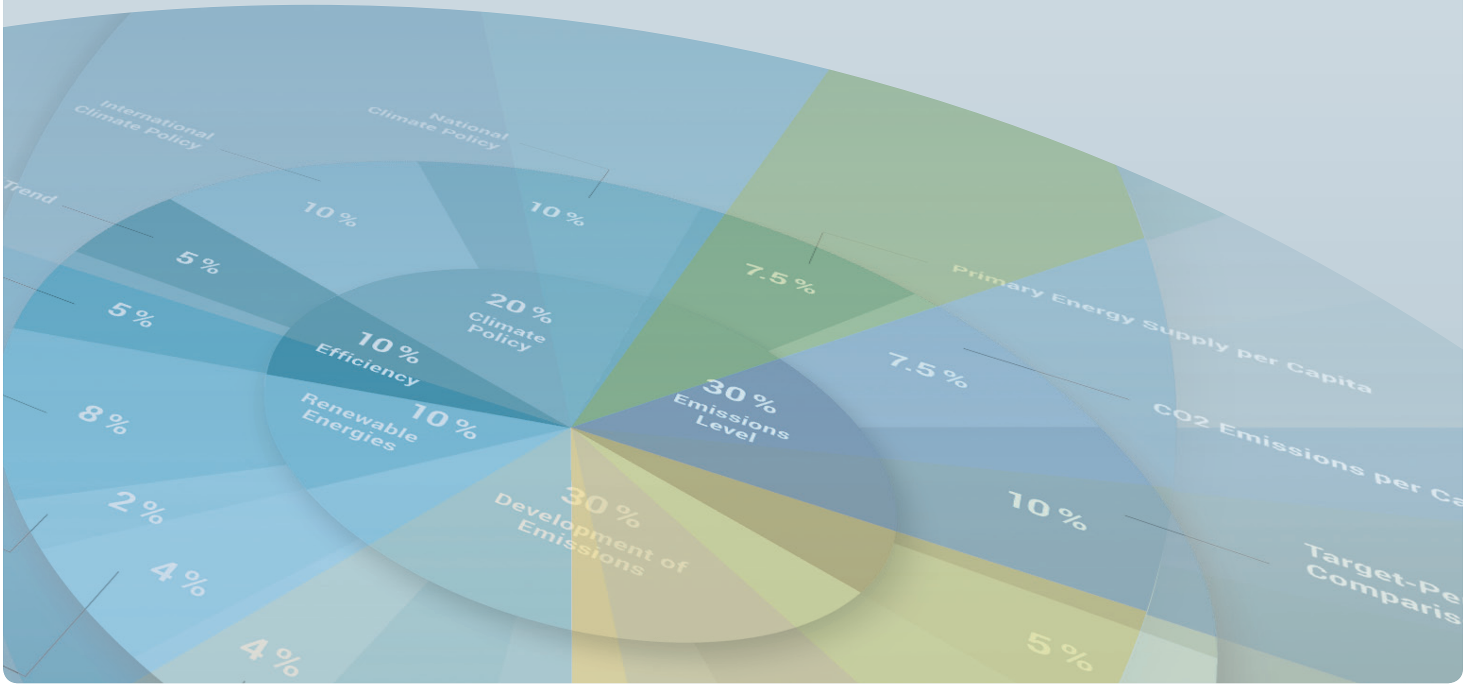
Climate Change Performance Index

Background and Methodology

Jan Burck, Lukas Hermwille, Christoph Bals



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Foreword

Corresponding to the record breaking global emissions of the last years, the carbon dioxide (CO_2) concentration in our atmosphere already exceeds the historic value of 400ppm. If this trend is not inverted, our chances to stay below the 2 °C guardrail and thus avoid climate change with all its expected impacts are virtually zero. At the moment we are heading towards an average global warming of 4 to 6 °C. The subsequent worldwide dramatic consequences are impressively documented in the World Bank report "Turn down the Heat". The World Energy Outlook from the IEA states clearly that, if we want to protect our atmosphere properly, two-thirds of the available fossil fuel resources must remain in the ground.

At the same time the future of our energy supply system is at a crossroads. For one thing, we may well be seeing the start of a new fossil age. The shale gas revolution in the United States, the tar sands in Canada and a lot of other unconventional new sources of fossil fuels are being exploited right now. This new supply is driving down the price of conventional fossil fuels.

For another, we witness massive investment in renewable energy all over the world. Renewable energy technologies are constantly improving and the costs involved are sinking at an impressive pace. Especially wind and solar energy may soon provide a sustainable and affordable energy alternative. The competition of the two supply systems – new fossil fuels vs. renewable energies – has not been decided yet. But this competition is one key issue and will be decisive for the success or failure of decarbonisation process. The other key issue is energy efficiency. We must produce our electricity and goods much more efficiently, yet simultaneously avoid rebound effects that are typically associated with gains in efficiency.

The two most promising strategies for a low-carbon future, that is large-scale deployment of renewable energies and efficiency improvements, play a prominent role in the methodology of the Climate Change Performance Index (CCPI). The Climate Change Performance Index was developed to accompany countries along this low-carbon pathway as well as to point out the weaknesses and strengths in the development of their national and international climate policies.

Twenty percent of global emissions derive from deforestation and forest degradation. The loss of the Earth's green lungs is one of the main drivers of global temperature rise. For the fourth time now, the Index includes the emissions caused by deforestation.

