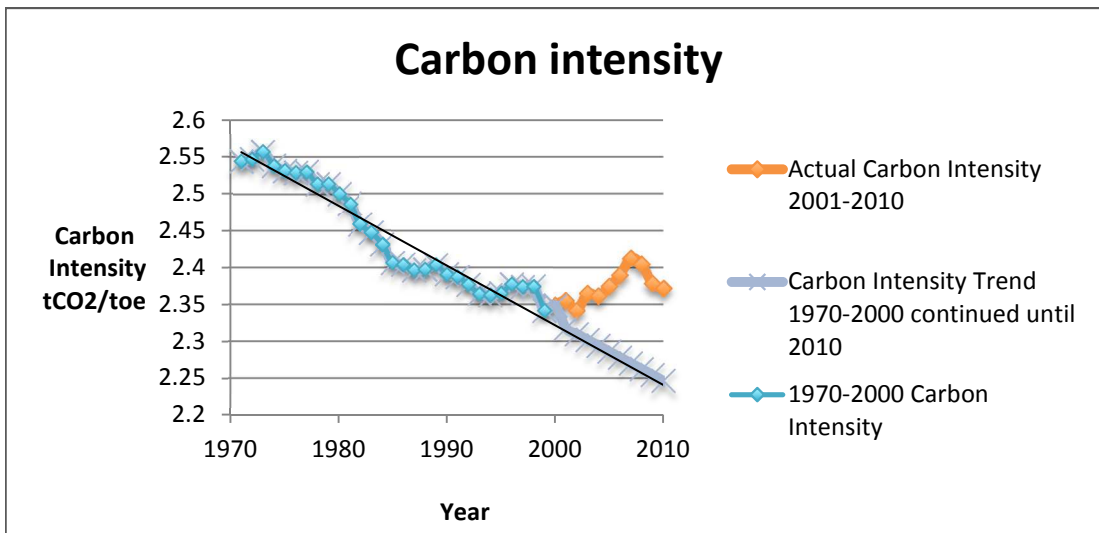


Figure 5: Carbon intensity over the period 1970-2010, actual and corrected to fit the historical trend from 1970-2000.
Source: Own calculation based on IEA numbers.

continue to be the most important drivers of the increase in CO₂ emissions from fossil fuel combustion.

While it is true that population and GDP are responsible for the largest absolute changes in decadal CO₂ emissions, both these parameters cannot be “improved” like carbon intensity and energy intensity can.

On the one hand population is an exogenous driver to the models that calculate the emission scenarios. On the other hand, the goal of these models is to maximise

line for the continued trend from 1970 – 2000 to 2010, to show the significant deviation from the previous trend.

CAT's assessment finds that about 80% of the accelerated increase in CO₂ emissions **in the period 2000 – 2010 is due to a reversal of the historical decarbonisation trend**⁶.

Increasing emission reductions in the energy sector means reducing the carbon intensity of the energy sector, i.e. the amount of carbon emissions to energy use.

⁶ These 80% are the share of additional increase in emissions from 2000 – 2010 compared to the emissions trend from 1970 – 2000 that can be explained by the reversal of in carbon intensity. 83% of this additional

increase, i.e. the increase above the trend from 1970-2000, is explained by carbon intensity, not population growth or GDP.

Figure 6 describes what values are required for carbon intensity from now until 2050 in order to stay below the 2°C pathway with 66% probability. From the figure, it becomes clear

that carbon intensity rates will have to decrease rapidly in the coming decades: increasing to 3% annually by 2030 and close to this level through the 2040s, before

