Climate Change Performance Index

Background and Methodology

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Summary

Recognising the urgency to take immediate action in protecting the global climate, the 21st Conference of the Parties (COP21), held in December 2015 in Paris, made a ground-breaking achievement in adopting the goal to limit global warming to well below 2°C and pursue efforts to limit warming to 1.5°C. The International Panel on Climate Change (IPCC) Special Report on the *Impacts of Global Warming of 1.5°C* shows that for the achievement of the Paris targets ambitions for climate protection need to be increased. Since the revision of its methodology in 2017, the Climate Change Performance Index (CCPI) is suited to measure the progress of countries towards contributing to the climate goals agreed to in Paris. It is now applied for the second time for the CCPI 2019 edition and thus guarantees a comparability with the previous CCPI 2018 edition.

The Climate Change Performance Index is an instrument designed to enhance transparency in international climate politics. Its aim is to put political and social pressure on those countries which have, up until now, failed to take ambitious action on climate protection. It also aims to highlight those countries with best practice climate policies.

This publication explains how the CCPI is calculated. Furthermore, it lists the literature and data sources used for these calculations.

Content

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 keep global warming well below 2°C and to pursue efforts to limit the increase to 1.5°C thus avoid climate change with all its expected impacts are virtually zero. The special report on *Global Warming of 1.5°C*, newly released by the International Panel on Climate Change (IPCC), sheds light on the substantial difference in impacts between warming of 1.5°C and 2°C. With business as usual (BAU) scenarios, we are at the moment even heading towards an average global warming of 4 to 6°C and still towards an up to 3°C, if countries fulfil their publicly announced mitigation targets.

The subsequent worldwide dramatic consequences are impressively documented in the World Bank report "Turn down the Heat". The World Energy Outlook from the International Energy Agency (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 already provide a sustainable and affordable – oftentimes already cheaper – 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 the 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 are a large-scale deployment of renewable energies and efficiency improvements leading to a globally stable or even decreasing energy use, play a prominent role in the methodology of the Climate Change Performance Index (CCPI). The CCPI 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.

After the twenty-first session of the Conference of the Parties (COP21) in Paris 2015, the next years will decide on the path towards a sustainable future. Alongside the COP24 in Katowice, Germanwatch, the NewClimate Institute and the Climate Action Network will present the Climate Change Performance Index 2019 to the global public. The CCPI compares countries by their development and current status in the three categories "GHG Emissions", "Renewable Energy" and "Energy Use", the 2°C-compatibility of their current status and targets set for the future in each of these categories and their ambition and progress in the field of climate policy aiming at inducing enhanced action on climate change, both domestically and in international diplomacy.

As has been the case with the previous editions, the CCPI 2019 would not have been possible without the help of about 350 climate experts from all over the world, who evaluated their countries' climate policy. We would like to express our deep gratitude and thank all of them.

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.

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.climate-change-performance-index.org.

1 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 usually compares those 56 countries that together are responsible for more than 90 percent of annual worldwide carbon dioxide emissions.

The climate change performance is evaluated according to uniform criteria and the results are ranked. With reaching the Paris Agreement in 2015, every country has put forward own mitigation targets and the global community emphasised the need to limit global temperature rise well below 2°C or even 1.5°C. The CCPI evaluates how far countries have come in achieving this goal. It helps to access and judge the countries' climate policy, their recent development, current levels and well-below-2°C compatibility of GHG emissions, renewable energies, energy use (as an indication of their performance in increasing energy efficiency) and their targets for 2030.

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 systematically protect the climate. Thus, the index is to be both a warning as well as an encouragement to everybody involved. With this in mind, the NewClimate Institute, the Climate Action Network 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 as well as national government institutions inform themselves on ways of increasing their countries' rank. Naturally, the index is also available online for general public interest.[1]

[1] Burck et al. (annualy updated)

2 Methodology

The climate change performance is measured via fourteen indicators, classified into four categories:

1. "GHG Emissions" (40%),

2. "Renewable Energy" (20%),

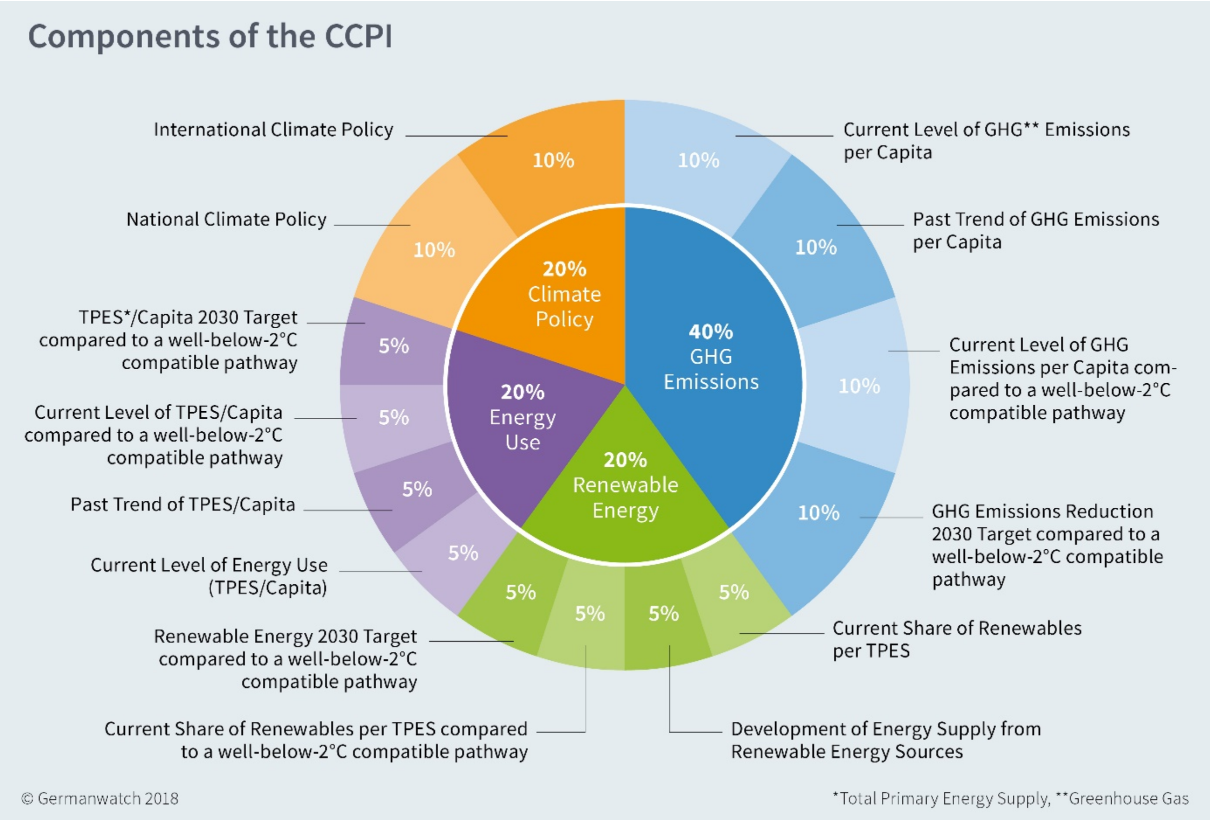
3. "Energy Use"(20%)

4. "Climate Policy" (20%).

A country's performance in each of the categories 1-3 is defined by its performance regarding four different equally weighted indicators, reflecting four different dimensions of the category: "current level", "recent developments (5-year trend)", "2°C compatibility of the current level" and the "2°C compatibility of its 2030 target". These twelve indicators are complemented by two indicators, measuring the country's performance regarding its national climate policy framework and implementation as well as regarding international climate diplomacy in the category "Climate Policy".

Figure 1 gives an overview of the composition and weighting of indicators defining a country's overall score in the CCPI. For details on the constitution of a country's scoring, please see chapter 3 "Calculation and Results".

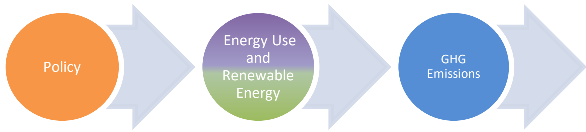
Figure 1: **Components of the CCPI: Fourteen indicators (outer circle) in four categories (inner circle)**



The index rewards policies which aim for climate protection, both at the national level and in the context of international climate diplomacy. Whether or not countries are stimulating and striving towards a better performance can be deduced from their scores in the "Climate Policy" indicators. If these policies are effectively implemented can be read – with a time lag of a few years – in the country's improving scores in the categories "Renewable Energy" and "Energy Use" and lastly in positive developments in the category "GHG Emissions". Following this logic, the index takes into account the solutions with a weighting of 20% each:

- an effective climate policy,
- an expansion of renewable energy, and
- improvements in energy efficiency and thus control over domestic energy use.

This weighting scheme leaves the CCPI responsive enough to adequately capture recent changes in climate policy and newly achieved improvements on the way to reduce GHG emissions. As GHG emissions reductions are what needs to be achieved for preventing dangerous climate change, this category weighs highest in the index (40%). Measuring both, emissions trends and levels, the CCPI provides a comprehensive picture of a country's performance, neither too generously rewarding only countries, which are reducing emissions from a very high level, nor countries, which still have low levels but a vast increase. This combination of looking at emissions from different perspectives and since 2017 also taking into account a country's performance in relation to its specific well-below-2°C pathway ensures a balanced evaluation of a country's performance.



Data sources and adaptions

The CCPI is using the PRIMAP[2] data base to assess all GHG emissions arising across all sectors. As the PRIMAP data base does not cover LULUCF emissions, the LULUCF emissions are taken from FAO[3], the national inventory submissions 2018[4] and the biannual country reports[5]. For all energy-related data in the categories "Renewable Energy" and "Energy Use", the index continues to use data from the International Energy Agency (IEA)[6], generally following the definitions given by the IEA. However, the CCPI assessment excludes non-energy use from all data related to total primary energy supply (TPES) as well as traditional biomass from all numbers provided by the IEA for both, TPES numbers and the assessment of renewable energy.[7]

The evaluation of the countries' mitigation targets is based on their Nationally Determined Contributions (NDCs), communicated to the UNFCCC.[8] Since clear guidelines and frameworks for the framing of NDCs are not existent, the countries' targets partly had to be inter-/extrapolated to 2030 in order to assure comparability (for details, please see chapters 2.1.4 for GHG reduction targets, 2.2.4 for RE targets and 2.3.4 for energy use targets). Evaluations of countries' performance in climate policy is based on an annually updated survey among national climate and energy experts from the country's civil societies (for details, please see chapter 2.4).