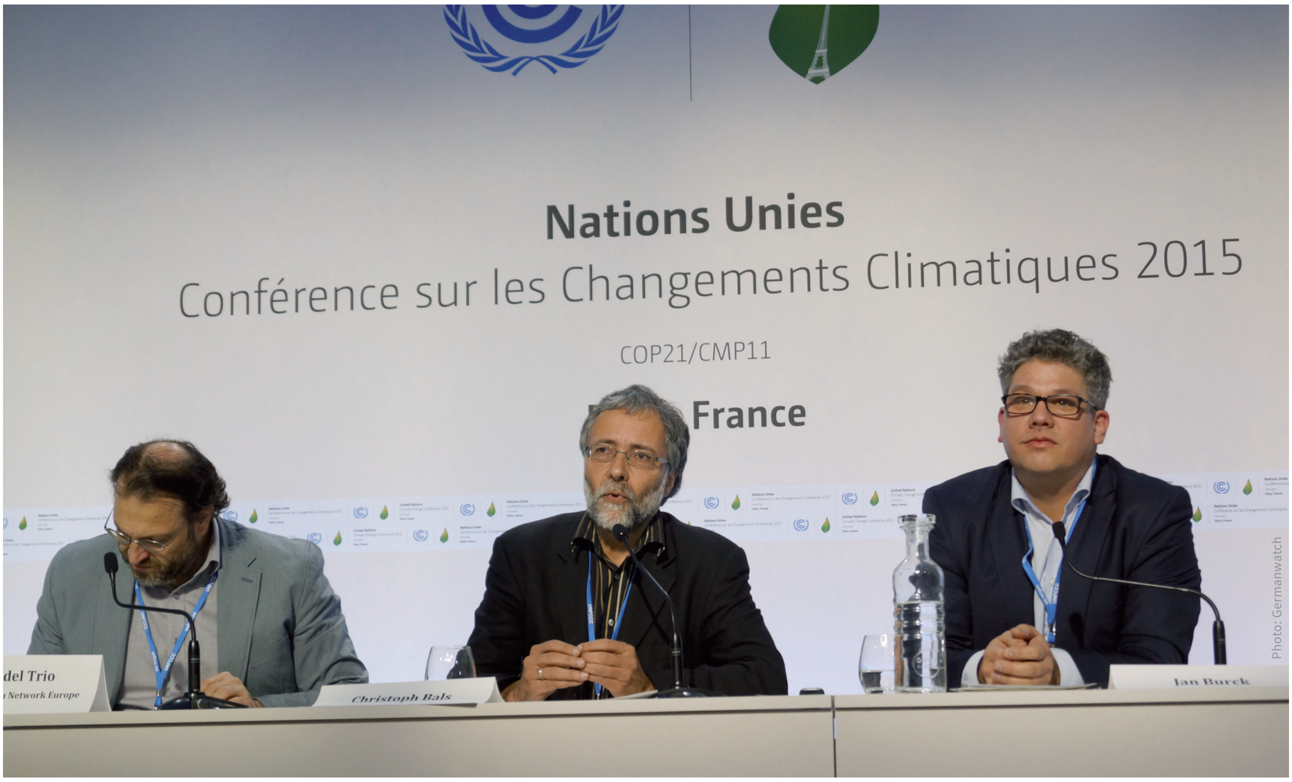
After the twenty-first session of the Conference of the Parties (COP 21) in Paris 2015, the next years will decide on the path towards a sustainable future. At COP22 in Marrakech, Germanwatch and the Climate Action Network Europe will present the Climate Change Performance Index 2017 to the global public. The aim of the Index is to induce enhanced action on climate change at both, national and international level. The Climate Change Performance Index compares countries by their emissions development, emissions levels, renewable energy, efficiency and climate policies, thus offering a comprehensive view of the current efforts of the states analysed. These are the 58 top emitters that are, together, responsible for more than 90 percent of the global energy-related CO_2 emissions.

As has been the case with the previous editions, the Climate Change Performance Index 2017 would not have been possible without the help of about 280 climate experts from all over the world, who evaluated their countries' climate policy. We would like to express our deep gratitude and thanks to all of them.

The following publication explains the background and the methodology of the Climate Change Performance Index. The results of the CCPI can be accessed online at www.germanwatch.org/en/ccpi.

With best regards!

Jan Burck
(Germanwatch – Team Leader German and EU Climate Policy)



Jan Burck, Christoph Bals (both Germanwatch) and Wendel Trio (CAN-Europe) at the press conference for the CCPI 2016 in Paris.

1. The Climate Change Performance Index – Who Does How Much to Protect the Climate?

Getting a clear understanding of national and international climate policy is difficult, as the numerous countries which need to be taken stock of, each have various initial positions and interests. To untangle the knot of differentiated responsibilities, as well as kept and broken promises, and to encourage steps towards an effective international climate policy, Germanwatch developed the Climate Change Performance Index (CCPI). The index compares those 58 countries that together are responsible for more than 90 percent of annual worldwide carbon dioxide emissions. Their climate change performance is evaluated according to uniform criteria and the results are ranked. Both industrial countries and countries in transition (which are Annex I parties to the Framework Convention on Climate Change adopted in Rio 1992, and as such accept a special responsibility) as well as all countries that emit more than one percent of global CO_2 emissions are included in the index. According to Article 2 of the United Nations Convention on Climate Change, all of these countries are required to ensure the prevention of dangerous climate change. Every year, the CCPI evaluates how far countries have come in achieving this goal. With the help of the index, the climate change policy, the level and recent development of emissions and the performance in the field of renewable energies and efficiency of each country can swiftly be accessed and judged. The component indicators provide all actors with an instrument to probe in more detail the areas that need to see movement. The objective is to raise the pressure on decision makers, both at the political and civil society level, and to move them to consequently protect the climate. Thus, the index is to be both a warning, as well as an encouragement, to everybody involved. With this in mind, Climate Action Network Europe (CAN-E) and Germanwatch present the CCPI every year at the UN Climate Change Conference, thus creating as much attention as possible in the observed countries and pushing forward the discussion on climate change. The astounding press echo to the CCPI shows its relevance: Both, at the national and international level, numerous media report about the outcomes and on how well their country performed in the latest edition of the index. Awareness was also raised in politics. Many delegates at the climate conferences inform themselves on ways of increasing their countries' rank. Naturally, the index is also available online for general public interest.[1]

[1] http://germanwatch.org/en/ccpi

2. Methodology

The climate change performance is measured via fifteen different indicators that are combined into one single composite indicator. They are classified into five categories – 'Emissions Level', 'Development of Emissions', 'Efficiency', 'Renewable Energies' and 'Climate Policy'. Together, these composite indicators form a differentiated picture of the climate change performance of each country.

Figure 1 (next page) gives an overview of the indicators and the weight of the categories in the overall score.

The index rewards policies which aim for climate protection, both at the national and international level. Whether or not countries are currently striving towards a better performance can be deduced from their scores in the 'climate policy' indicators. Whether or not these policies effectively lead to a reduction of emissions can be read – with a time lag of a few years – in their improving scores in the 'emissions', 'efficiency' and in the 'renewable energies' indicators.

As climate policy, efficiency and renewable energies are responsible for 40% of each country's overall score, achievements in reducing emissions and promoting mitigation technologies are adequately included in the index. To allow the CCPI to be responsive enough to adequately capture ambitious climate policy, the weighting of the level of current emissions must not be higher than 30% including emissions from deforestation, as the absolute amount of CO_2 that a country emits can only be changed in small steps. On the other hand, the indicator 'level of emissions' ensures that countries, which are making their emission reductions from a very high level, are not being rewarded too generously. This indicator also ensures that the current status of economic development within each country is taken into account.

The emissions data, on which the CCPI ranking is built, is taken from the annual edition "CO_2 Emissions from Fuel Combustion" of the International Energy Agency (IEA). This data allows a yearly comparison, up to and including 2014, of all energy-related emissions of the 58 countries evaluated.

Since 2012, the index includes data on emissions from deforestation and forest degradation. Based on the FAO Global Forest Resource Assessment 2015 we calculate per-capita emissions from deforestation and forest degradation. Other non-energy-related emissions (e. g. from livestock, agricultural tilling and fertilizing) could not yet be taken into account due to uncertain data. Livestock alone is estimated to be responsible for 18% of global emissions, which is comparable to all emissions generated by the worldwide transport sector.[2]

Box 1: Evaluation of the CCPI

Since 2005, the Climate Change Performance Index has been contributing to a clearer understanding of national and international climate policy. It is an important tool towards the various initial positions and interests as well as kept and broken promises of the numerous countries in a world which is facing the challenge to reduce the causes of a dangerous climate change.