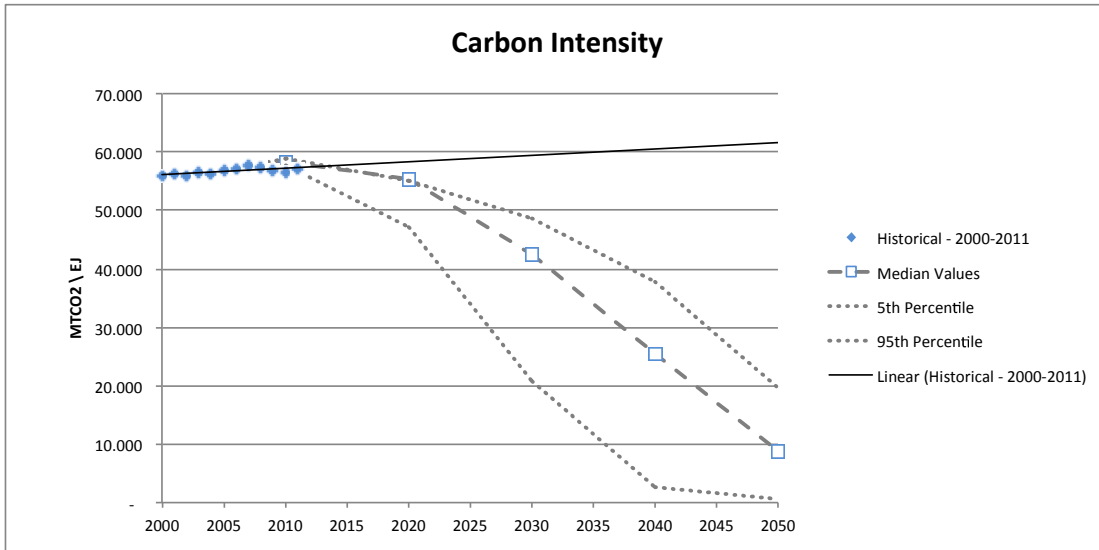


Figure 6: Carbon intensity 2000 – 2050, historical and projected. The solid line shows the trend for 2000-2010 if continued up to 2050. The dotted line shows carbon intensity compatible with 2°C. Source: Own estimates based on IEA and the IPCC database.

gradually reducing to 1.6% annually in the 2050s.

The energy sector is decarbonised at the point when global carbon intensity, i.e. total CO₂ emissions from energy and industry related to global energy consumption, approach zero⁷.

Rapid shifts are possible

Examples from the past show that transformative processes can move faster than initially expected.

Increase of renewable energy: Costs of renewable energy have declined dramatically over the last years and much faster than previously expected. One exceptional example is the decline of costs for solar photovoltaic. Some renewable energy technologies have already achieved market competitiveness. In 2012, renewables made up **just over half of total net additions to**

electric generating capacity from all sources in 2012⁸. This could be the start of a new positive trend paving the way to a full decarbonisation of the energy sector. In fact, a low-carbon world requires 100% of net additions from carbon-neutral technologies and phase out of fossil fuel-based power plants. This transition has been much faster than expected, the International Energy Agency has constantly underestimated the growth of renewable energy: Since 2006, the renewable capacity projections had to be increased with each version of the World Energy Outlook to reflect real developments.

Efficient lighting: Also the transition to very efficient lighting was faster than predicted: 55 countries have agreed to phase out inefficient lighting by 2016 under the initiative En.lighten and are implementing concrete actions to

⁷ With the Kaya identity, a decomposition method aimed at analysing emission scenarios for CO₂ emissions from energy and industry, we can investigate what the required pathways for energy intensity and carbon intensity should be in order to stay below 2°C (and 1.5°C). GDP and population are here considered as external drivers for

reasons explained above.

⁸ <http://www.ipcc-wg3.de/assessment-reports/fifth-assessment-report>

meet this target⁹ The IPCC expects the very efficient LEDs to become the most widely used light source in the future¹⁰. Some global lighting technology providers have switched entirely to very efficient LEDs.

Car standards/electro mobility: Various countries have put in place or increased the ambition of efficiency or emission standards for cars in the last years. Important examples are the US, the EU, Japan and China. The EU with the globally strongest standard is overachieving it. The Global Fuel Economy Initiative, founded in 2009, promotes the improvement of the energy efficiency of vehicles globally to 50% of current energy intensity.¹¹ An electric car is now in the palette of each large car manufacturer, unthinkable a few years ago. They expect this technology to be the future.