[2] PRIMAP (annually updated)
[3] FAO (2015)
[4] UNFCCC (2018-a)
[5] UNFCCC (2018-b)
[6] IEA (annually updated-a)

[7] Since the IEA does not explicitly identify traditional biomass as such, it is assumed that the residential use of biomass (explicitly listed in the IEA statistics) strongly coincides with traditional use biomass, especially in developing countries. In industrialised countries this quantity is negligible in most cases.
[8] UNFCCC (2018-c)

Box 1: Comparability of different editions of the CCPI

An index that compares the climate change performance of different countries over several years encourages comparing a country's ranking position to the past years. We need to point out that three factors limit the comparability.

The first reason is limited comparability of the underlying data. The calculation of the CCPI is partly based on different databases by the International Energy Agency (IEA) and from PRIMAP. In many cases the IEA and others have 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 from the same year but taken from a later edition of the databases.

The second factor that leads to limited comparability is that our expert pool providing the data basis for the climate policy category is continuously being extended and altered. We strive to increase the number of experts so that new evaluations of the countries' policies depict a more differentiated result. At the same time, some experts are not available any more, e.g. due to a change of job. When the people acting as the judges of a country's policy change, differences in judgements can occur.

Thirdly, in 2017, the underlying methodology of the CCPI has been revised and adapted to the new climate policy landscape of the Paris Agreement. Even though the new methodology is based on similar ranking categories and data sources, some indicators as well as its weighting scheme have been adapted. With its new composition, the CCPI was extended to measuring a country's progress towards the globally acknowledged goal of limiting temperature rise well below 2°C. Furthermore, the index now also evaluates the country's 2030 targets. And finally, the former scope of looking at energy-related CO_2 emissions has been extended to GHG emissions.

The CCPI 2018 and the CCPI G20 Edition of July 2017 were the first index publications based on the new methodology. Hence, regarding the applied methodology, the CCPI 2019 edition (for 56 selected countries and the EU) ensures a comparability with these previous editions.

2.1 GHG emissions (40% of overall score)

The greenhouse gas (GHG) emissions of each country are what ultimately influences the climate. Therefore, they may be perceived as the most significant measure in the success of climate policies. That is why the emissions category contributes 40% to the overall score of a country.

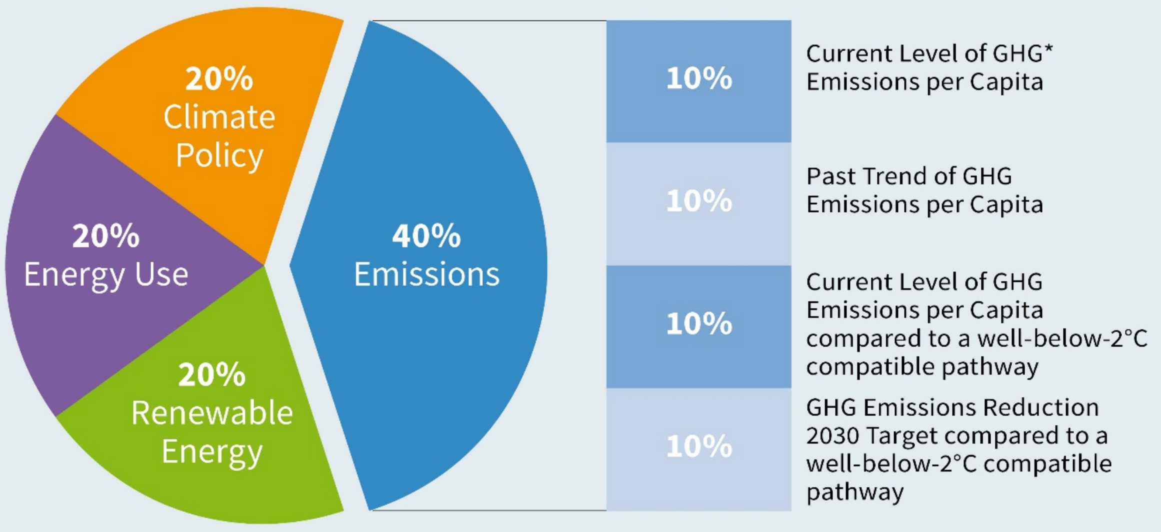
However, the diversity of countries evaluated in the CCPI is enormous. It is therefore indispensable that more than just one perspective be taken on the emissions level and how the GHG emissions of a given country have developed in the recent past.

The GHG emissions category thus is composed of four indicators. "Current Level", "Recent Developments" of per capita GHG emissions and the of per capita emissions are complemented by two indicators, comparing the countries' current level and 2030 emissions reduction targets to its country-specific well-below-2°C pathway. All of these indicators are weighted equally with 10% each.

For the first time, the CCPI covers all major categories of GHG emissions. This includes energy-related CO_2 emissions, CO_2 emissions from land use, land use change and forestry (LULUCF), methane (CH_4), nitrous oxide (N_2O), and the so-called F-gases hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) for which we use data from PRIMAP provided by the Potsdam Institute for Climate Impact Research.[9]

With using overall GHG-related instead of only energy-related CO_2 emissions as in previous editions of the CCPI, the index now reflects a more comprehensive picture of the actual mitigation performance of a country, taking into account that emissions from other sectors play a crucial role in some of the evaluated countries.

Figure 2: Weighting of Emissions Level Indicators



*Greenhouse Gas

[9] Potsdam Institute for Climate Impact Research (2017)

Box 2: Emissions accounting and trade

The currently prevailing way of accounting for national emissions encompasses all emissions emerging from domestic production using a territorial system boundary while excluding international trade. 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 plausible at first sight.