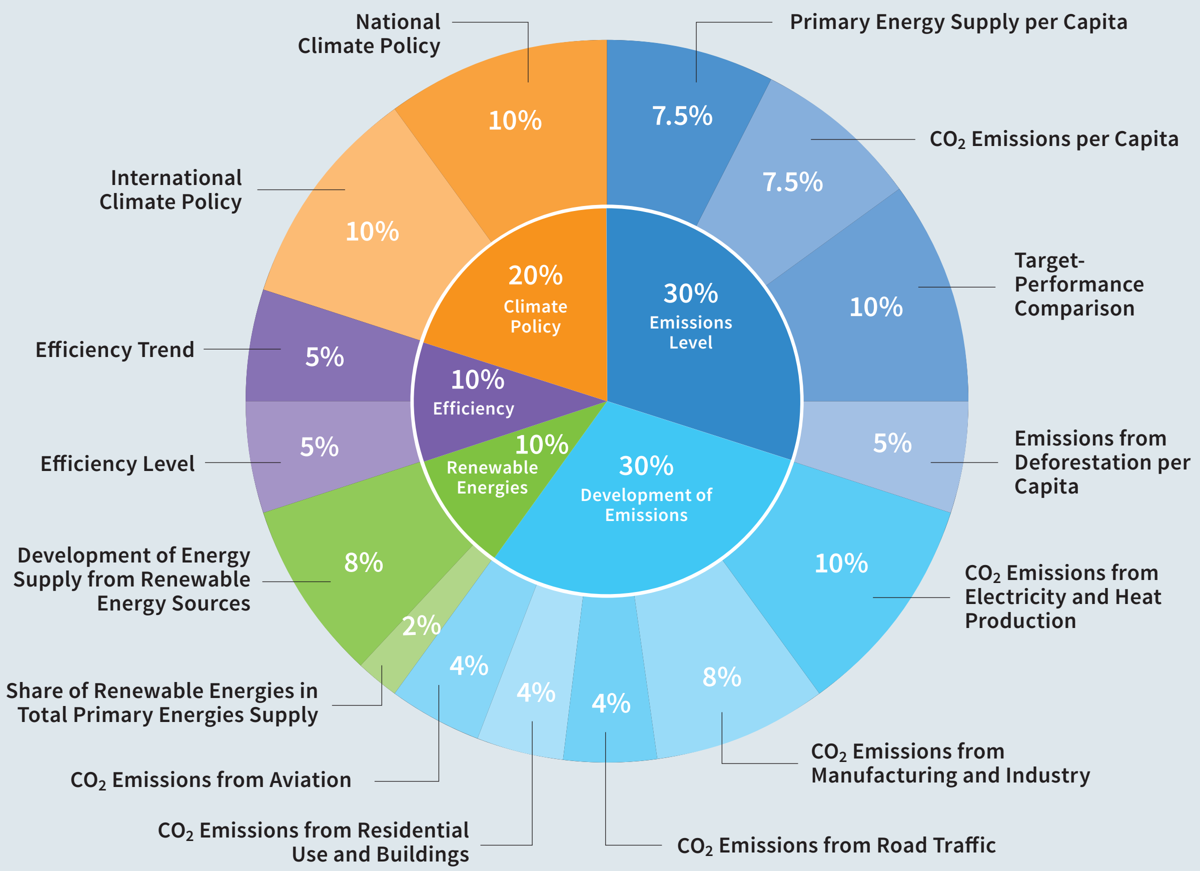
To further demonstrate existing measures more accurately and encourage steps towards an effective climate policy, the index' methodology has been evaluated after its seventh edition. The evaluation process was carried out in order to reorganise the underlying data, to find a method to integrate newly available deforestation and forest degradation data, to better capture recent political movements and to develop an approach which is more focused on mitigation solutions regarding climate change performance. Our world is characterized by fast-moving geopolitical and natural changes and our goal was to increase the sensitivity of the CCPI towards these changes.

One of the biggest challenges for the creation of a country-related composite index is the vast diversity of countries regarding geographical pre-conditions, historic responsibilities and economic capabilities. A second goal of the evaluation of the CCPI was, therefore, to better balance the subsets of indicators for a more equitable result in terms of these country specifics.

A major step forward has been made with the integration of data on emissions from deforestation and forest degradation. We are now able to present a more complete view on anthropogenic impacts on the world's climate. With an updated weighting and categorization of indicators we can track changes in climate change performance more immediately and at the same time increase the equity balance of the CCPI.

[2] Steinfeld et al. (2006)

Figure 1: Components of the CCPI



In addition to emissions data, qualitative data on the climate policy of evaluated countries is compiled through surveys of local climate change experts. These experts, usually representatives of non-governmental organisations, outline the most important policy measures to promote renewable energies, to increase energy efficiency or for other CO_2 emission reductions in the electricity and heat production sector, manufacturing and construction industries, transport sector, residential sector and forest- and peatland sector of their respective countries. These policies are then evaluated regarding their effectiveness towards climate protection. The country experts also evaluate their countries' Nationally Determined Contributions (NDCs) and their countries' performance in international climate-related negotiation processes.

The methodology that is used for the CCPI's ranking follows the OECD guideline for creating performance indicators.[3] The selection and weighting of indicators of the editions of the CCPI since 2013 has been altered substantially compared with earlier editions as a result of a thorough evaluation process (see box 1). Therefore, results from earlier editions of the CCPI should not be compared to those since the CCPI 2013.

However, to allow for some historic comparison, we simulated the ranking that countries would have scored in 2012 under the new selection and weighting of indicators.

Countries are compared in separate areas following a standardised method for comparative evaluation. To evaluate countries' scores, the CCPI does not assign absolute values (good or bad) but rather makes an inter-country comparison (better or worse). Therefore, any individual score will only indicate climate performance relative to that of other countries. Still, the top three positions of the CCPI remain empty, as no country has yet managed a climate change performance judged to be "sufficient" to the task.

[3] Freudenberg (2003)

2.1. Emissions

The CO_2 emissions of each country are what ultimately influence the climate. Therefore, they may be perceived as the most significant measure in the success of climate policies. That is why emissions contribute the major share of 60% to the overall score of a country.

However, the diversity of countries evaluated in the CCPI is enormous. It is, therefore, indispensable that more than just one perspective is being taken on the emissions level and the recent development of CO_2 emissions of a given country.

The level of current emissions only changes very slowly. Thus, it is less an indicator of the performance of climate protection than an indicator of the respective starting point of the investigated countries. From an equity perspective, it is not fair to use the same yardstick of climate protection performance on countries in transition as on developed countries. The level of current emissions therefore is a means of taking into account each country's development situation and thus addressing the equity issue.

The recent development of emissions, however, is comparatively responsive to effective climate policy, and therefore is an important indicator for a country's performance.