US action on existing power plants an important but, taken alone, insufficient step to meet its pledge

The US Environmental Protection Agency (EPA) announced on 2 June 2014 a new regulation that will **reduce GHG emissions from the electricity sector by 30% below**

2005 levels by 2030. This is a first regulation from the US authorities for regulating CO₂ emissions from the electricity sector on the federal level. Until this date, comprehensive policies that reduce GHG emissions from power plants have only been implemented at the state level. However, it is insufficient to meet its pledges of 17% reduction from 2005 emissions¹² of all greenhouse gas emissions by 2020 (equivalent to about 4% below 1990 levels by 2020) and is inconsistent with their long-term target of 83% below 2005 level by 2050 (equivalent to about 80% below 1990 levels by 2050)(Figure 7).

Furthermore, based on the CAT assessment here, 2030 national emissions would be around 5% **above** 1990 levels (or 10 % below 2005 levels). These levels are far above those required for a 2°C pathway: the CAT has calculated from the IPCC AR5 scenarios that reductions for the Annex I countries in 2025 and 2030 are 25-55% and 35-65% **below** 1990 levels respectively for an equity scenario based on relative capability to mitigate.

The Clean Power Plan addresses emissions from the electricity sector only, which is a major contributor to the USA's total GHG emissions. In 2012, around one third of the

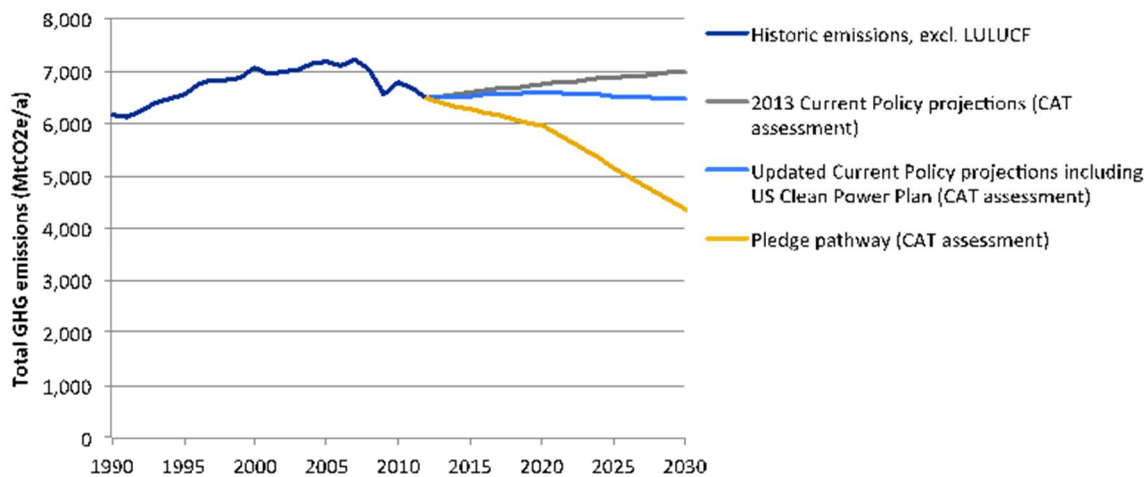


Figure 7: GHG emissions of the USA under different scenarios. Source: Own calculations and CAT update 2013.

⁹ <http://www.enlighten-initiative.org>

¹⁰ <http://www.ipcc-wg3.de/assessment-reports/fifth-assessment-report>

¹¹ <http://www.globalfueleconomy.org>

¹² US 2005 emissions were 16% above 1990 levels.

USA's total emissions of 6488 MtCO₂e originated from the power sector¹³. The new proposed regulation for emissions of electric power plants in the USA will bring GHG emissions down by around 200 MtCO₂e/a in 2020 compared to trends without this regulation. This will help the USA to implement its pledge, but will not be sufficient to close the full gap of around 700 MtCO₂e between recent trends and the pledge from earlier assessments¹⁴ of the climate action tracker.

Under the Copenhagen Accord, the USA has announced a long-term target of reducing total GHG emissions: -83% below 2005 in 2050. This target would be just within the

range of the USA's emissions compatible with 2°C.¹⁵ In order to be on track to meet their long-term target, the US GHG emissions in 2030 would have to be about 39% below 2005 levels (equivalent to 29% below 1990 levels).