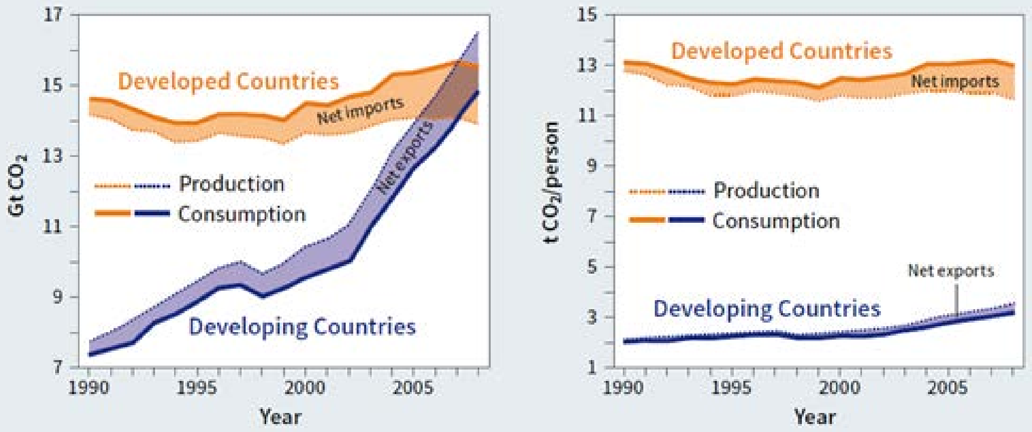
In the course of globalisation, international trade has caused an increasing spatial separation between the production and consumption of goods. Thus, on the one hand China, Thailand and South Africa, who belong to the group of high-producers and greenhouse gas exporters, currently report emission levels 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.

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.

This CCPI is calculated with production emissions only.

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.

2.1.1 Current Level of GHG Emissions per Capita

Even with ambitious climate policy, the level of current per capita GHG emissions usually only changes in a longer-term perspective. Thus, it is less an indicator of recent performance of climate protection than an indicator of the respective starting point of the countries being investigated. 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.

2.1.2 Past trend of GHG Emissions per Capita

The indicator describing the recent development of GHG emissions accounts for 10% of a country's overall score in the CCPI. To reflect the development in this category, the CCPI evaluates the trend over a five-year period of greenhouse gases per capita. The indicator measuring recent development in emissions is comparatively responsive to effective climate policy, and is therefore an important indicator of a country's performance.

2.1.3 Current Level of GHG Emissions per Capita compared to a well-below-2°C compatible pathway

The benchmark in the index category "GHG Emissions" is based on a global scenario of GHG neutrality in the second half of the century, which is in close alignment with the long-term goals of the Paris Agreement. To stay within these limits, GHG emissions need to be drastically reduced, a peak needs to be reached by 2020 and CO_2 emissions need to decline to net zero by around 2050.[10]

Figure 4: GHG emissions: actual pathway (green) vs. well-below-2°C target pathway (orange). Example of an over-performing country.

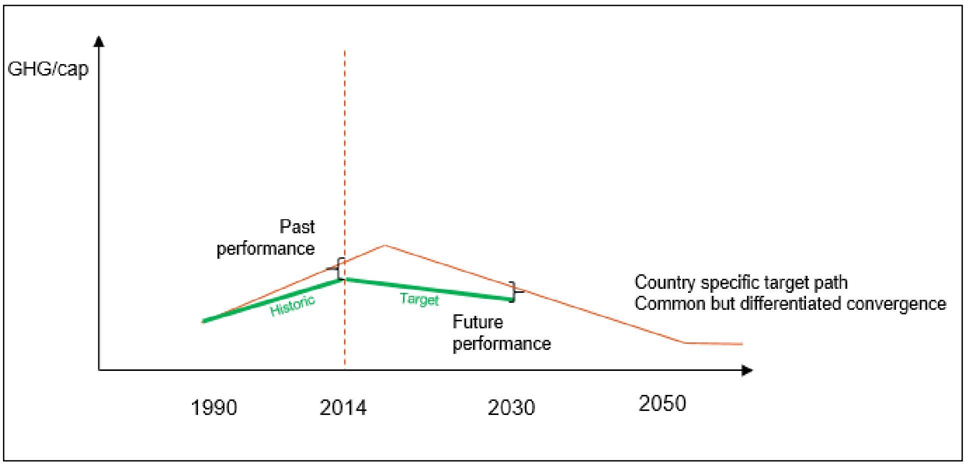


Illustration: Germanwatch/ NewClimate

[10] Rogelj, J., et al. (2015)

The calculation of individual country target pathways is based on the common but differentiated convergence approach (CDC).[11] It is based on the principle of "common but differentiated responsibilities and respective capabilities" laid forth in the Framework Convention on Climate Change; "common" because all countries need to reduce their per capita emissions to the same level (here net zero) within the same time-period (here 60 years), "differentiated" because developed countries start on this path as of 1990, while developing countries do so once they reach the global average per capita emissions. Hence, some developing countries can temporarily increase their emissions without letting the overall limit of well below 2 °C out of sight.

For this indicator we measure the distance of the country's current (2016) level of per capita emissions to this pathway.

2.1.4 GHG Emissions Reduction 2030 Target compared to a well-below-2°C compatible pathway

The CCPI also evaluates a country's 2030 mitigation target, i.e. its emissions reduction plans for 2030. We do so by measuring the distance between this target and the country's pathway determined using the common but differentiated convergence approach. The GHG emission targets of the countries are taken from the Climate Action Tracker.[12]

2.2 Renewable Energy (20% of overall score)

Swift action is required as 2016 was the first year with a constant CO_2 concentration in the atmosphere above 400ppm.[13] Most of the researchers anticipate that a permanent transgression of this threshold will lead to a temperature rise above 2°C.[14] Therefore, a constant expansion of renewable energies and a decline in fossil fuel combustion are essential.