Photo: digitalstock

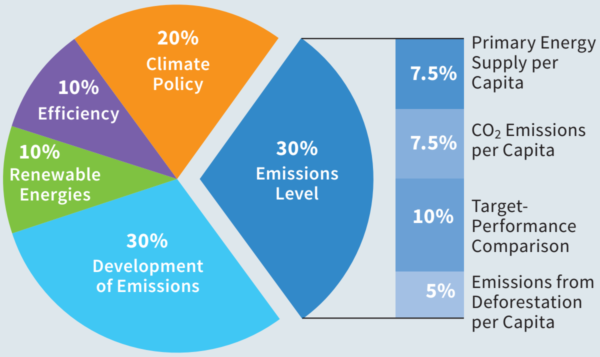
2.1.1. Level of Current Emissions (30% of Overall Score)

The level of current emissions is measured by using three separate indicators. Emissions from deforestation and forest degradation are accounted for by adding them as an extra indicator to the emissions level. Firstly, the overall 'CO_2 emissions per capita' is used.

The second emissions level indicator is 'primary energy supply per capita'. Under the assumption that energy will never be abundant, this indicator is an important complement to 'CO_2 emissions per capita'. This indicator also takes into account energy that has been supplied by low-carbon but possibly non-sustainable technologies such as nuclear power and/or large hydropower.[4]

Lastly, a specific 'target-performance' indicator similar to the Common but Differentiated Convergence (CDC) approach, which is based on the principle of "common but differentiated responsibilities" laid forth in the Framework Convention on Climate Change, is taken into account.[5] It compares the per-capita emissions from 1990 onwards with the "desired" development in the same time period. The underlying principle of this "desired development" is that the most serious consequences of global warming (dangerous climate change) will presumably be avoided if global average temperatures do not exceed 2 °C above pre-industrial levels.[6] In this scenario, the concentration of CO_2 equivalents in the atmosphere is kept below 400ppm. The development pathways to this target envision a gradual convergence of per-capita emissions in industrial, as well as developing and transitional countries to comparable levels by 2050. The comparison of target and reality allows developing countries to temporarily increase their emissions without letting the overall limit of 2 °C out of sight.

Figure 2: Weighting of Emissions Level Indicators



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[4] See Box 4: Hydropower, p. 13
[5] Höhne (2006)
[6] Meinshausen et al. (2009)

Box 2: Emission Accounting and Trade

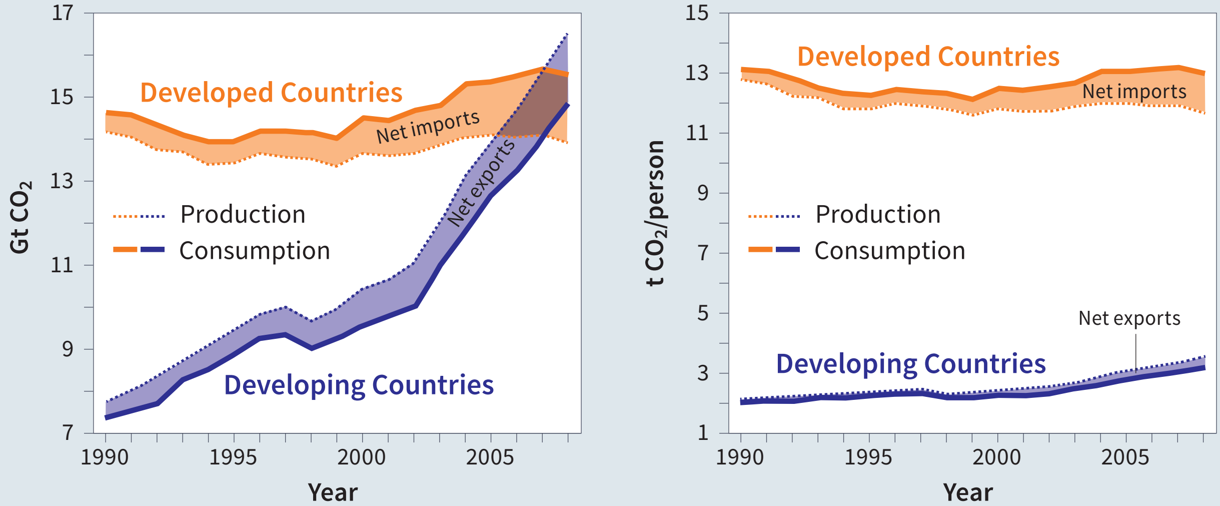
The currently prevailing way of accounting national emissions encompasses all emissions emerging from domestic production using a territorial system boundary[7] while excluding international trade.[8] In this sense, the nation producing the emissions is also the one held accountable no matter if those emissions are closely connected to an outflow of the produced goods to other countries. Considering that national governments can only exert political influence on domestic production but have no power over production-related emissions abroad, this conception seems prima facie plausible.

In the course of globalisation, international trade has caused an increasing spatial separation between production and consumption of goods. Thus, on the one hand China, Thailand and South Africa, who belong to the group of high-producers and greenhouse gas exporters, currently report emission levels that are considered too high. On the other hand, France, Switzerland and the USA are large importers of CO_2 intensive goods but the emissions imported are not charged to their account.[9]

With increasing international trade influencing national economies as well as related emissions, an alternative emission accounting approach has emerged from scientific research. In contrast to the production-based approach, it is focused on emissions caused by national consumption. As a basis for calculating nation-level emissions this account uses the total of national consumption being the sum of all goods produced, less the ones exported, plus the ones imported by a country. Measuring emissions based on what is consumed would lead to an increase of the absolute amount of CO_2 for several of the industrialised countries, induced by their emission intensive trade record. In contrast, countries like China and other emerging economies have proactively attracted production industries and continue to do so. In general, those countries also profit from their exports of emission intensive goods and should therefore not be entirely relieved of their responsibility.

The evaluation of emission data from the production and consumption of goods and services as presented in the graph in figure 3 by Caldeira and Davis (2011: 8533) shows significant differences between consumption-based and production-based data, while their development is clearly related. Generally, the amount of emissions embodied in global trade is constantly growing, increasing the importance of understanding and acknowledging consumption-based emission data. At the same time, the graph implies a high level of aggregation, wiping away diversity within the aggregate groups of developed and developing countries. Acknowledging this diversity, however, would require far more detailed analyses.

Figure 3: Historic CO_2 Emissions from Production and Consumption of Goods and Services[10]



Historic CO_2 emissions from 1990 to 2010 of developed (Annex B) and developing (non-Annex B) countries with emissions allocated to production/territorial (as in the Kyoto Protocol) and the consumption of goods and services (production plus imports minus exports). The shaded areas are the trade balance (difference) between Annex B/non-Annex B production and consumption. Bunker fuels are not included in this figure.