Linearly extrapolating the proposed target for emissions from the electricity sector (30% below 2005 in 2030) into the future would mean that emissions reach minus 54% in 2050 and zero by 2090. This would be too late to reach the long-term pledge of the USA of -83% of all greenhouse gas emissions by 2050.

We calculate a reduction below BAU of approximately 0.5 GtCO₂e in 2030 and decrease of 726MtCO₂e/a from

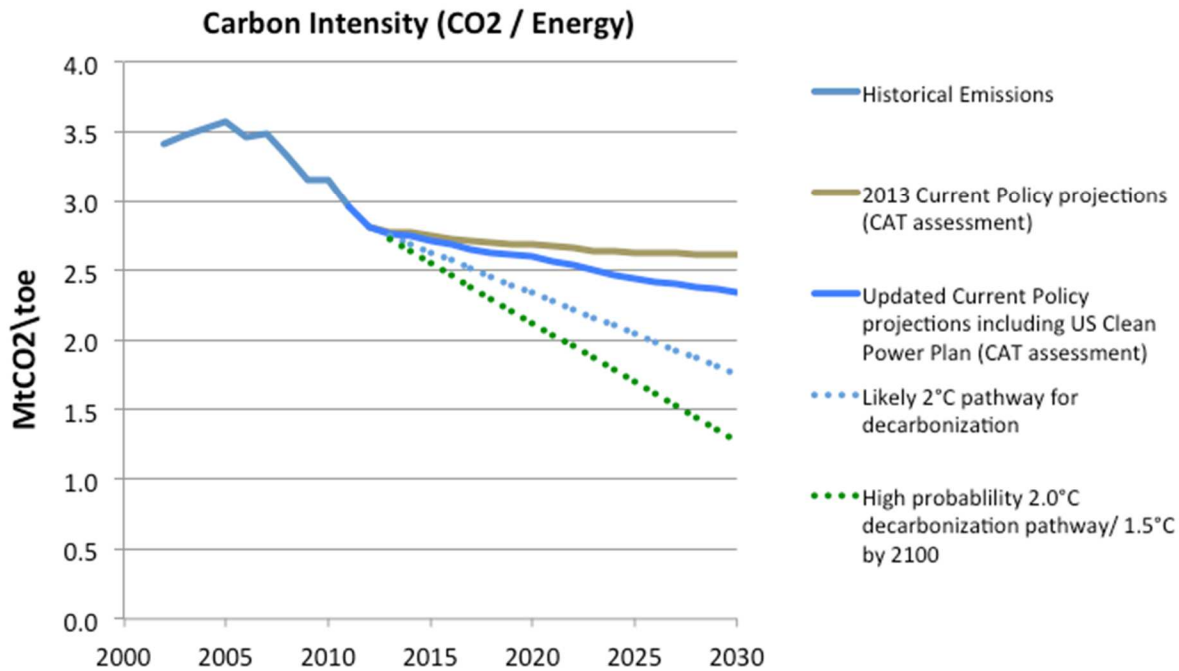


Figure 8: Carbon intensity for the USA historically and under different scenario projections, including the estimated effects of the recently announced Clean Power Plan Proposed Rule.

¹³ In several analyses of the EPA plan a share of 38% was used. This figure arises when including carbon removals from forestry into the US total emissions.

¹⁴ <http://climateactiontracker.org/publications/publication/154/Analysis-of-current-greenhouse-gas-emission-trends.html>

¹⁵ According to Höhne et al. (2013) 'North America's' fair share for 2050 is at minimum an 80% reduction relative to 2010. The USA's 83% reduction below 2005 pledge is equivalent to an 82% reduction below 2010 levels. The 2050 pledge is therefore just within the range of effort-sharing proposals. If all regions only meet the top end of the range, we will not reach the 2 degree goal.

2491MtCO₂e/a in 2005. Assuming a linear decrease from today on, this would mean emissions of 1950 MtCO₂e/a in 2020, in comparison to 2120 MtCO₂e/a in the most recent projections of the USA¹⁶.