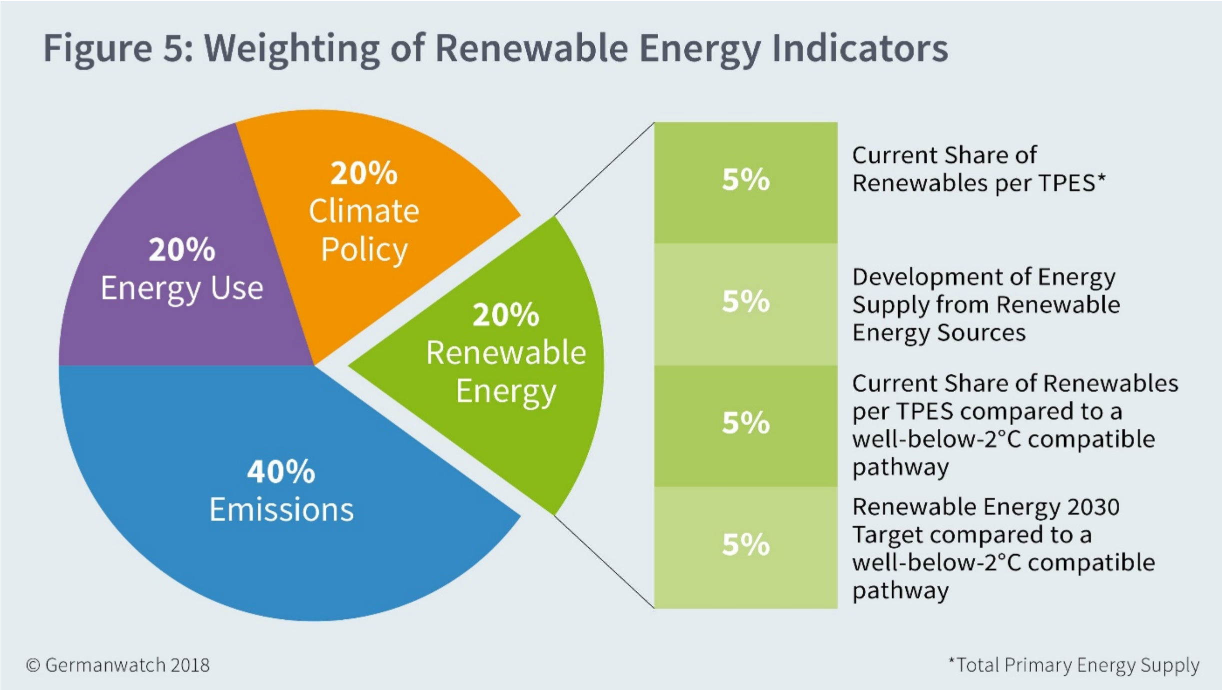
Substituting fossil fuels with renewable energies is one of the most prominent strategies towards a transformed economic system that is compatible with limiting global warming well below 2°C. It is equally important to increase energy efficiency, leading to a reduction in global energy use. For example, in the year 2015, renewable energies in Germany accounted for approximately 14.9% of total final energy consumption. Calculations show that deployment of renewable energies resulted in a net avoidance of 156 Mt. CO_2 in 2015.[15] This shows that a targeted increase in the share of renewable energies can make a vital contribution to climate change protection efforts. The "renewable energies" category assesses whether a country is making use of this potential for emissions reduction. This category, therefore, contributes with 20% to the overall rating of a country, within which each of the four indicators accounts for 5%.

In the absence of data assessing traditional biomass only, all renewable energy data is calculated without residential biomass for heat production, in order to prevent disadvantages for countries increasing their efforts to replace the unsustainable use of traditional biomass in their energy mix.

The recent developments and the 2°C compatibility of the current level exclude hydropower, while values for the current level and the 2°C compatibility of the 2030 target include hydropower (see Box 3).

Furthermore, all values for total primary energy supply (TPES) integrated in the CCPI exclude non-energy use, such as oil usage for other reasons than combustion, in order not to distort the picture and avoid disadvantages for countries with e.g. a larger chemical industry which is usually predominantly export-oriented, leading to the allocation problems mentioned in Box 2.

[11] Höhne, N. et al. (2006)
[12] Climate Action Tracker (2017)
[13] Betts, R.A. et al. (2016)
[14] OECD (2012)
[15] BMWi (2015)



2.2.1 Current Share of Renewable Energy Sources per Total Primary Energy Supply (TPES)

To recognize countries such as Brazil that 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, 5% of the overall ranking is attributed to the share of renewable energies in the total primary energy supply.[16]

2.2.2 Recent developments of Energy Supply from Renewable Energy Sources per Total Primary Energy Supply

The second indicator of a country's performance in the renewable energy category shows the recent development of energy supply from renewable sources over a five-year period. Like the other indicators in this category, this dynamic indicator accounts for 5% of the overall CCPI score. To acknowledge the previously described risks surrounding an expansion of hydropower and to adequately reward countries that concentrate on more sustainable solutions, it excludes this technology from the underlying data and therefore focuses on "new" renewable energy sources, such as solar, wind and geothermal.