7 IPCC definition of boundary: "... greenhouse gas emissions and removals taking place within national (including administered) territories and offshore areas over which the country has jurisdiction" (IPCC 1996: 5)

8 Peters (2008), Peters and Hertwich (2008)

9 Peters et al. (2011)

10 Caldeira and Davis (2011: 8533)

Especially with regard to fairness and equity considerations, the use of a consumption-based approach to emissions seems to be beneficial. Advocates of this approach argue that all production is done for the purpose of consumption and, therefore, consumption can be seen as the driver of production and emissions.[11] Hence, holding countries accountable for the emissions associated with their citizens' eventual consumption would only seem fair.

Nevertheless, when it comes to the practical application of consumption-based emission accounting there are numerous obstacles from a methodological, scientific and political point of view: The application of the concept of consumption-based emissions requires complex calculation and high data input. So far, only few institutions provide consumption-based emission data, often arriving at different results and lacking behind in currentness. In contrast, production-based emission data is both widely available and easily assessable. Its predominant use on a semi-political level, by research institutes and NGOs on an international level, further reinforces its supremacy. Consequently, public media coverage is strongly biased towards the production-based accounting approach, resulting in a global public that is generally only informed about production-based emissions and their developments. Moreover, an agreement on the method by which consumption-based emission calculations should proceed has yet to be reached. Therefore, results based on different methodologies may end up being incomparable which can cause high vulnerability to a scientific tool such as the CCPI undermining both its applicability and its meaningfulness in the political context.

In face of the methodological uncertainty and the high complexity of consumption-based emission calculations, the CCPI refrains from following a consumption-based approach at the moment. For future revisions of the index methodology, however, consumption-based emission level calculations will remain an important concept and will be implemented once their scientific practicability and their political acceptance on the international level have been improved.

Emissions from Deforestation and forest degradation

Since 2012, the Climate Change Performance Index (CCPI) has supplemented its assessment of fossil fuel emissions with an indicator for the Land Use, Land Use Change and Forestry sector (LULUCF). Due to data constraints, previous indicators have focused only on emissions from deforestation. However, with improved data now available, the CCPI 2016 indicator features a new and simplified method that assesses emissions both from deforestation and forest degradation. Whilst this represents a step towards a more comprehensive and fairer index, there are still limitations (as outlined below), and future reports will endeavor to incorporate new data as it becomes available.

Studies indicate that forest-based emissions contribute around 10% of annual global GHG emissions. If emissions from peat-soils are included, this increases to ca. 12%, which is roughly comparable to the global road transport sector[12]. Globally, such emissions levels are minor compared to those from fossil fuels. However, forest emissions are geographically concentrated in forest-relevant countries. For example Brazil and Indonesia currently produce a large part of the global CO_2 emissions from deforestation, whilst China and the USA achieve large CO_2 removals from re/afforestation.

Forest ecosystems naturally accumulate and store carbon in living trees, as well as in soils, deadwood and leaf litter. Globally, forests contribute to the terrestrial carbon sink, absorbing CO_2 from the atmosphere and providing a natural buffer for anthropogenic emissions. Deforestation not only releases forest carbon, it also reduces the natural sink capacity of the forest ecosystem. However, actions such as forest protection and reforestation can enhance this sink, and achieve net removals of carbon from the atmosphere.

Data and Methodology

Forest data for the CCPI 2017 is based on the Global Forest Resource Assessment (GFRA 2015) of the United Nations Food and Agriculture Organisation (FAO)[13]. The FAO has been assessing forests and publishing the GFRA since 1990. Data is collected through standardised national surveys, supported by remote sensing technology, and authorised by countries

11 Tukker et al. (2014)
12 Van der Werf et al. (2009), 737, 738
13 FAO (2015b)

as official national data. Reports are released every five years, and data quality is continually improved and updated, also retrospectively.

The latest report features state-of-the-art data on “carbon in living biomass” of forests of every participating country.[14] This data represents the carbon contained in living trees (both above ground in tree trunks and branches, and below ground in root mass) of all areas of a country defined as forest.[15] It includes natural, managed, and plantation forests, but excludes forest crops such as palm oil plantations, and trees in non-forest areas (such as parks and sparsely wooded lands). Data is available as carbon stocks at individual years (1990, 2000, 2005, 2010 and 2015) and as annual change rates averaged over the respective time periods.

The CCPI uses the annual change rates for carbon in living forest biomass from 2010-2015 as a basis for the indicator. For a few countries, data for the latest period was not yet available. In these cases, annual change rates of the former time period (2005-2010) were used as a proxy indicator.

The indicator represents the countries’ net carbon change in living forest biomass, both from changes in area (deforestation, afforestation, reforestation) and changes in the carbon content of standing forests (forest degradation, forest improvement). Changes in forest carbon may be negative and imply carbon emissions to the atmosphere, or may be positive and imply carbon removals. Carbon emissions and removals are converted to CO_2 by multiplying by 44/12 (the atomic weight conversion factor of carbon to carbon dioxide).

It is important to note that due to both retrospective improvements in data, and the changing methodological approach, the indicator used in the CCPI 2016 and 2017 cannot be directly compared to those of previous reports.

Assumptions and caveats

Carbon in forest ecosystems – not just living biomass

Forests are not only made up of living trees, and there are further significant carbon pools in the world’s forest ecosystems. Unfortunately, current data for carbon in dead wood, forest litter and soils is inconsistent and therefore not internationally comparable. It is estimated that carbon in living biomass makes up 45% of carbon in forest ecosystems, with dead biomass (dead wood and litter) at 10%, and soil carbon (to 30cm deep) accounting for another 45% globally. By assessing only living biomass, up to 55% of forest carbon is thereby excluded from this indicator.

There is generally more non-living biomass carbon stored in natural primary forests, than in “tidy” plantations and managed forests, which are steadily becoming more widespread. This means that a country’s net emissions from deforestation and degradation are likely to be underestimated, while removals from forest improvement may be overestimated. Especially, soil carbon takes many years to regenerate, and may never reach pre-deforestation levels. The decomposition of especially carbon-rich peat-soils resulting from deforestation or the draining of forest wetlands is acknowledged as a major source of emissions. However, comprehensive and internationally comparable data on these changes is not yet available. As a global average, changes in carbon in non-living biomass are estimated to make up approximately 30% of the changes in carbon stocks of forests in 2011-15.[16]

Not all forests are equal

By focusing only on the climate change effects of CO_2 emissions to the atmosphere, this indicator assesses the changes in carbon stocks of forests, regardless of what kind of forests are measured. However, plantation forests may have very different qualities to natural forest, with regard to carbon balance, biodiversity and ecological functioning. For example, a country with relatively low emissions may still be undermining the biodiversity values of its forests. These qualities cannot be properly captured by this indicator.