The **Clean Power Plan** is part of President Obamas Climate Action Plan and covers the complete electricity sector, suggesting measures in the areas of efficiency on the supply and demand side, renewable energy, and other low-carbon technologies. It will provide options for states to meet the reduction goals in a “flexible manner.”¹⁷

Clean Power Plan decarbonisation rates far from those needed for 2°C

Over the past 10 years, there has been a substantial decline in CO₂ emissions in the US energy sector. The decline corresponds to a

15% decrease in carbon intensity from 2002 to 2012 (about 1.4% per annum improvement), primarily as a result of a fuel switch from coal to gas. The new policy implies an economy wide decarbonisation rate of about 0.9% per annum, significantly lower than that achieved in the last decade. This is not as fast as is needed for a 2°C decarbonisation pathway, and could therefore mean an actual deterioration of the current decarbonisation rate, illustrated by the ‘historical emissions’ in the figure below. The CAT team has calculated the required global carbon intensity pathways for the period 2020 – 2100 consistent with a 2°C pathway.

¹⁶ [http://www.eia.gov/forecasts/aeo/pdf/0383\(2014\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2014).pdf)

¹⁷ <http://www2.epa.gov/sites/production/files/2014-05/documents/20140602fs-overview.pdf>

Background on the Climate Action Tracker

The “Climate Action Tracker”, www.climateactiontracker.org, is a science-based assessment by Ecofys, Climate Analytics and the Potsdam Institute for Climate Impact Research (PIK) that provides regularly updated information on countries’ reduction proposals.

The Climate Action Tracker¹⁸ reflects the latest status of the progress being made at international climate negotiations. The team that performed the analyses followed peer-reviewed scientific methods (see publications in Nature and other journals)¹⁹ and significantly contributed to the UNEP Emissions Gap Report²⁰.

The Climate Action Tracker enables the public to track the emission commitments and actions of countries. The website provides an up-to-date assessment of individual country pledges about greenhouse gas emission reductions. It also plots the consequences for the global climate of commitments and actions made ahead of and during the Copenhagen Climate Summit.

The Climate Action Tracker shows that much greater transparency is needed when it comes to targets and actions proposed by countries. In the case of developed countries, accounting for forests and land-use change significantly degrades the overall stringency of the targets. For developing countries, climate plans often lack calculations of the resulting impact on emissions.

Contacts

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Dr. h.c. Bill Hare (bill.hare@climateanalytics.org) (PIK and Climate Analytics) was a lead author of the IPCC Fourth Assessment Report, is guest scientist at PIK and CEO at Climate Analytics.

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¹⁸ www.climateactiontracker.org

¹⁹ e.g. <http://www.nature.com/nature/journal/v464/n7292/full/4641126a.html> and <http://iopscience.iop.org/1748-9326/5/3/034013/fulltext>

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Established in 1984 with the mission of achieving “sustainable energy for everyone”, Ecofys has become the leading expert in renewable energy, energy & carbon efficiency, energy systems & markets as well as energy & climate policy. The unique synergy between those areas of expertise is the key to its success. Ecofys creates smart, effective, practical and sustainable solutions for and with public and corporate clients all over the world. With offices in Belgium, the Netherlands, Germany, the United Kingdom, China and the US, Ecofys employs over 250 experts dedicated to solving energy and climate challenges.

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Climate Analytics

CLIMATE ANALYTICS is a non-profit organization based in Potsdam, Germany. It has been established to synthesize climate science and policy research that is relevant for international climate policy negotiations. It aims to provide scientific, policy and analytical support for Small Island States (SIDS) and the least developed country group (LDCs) negotiators, as well as non-governmental organisations and other stakeholders in the ‘post-2012’ negotiations. Furthermore, it assists in building in-house capacity within SIDS and LDCs.

www.climateanalytics.org

Potsdam Institute for Climate Impact Research (PIK)

The PIK conducts research into global climate change and issues of sustainable development. Set up in 1992, the Institute is regarded as a pioneer in interdisciplinary research and as one of the world’s leading establishments in this field. Scientists, economists and social scientists work together, investigating how the earth is changing as a system, studying the ecological, economic and social consequences of climate change, and assessing which strategies are appropriate for sustainable development.

www.pik-potsdam.de