[16] See Box 3: Hydropower and Human Rights violation, p.14

Box 3: Hydropower and human rights violation

One of the largest contributors to renewable energy supply is the generation of hydropower. However, many large hydropower projects are considered 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, countries that already meet a large share of their energy demand with supply from renewable energies – often old and potentially non-sustainable hydropower – can hardly raise their production in relative terms as easily as a country that starts with near-zero renewable energy supply. On the contrary, if a country already covers nearly 100% of its demand via renewable energy supply and at the same time increases efficiency, the total renewable energy supply might even fall. In such an extreme case a country would receive a very low CCPI score in the Renewable Energy Category while demonstrating exemplary climate change performance.

Secondly, if the CCPI fully included large hydropower, it would reward 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 and a distinction between large non-sustainable projects and sustainable small-scale hydropower generation is insufficient. In its attempt to balance the extent of rewarding countries for expanding large-scale hydropower, the CCPI excludes all hydropower from two of four indicators in the renewable energy category. As a result, the recent developments in renewable energy as well as the indicator that measures the current level of renewables to a country's well-below-2°C pathway exclude hydropower, while the total values of the current level and the indicator evaluating the 2030 renewably energy target include hydropower.

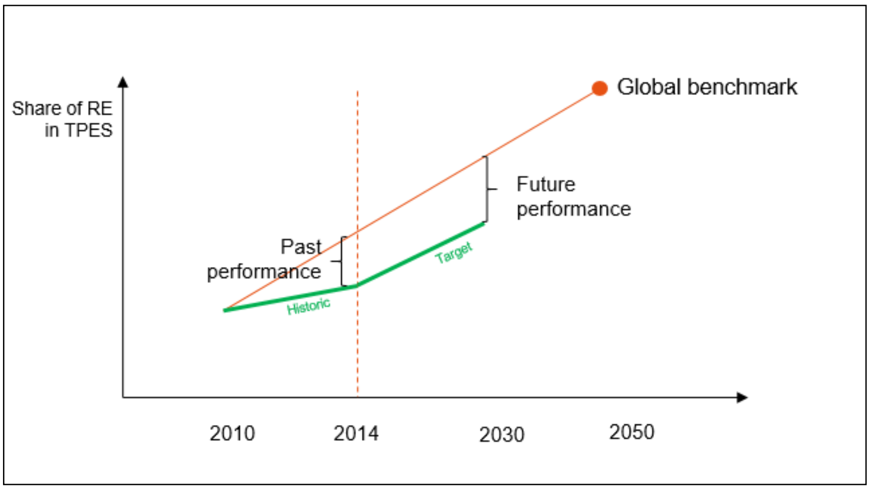
If data availability on large-scale and non-sustainable hydropower changes in the future, we will include these data and therefore exclude non-sustainable hydropower only from all four indicators.

Non-sustainable approaches and human rights violations related to the expansion of renewable energy are increasingly also affecting other renewable energy technologies. The drain of land resources for energy generation from biomass and the resulting conflict with land resources for food production is only one example of the complexity surrounding the necessary expansion of renewable energies. Both fields of conflict are also increasingly being seen in reaction to the expansion of onshore wind power generation. The authors of the CCPI are well aware of the increasing importance of these developments and will continuously examine possibilities to acknowledge them in future editions of the ranking.

2.2.3 Current Share of Renewables per TPES compared to a well-below-2°C compatible pathway

The benchmark within the index category "Renewable Energy" is a share of 100% renewable energy by 2050. The Paris Agreement requires net zero greenhouse gas emissions in the second half of the century, while energy-related emissions need to reach zero already by the middle of the century. Renewable energy will play a significant role in the transition. Accordingly, the CCPI continues to emphasise the necessity of making progress in renewable energy, even if other low or zero carbon options which result in other severe challenges could be available (nuclear or carbon capture and storage). Although the target is very ambitious, studies emphasise the possibility of reaching almost 100% renewable energy even with current technologies by mid-century.[17] Many NGOs therefore support a 100% renewable target to set the right incentives for countries in transforming their energy systems, also taking into account the necessity to establish and follow a consistent approach to sustainable development and inter-generational justice.

Figure 6: Renewable Energy pathway



2.2.4 Renewable Energy 2030 target compared to a well-below-2°C compatible pathway

The CCPI also evaluates the distance between a country's renewable energy targets for 2030 and the country's desired pathway from 2010 to 100% renewable energy in 2050 (using a linear pathway for methodological reasons).

Comparing renewable energy targets is a substantial challenge because countries put forward their renewably energy targets in many ways, as there is an absence of uniform rules for such target setting. Some countries only have targets for subnational states, others have national targets. Some define their targets in terms of installed capacity rather than the share of renewables in the TPES.

In order to convert these different types of targets into a future share of renewable energy in the TPES, we proceeded as follows:

[17] WWF et al. (2011)

- Countries that provided renewable energy (RE) targets as share of the TPES are taken directly.
- Country-specific capacity factors, based on the World Energy Outlook (2017) data, are used to convert capacity targets into generation targets. If no country data is available, the world averages are used. The generation targets are then converted to the share of renewable in the TPES.
- Whenever a target is formulated for a year other than 2030, a 2030 value is calculated by linear interpolation of the target share.
- All numbers for the current share of renewables in a country's energy supply are taken from the IEA energy balances.

The table in the Annex explains the approach chosen for each individual country including all accompanying assumptions (see also legend below table for an explanation of assumptions a to e).