Natural vs. anthropogenic changes

Countries with large areas of natural forest have a natural forest sink – forests may absorb carbon and bind it in the ecosystem naturally, or conversely emit carbon through natural processes such as drying and natural forest fires. While being very accurate in accounting for emissions and removals, this indicator cannot distinguish between anthropogenic and natural changes – more simply put, some emissions and removals are not caused by economic activities, and cannot be controlled or altered through changes in domestic policy. For example, in countries with large areas of natural and un-managed forests, natural removals may be wrongly attributed to good forest policy. However, it can be argued that most forests are somehow subject to management, and even natural forests must be protected through conservation laws. This indicator thereby allows countries to take credit for allowing their natural sinks to function, and in some cases, countries may be penalized for natural emissions that are beyond their control.

[14] FAO (2015b)
[15] By the standards of the FAO forest definition (GFRA 2015 - Terms and Definitions)
[16] Federici et al. (2015)

2.1.2. Recent Development of Emissions (30% of Overall Score)

The indicators describing the recent development of emissions are in sum weighted as 30% of a country's score in the CCPI. To allow the CCPI to not only rate overall climate protection performance, but also to analyse good practice or shortcomings in more detail, we chose to measure changes in CO_2 emissions from the energy, industry, transport and residential sectors separately. This categorisation corresponds also to the IPCC guidelines for energy-related emissions inventories.[17] The weighting of each sector is set roughly according to its world-wide relevance to climate change.

We apply two different calculation methods. In both methods, the evaluated time frame consists of two three-year periods which are spaced by five years (2007-2009 compared to 2012-2014). These periods have the advantage of being able to average out temporary fluctuations. The 'development of emissions' indicators are based on the International Energy Agency's recent data on "CO_2 Emissions from Fuel Combustion".

In the first method we look at the relative trend of emissions compared to the current level of emissions in terms of percentage. In the second method we look at the overall increase or decrease of per-capita emissions in terms of tonnes of CO_2 per capita. Both methods are then combined in one final rating using normalisation as described in chapter 2.

In the category 'electricity and heat production', emissions from electricity generation are considered. As a high-risk energy source, nuclear power is taken into account with so-called "risk equivalents per energy unit" (which are roughly equivalent to the emissions of a modern coal power plant). This avoids rewarding the construction of new nuclear power plants, as only countries that substitute nuclear energy with low emissions fuels can improve their position. Nuclear energy is not accounted for as a separate indicator, however.

In the transport sector, emissions from road transport and aviation are evaluated. International aviation emissions are granted an extra "climate weighting". The reason given is that aeroplanes emit not only CO_2 but also water vapour. These emissions cause an especially large climate effect due to the flight altitude and are therefore measured using so called "CO_2 equivalents". International aviation emissions are calculated into the index with the IPCC's 1999 "best guess" factor of 2.7.

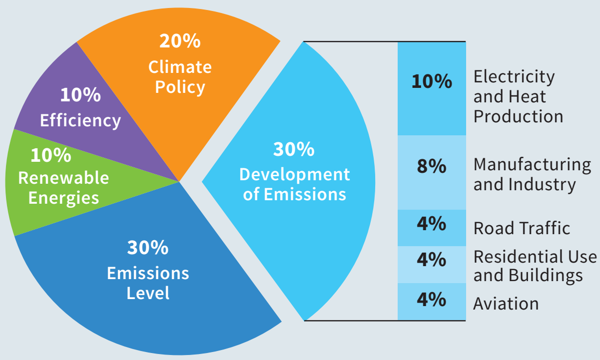
The CO_2 emissions for international aviation are calculated, according to the IEA method, by the amount of "bunker fuels" that a country has stored for aviation use. This is under the assumption that it will in fact be used to fuel up. In contrast to earlier editions of the CCPI, data availability has improved such that it is now possible to also include emissions from domestic aviation in addition to international aviation.

International shipping, however, remains excluded from our observation, as shipping emissions cannot be calculated in the same way. Shipping fuel is mainly held in important ports, e.g. Rotterdam or Shanghai, but put into use in ships from various countries. Therefore, it is hardly possible to determine who is responsible for the emissions. Here, as with international trade (see above), the CCPI follows the "Kyoto reasoning" of only counting countries' emissions within their borders.

The residential sector includes those emissions that are generated through the heating of buildings and of domestic use water (not those from electricity though – else they would be counted twice).

Emissions from manufacturing and construction are to be found in the industrial sector.

Figure 4: Weighting of Emissions Development Indicators



[17] IPCC (1997)

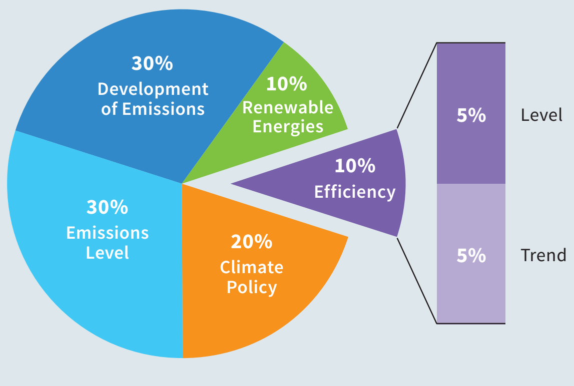
Box 3: Shale Gas

Recent developments, particularly in the United States of America, show a widespread expansion of gas production from unconventional sources like shale gas. The production of shale gas involves the use of enormous amounts of water and toxic chemicals. In addition to threatening the local biosphere and fresh water supplies, this also results in the release of potent greenhouse gases (GHG) at the boreholes. These emissions are a great challenge for the CCPI, because the IEA data on energy-related emissions only includes emissions from the burning of fossil fuels. Direct emissions released in the process of conveyance are not accounted for. Thus, substituting coal with shale gas would lead to a decrease of emissions in the IEA data – and subsequently to a higher ranking in the CCPI, despite the fact that de facto overall emissions would barely have changed. Howarth et al. (2011) suggest that overall specific emissions from shale gas could actually even exceed specific emissions from coal, due to a methane leakage of about 4%, which is not only twice as much as usually indicated by the gas industry, but also enough to thwart the advantage gas offers over coal due to less CO_2 emissions. Recent studies, summarized by Howarth (2014), assume even higher leakage rates up to 9% (e.g. Karion et al. 2013; Brandt et al. 2014). Due to measurement and methodological uncertainties, studies come to different results about the actual leakage rates but most agree that emissions are probably much higher than assumed by public authorities. If further studies verify these results, it must be evaluated how to include these additional emissions in the Index.

2.2. Efficiency

Energy Efficiency is complex to measure and would require a sector by sector approach, for which at this moment there are no comparable data sources across all countries available. One of the two most prominent strategies towards low-carbon development is the promotion of energy and CO_2 intensity.[18] To reflect this, two different indicators are taken into account in the index. The first indicator is 'CO_2 emissions per unit of total energy supply' (CO_2/TPES). This indicator describes the carbon intensity of a country's energy sector and indicates the share of fossil fuels in the energy supply. The second indicator is 'total primary energy supply per gross domestic product in terms of purchase power parities' (TPES/GDP). This indicator is more focused on how efficient energy is used in the economy. Both are accounting for 5% of the CCPI ranking. Decoupling processes in this two indicators offer a signal about a country's progress in decarbonising the economic sector.