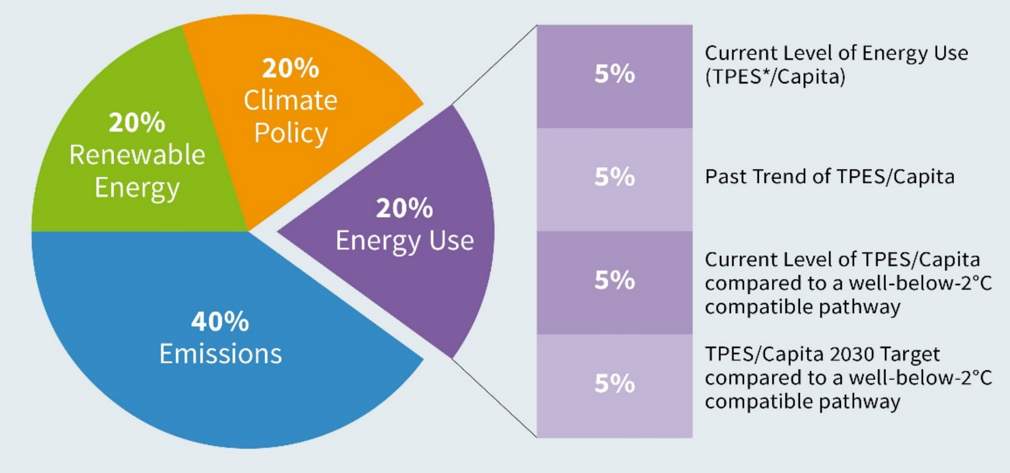
2.3 Energy Use (20% of overall score)

Besides an expansion of renewable energies, a vast increase in energy efficiency is crucial to achieving global decarbonisation and overall greenhouse gas neutrality by mid-century. The more efficient energy can be used, the faster and easier countries can reach net-zero emissions. Therefore one major step in combatting the global climate crisis is to reduce the energy needed to provide for products and services.

Increases in energy efficiency in its strict sense are complex to measure and would require a sector-by-sector approach, for which there are no comparable data sources across available all countries at the present time. The CCPI therefore assesses the per-capita energy use of a country and measures progress in this category.[18] As in the categories "Emissions" and "Renewable Energy", the CCPI aims to provide a comprehensive picture and balanced evaluation of each country, acknowledging the different development stages of countries and thus basing their performance evaluation in per-capita energy use on four different dimensions: current level, recent development and the 2°C compatibility of both the current level and the 2030 target.

As in the renewable energy category, TPES data excludes values for non-energy use and traditional biomass (see chapter 2.2).

Figure 7: Weighting of Energy Use Indicators



[18] Rebound effects can diminish positive effects of increased efficiency or even reverse them. Still, we cannot forgo these efficiency improvements, but rather must complement them with adequate measures that limit rebound effects.

2.3.1 Current Level of Energy Use measured as Total Primary Energy Supply per Capita (TPES/Capita)

To recognize some countries increasing their per-capita energy use but doing so from a still very low level, this indicator gives the current TPES/capita values, which account for 5% in the overall index ranking.

2.3.2 Recent developments of Energy Use measured as TPES/Capita

In accordance with the categories on renewably energy and emissions, the indicator measuring recent developments in per-capita energy use describes the trend in the period of the last five years for which there is data available that allows for comparison across all evaluated countries. This indicator also accounts for 5% of the overall CCPI ranking.

2.3.3 Current level of TPES/Capita compared to well-below-2°C compatible pathway

For 2°C and 1.5°C scenarios, a decrease in emissions by reducing the (growth in) energy use is as crucial as deploying renewable (or other low-carbon) technologies. The IPCC carried out a scenario comparison using a large number of integrated assessment models.[19]

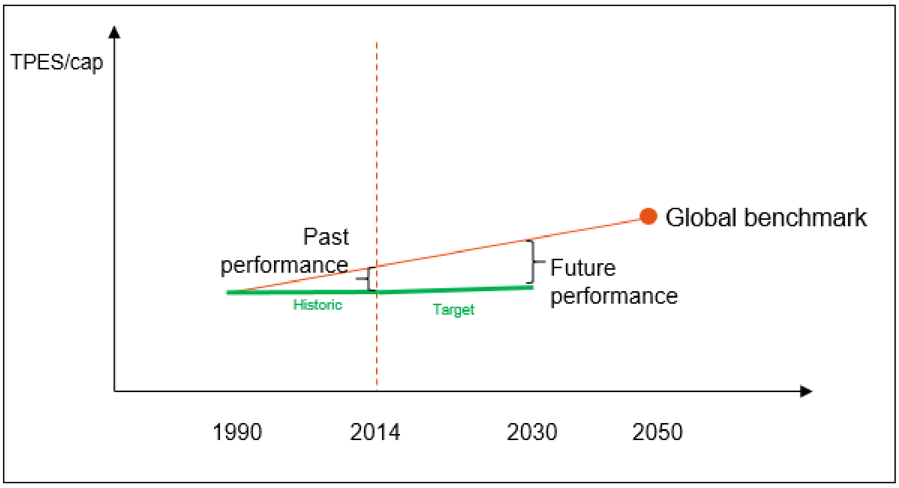
From the scenarios available, we observe that the total amount of global energy use in 2050 has to be roughly the same level or a bit higher than it is today, with a margin of uncertainty. At the same time population will grow slightly between today and 2050. We therefore pragmatically chose the benchmark to be “same energy use per capita in 2050 as the current global average”, which is 80 gigajoules per capita in Total Primary Energy Supply.

Current energy use per capita is very diverse. At the present time, the value for India is only a third of the global average, while for the United States it is more than three times higher than the global average. Consequently, the chosen benchmark would allow India to increase its energy use per capita threefold by 2050, while absolute energy demand can grow even further due to population growth. The United States would need to cut per-capita energy use to a third by 2050.