Figure 5: Weighting of Efficiency Indicators



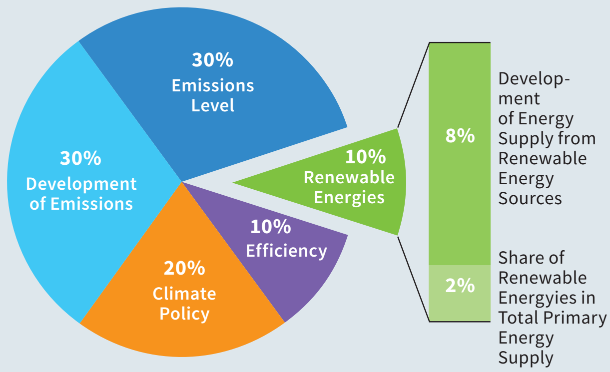
[18] Rebound effects can diminish positive effects of increased efficiency or even reverse them. Still, we cannot forgo these efficiency improvements, but rather complement them with adequate measures that limit rebound effects. See Santarius (2012) for more information.

2.3. Renewable Energies

The substitution of fossil fuels by renewable energies is the second most prominent, and equally important strategy towards a transformed economic system that is compatible with limiting global warming below 2 °C. For example, in the year 2014 renewable energies in Germany accounted for approximately 13.5% of total final energy consumption. Calculation show that deployment of renewable energies resulted in a net avoidance of 155 Mt. CO_2 in 2014.[19] This shows that a targeted increase of the share of renewable energies can make an essential contribution to climate change protection efforts. The 'renewable energies' indicator assesses whether a country is making use of this potential for emissions reduction.

The level as well as the recent development of renewable energies, therefore, contributes with 10% to the overall rating of a country. 80% of this indicator's rating is based on the recent development of energy supply from renewable sources. To also reward countries such as Norway or Iceland who have already managed to gain a major share of their total energy supply from renewable sources and therefore have less potential to further extend their share of renewable energies, the remaining 20% are attributed to the share of renewable energies in the total primary energy supply.[20]

Figure 6: Weighting of Renewable Energies Indicators



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Box 4: Hydropower

One of the largest contributions to renewable energy supply is generated by hydropower. However, many large hydropower projects are deemed to be not sustainable. Large hydropower projects often have profound negative impacts on local communities, wildlife and vegetation in the river basins and sometimes even produce additional greenhouse gas emissions where water catchments are particularly shallow.

This causes a double challenge to the CCPI. Firstly, for countries that already meet a large share of their energy demand with supply from renewable energies – often old and potentially unsustainable hydropower – can hardly raise their production in relative terms as easily as a country that starts with near zero renewable energy supply. To the contrary, if a country already covers nearly 100% of its demand via renewable energy supply and at the same time increases efficiency, renewable energy supply might even fall. In such an extreme case a country would score a very low CCPI score while demonstrating exemplary climate change performance.

Secondly, the CCPI rewards to some degree the development of unsustainable dam projects when an increase in renewable energy supply is solely driven by such projects. Such an approach is not regarded as adequate climate protection by the authors of the CCPI. Unfortunately, data availability on the structure or even sustainability of hydropower generation is insufficient to be incorporated in the CCPI. If data availability on large and unsustainable hydropower will change in future, we will include these data and therefore exclude unsustainable hydropower.

19 BMWi (2015)
20 See Box 4: Hydropower, p.13

2.4. Climate Policy

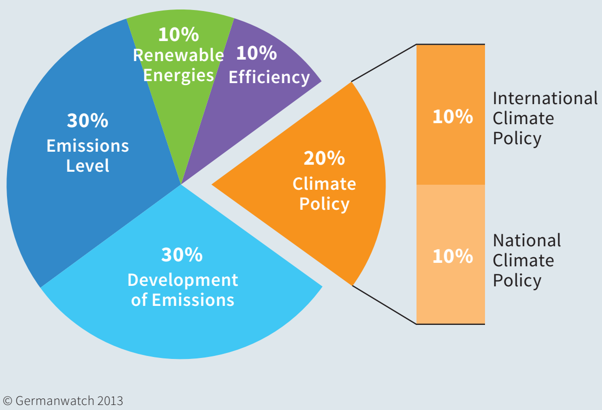
The climate policy category considers the fact that measures taken by governments to reduce CO_2 often take several years to show their effect on the emissions, efficiency and renewable energies indicators. On top of this, the most current CO_2 emissions data enumerated in sectors of origin, provided by the IEA, is about two years old. However, the assessment of climate policy includes very recent developments. The effect that current governments benefit or suffer from the consequences of the preceding administration's climate actions is thereby reduced.

The qualitative data of the indicator 'climate policy' is assessed annually in a comprehensive research study. Its basis is the performance rating by climate change experts from non-governmental organisations within the countries that are evaluated. By means of a questionnaire, they give a judgement and "rating" on the most important measures of their governments. The questionnaire covers the promotion of renewable energies, the increase of efficiency and other measures to reduce CO_2 emissions in the electricity and heat production sector, the manufacturing and construction industries, or transport and residential sectors.

Beyond that, current climate policy is evaluated with regard to reduction of deforestation and forest degradation on the basis of support and protection of forest ecosystem biodiversity. For the third time, this edition of the index also assesses national peatland policy. After the Paris Agreement, experts also evaluate the ambition level and 2° compatibility of their countries' Nationally Determined Contributions (NDCs) as well as their progress towards reaching these goals. Also, the performance at UNFCCC conferences and in other international conferences and multilateral agreements is evaluated. Thus, both the national and international efforts and impulses of climate policies are scored.[21] To compensate the absence of independent experts in some countries (due to the lack of functioning civil society structures), the national policy of such countries is flatly rated as scoring average points. The goal is to close these gaps in the future and steadily expand the network of experts. About 280 national climate experts contributed to the evaluation of the 58 countries of the CCPI 2017. They each evaluated their own country's national and international policy. The latter is also rated by climate policy experts that observe the participation of the respective countries at climate conferences.

Fossil of the Day presented by Climate Action Network (CAN) at the UN Climate Summit 2014 in Lima.

Figure 7: Weighting of Climate Policy Indicators



Climate policy has an overall weight of 20%, with both national and international policy making up 10%. Despite the apparently low influence of climate policy, this category has quite a considerable influence on short term changes in the overall ranking. Unlike the rather "sluggish" categories of 'emissions', 'efficiency' and 'renewable energies', a positive change in climate policy can lead a country to jump multiple positions. On the other hand, the "sluggish" categories can only be changed through successful climate change protection – the policy therefore plays a decisive role for future scores within the CCPI!

[21] The full questionnaire can be downloaded at http://germanwatch.org/en/ccpi

3. Calculation and Results

The current evaluation method sets zero as the bottom cut off, and 100 points are the maximum that can be achieved. A country that was best in one indicator receives full points (in that indicator). The best possible overall score is therefore 100 points. Important for interpretation is the following: 100 points are possible in principle, but for each partial indicator, and for the overall score, this still only means the best relative performance, which is not necessarily the optimal climate protection effort!

From the publication of the CCPI 2009 onwards, the first three places of the ranking can only be achieved if a country takes the plunge and pursues climate change protection in earnest. We decided to do this so as not to deceive, and to show clearly that until now, there is no country that is making even close to the efforts and impulses that are necessary to stay within the 2 °C limit. This is measured by means of the 'target-performance' indicator (see p. 7). The analysis of this indicator clearly shows that not one country has yet made sufficient efforts and reduced its emissions enough to play its part in averting dangerous climate change. As long as a country is not on the right path, it has no right to "stand on the podium".

The CCPI's final ranking is calculated from the weighted average of the achieved scores in the separate indicators. The CCPI does not evaluate the country's performance in absolute terms, but only in comparison with one another.

The following formula is used to calculate the index:

$$I = \sum_{i=1}^{n} w_i X_i$$

I: Climate Change Performance Index;

X_i: normalised indicator;

w_i: weighting of X_i , $\sum_{i=1}^{n} w_i = 1$ and $0 \le w_i \le 1$,

i: 1,...., n: number of partial indicators (currently 15)

$$\text{Score} = 100 \left(\frac{\text{actual value - minimum value}}{\text{maximum value - minimum value}} \right)$$

The differences between countries' efforts to protect the climate are only to be seen clearly in the achieved score, not in the ranking itself. When taking a closer look at the top position of 2017, one can see that the highest-ranking country France was not at the top in all indicators, let alone have they achieved 100 points. This example shows that failures and weak points of a country can only be recognised within the separate categories and indicators.

The current version of the Climate Change Performance Index including model calculations and the press review can be downloaded from www.germanwatch.org/en/ccpi

Box 5: Comparability of Different Editions of the CCPI

An index that compares climate change performance of different countries over several years encourages comparing one country's ranking position to the past years. We need to point out that due to two factors a comparison between two years is possible only up to a limited extent.

The first reason is limited comparability of the underlying data. The calculation of the CCPI is based on the annual publication "CO_2 Emissions from Fuel Combustion" of the International Energy Agency (IEA). The data gives an overview of the last year's CO_2 emissions and adds the most recent data, which we used for the new edition of the CCPI. However, in many cases the IEA has revised historic data retroactively in later editions, if it needed to complete former results, e.g. due to new measuring sources. So it might not be possible to reproduce the exact results of one year with updated data of the same year but taken from a later edition of "CO_2 Emissions from Fuel Combustion". Also the FAO is evaluating and improving their methods to measure deforestion and forest degradation (see also chapter 2.1.1.).

The second factor that leads to limited comparability is that our expert pool is continuously extended and altered. We strive to increase the number of experts so that new evaluations of the countries' policies depict a more differentiated result. On the same time some experts change their positions or are not available anymore for other reasons. With a changing jury of a country's policy also the judgment changes.

Both factors have to be kept in mind when comparing previous with current editions of the CCPI.

For the recent developments and data changes, please check the chapter "Changes since the Last Edition" in the most recent CCPI Results brochure (www.germanwatch.org/en/ccpi).

4. Application and Prospects

The Climate Change Performance Index was first introduced to a professional audience at the COP 11 – Montreal Climate Conference in 2005. The growing media/press response in the countries surveyed confirms the ever-increasing relevance of the Index, and encourages us in our work.

CAN Europe also supports the Index through its international network of experts working on the issue of climate protection.

Following a methodological evaluation of the 7th edition of the CCPI we began to include the carbon emissions data from deforestation. However, due to the lack of comparable data for various other sectors, like agriculture, peatland or forest degradation, the corresponding emissions can not be taken into account yet. We will continuously check the data availability for these sectors and include them as soon as possible.

By presenting the CCPI at the UN Climate Change Conferences, we aim to promote climate protection by reminding the major emitters worldwide of their responsibility.

By simplifying complex data the Index not only addresses experts, but everyone. We would like to emphasize that so far not one country in the world has done enough to protect the climate. We hope that the index provides an incentive to significantly change that and step up efforts.

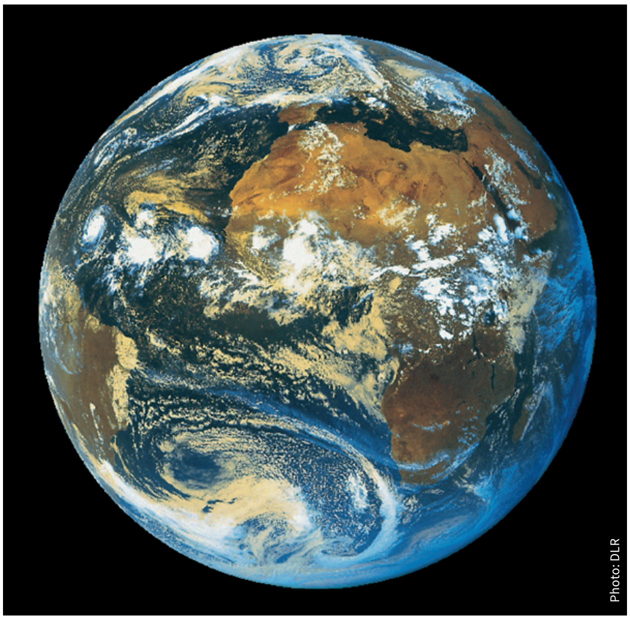


Photo: DLR

We will gladly provide you with more detailed information on specific country analyses. If you are interested or have any questions, please contact:

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Germanwatch

Following the motto "Observing, Analysing, Acting", Germanwatch has been actively promoting global equity and the preservation of livelihoods since 1991. In doing so, we focus on the politics and economics of the North and their worldwide consequences. The situation of marginalised people in the South is the starting point of our work. Together with our members and supporters as well as with other actors in civil society, we intend to represent a strong lobby for sustainable development. We attempt to approach our goals by advocating for the prevention of dangerous climate change, food security, and compliance of companies with human rights.

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CAN Europe

Climate Action Network Europe (CAN-E) is Europe's largest coalition working on climate and energy issues. With over 120 member organisations in more than 30 European countries – representing over 44 million citizens – CAN Europe works to prevent dangerous climate change and promote sustainable climate and energy policy in Europe.

The Climate Action Network (CAN) is a worldwide network of over 950 Non-Governmental Organizations (NGOs) in more than 110 countries, working to promote government and individual action to limit human-induced climate change to ecologically sustainable levels.

The vision of CAN is a world striving actively towards and achieving the protection of the global climate in a manner that promotes equity and social justice between peoples, sustainable development of all communities, and protection of the global environment. CAN unites to work towards this vision.

CAN's mission is to support and empower civil society organisations to influence the design and development of an effective global strategy to reduce greenhouse gas emissions and ensure its implementation at international, national and local levels in the promotion of equity and sustainable development.