We calculate a linear pathway from 1990 to the described benchmark in 2050 and measure the distance of the country's current level to this pathway.

[19] Clarke, L.et al. (2014)

Figure 8: **Energy Use pathway**



2.3.4 Energy Use TPES/Capita 2030 target compared to well-below-2°C compatible pathway

The CCPI also evaluates the distance between the country's energy targets for 2030 along the country's pathway to the 2050 benchmark.

Energy efficiency and energy use targets are not formulated in standardized units and therefore lack comparability. Some countries indicate these targets as efficiency gains compared to a certain baseline scenario, whereas others announce reduction targets for the energy intensity of their domestic economy.

We gathered information and combined various data sources to transform all targets expressed in different units into a targeted future per-capita energy use.

For this purpose, we relied on population projections by the United Nations[20] and, where necessary, on OECD projections for the gross domestic product (GDP).[21]

Where no explicit economy-wide target was available, we based our analysis on projections that incorporate current and new sectoral or federal policies such as the IEA World Energy Outlook 2017.[22] Whenever a target is indicated for a year other than 2030, we interpolated or extrapolated the result linearly to obtain a value for 2030. The table in the Annex specifies the approach we chose for each individual country. All historical data on TPES are taken from the IEA energy balances.[23]

[20] UN (2017)
[21] OECD (2017)
[22] IEA (annually updated-b)
[23] IEA (annually updated-c)

2.4 Climate Policy (20% of overall score)

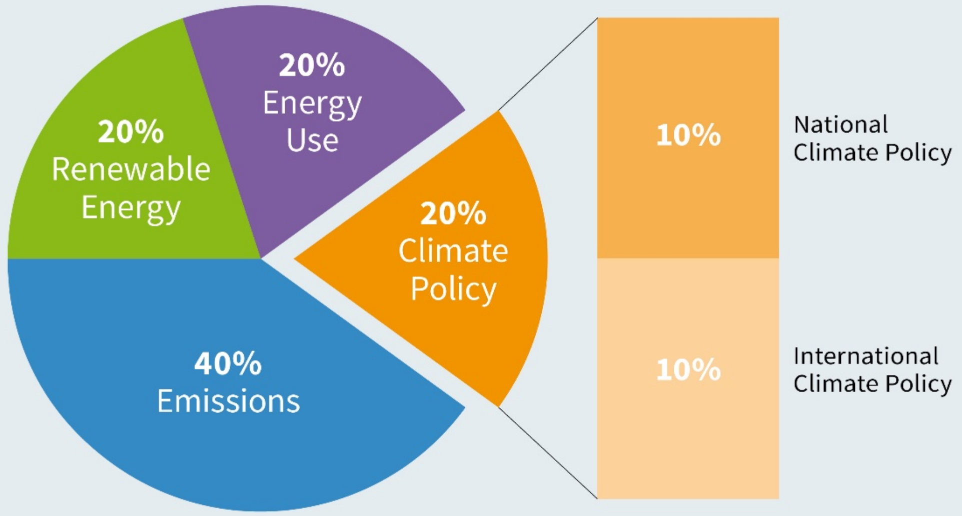
The climate policy category in the CCPI considers the fact that measures taken by governments to reduce greenhouse gases often take several years to show their effect on the emissions, energy use and renewable energy categories. On top of this, the most current greenhouse gas emissions data enumerated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

The data for 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. In 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 in energy efficiency and other measures to reduce greenhouse gas emissions in the electricity and heat production sector, the manufacturing and construction industries, and transport and residential sectors. Beyond that, current climate policy is evaluated with regard to a reduction in deforestation and forest degradation brought about by supporting and protecting forest ecosystem biodiversity, and national peat land protection.

In line with the Paris Agreement, experts also evaluate the ambition level and well-below-2°C compatibility of their country's Nationally Determined Contributions (NDCs) as well as their progress towards reaching these goals. The performance at UNFCCC conferences and other international conferences and multilateral agreements is also evaluated. Thus, both the national and international efforts and impulses of climate policies are scored. To compensate the absence of independent experts in some countries (due to the lack of functioning civil society or research 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 350 national climate experts contributed to the evaluation of the 56 countries of the CCPI 2019. They each evaluated their own country's national and international policy. The latter is also rated by climate policy experts that closely observe the participation of the respective countries at climate conferences.

Climate policy has an overall weight of 20%, with national and international policy making up 10% each. 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", "Renewable Energies" and "Energy Use", 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 mitigation – the policy therefore plays a decisive role for future scores within the CCPI.

Figure 9: Weighting of Climate Policy Indicators



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). 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.

The CCPI's final ranking is calculated from the weighted average of the achieved scores in the separate indicators with the following formula:

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

I: Climate Change Performance Index,
X_i: normalised Indicator,
w_i: weighting of X_i,

$$\sum_{i=1}^{n} w_i = 1 \ and \ 0 \leq w_i \leq 1$$

i: 1,…., n: number of partial indicators (currently 14)

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

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 the CCPI 2019, one can see that the highest-ranking country Sweden was not at the top in all indicators, let alone has it 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 or www.climate-change-performance-index.org/.

Development and Prospects

The CCPI 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 International supports the index through its international network of experts working on the issue of climate protection since the beginning.

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 could not be taken into account until this year.

Due to the methodological revision in 2017, we are able to assess all GHG emissions arising across all sectors. The Index also includes assessments of the countries' current performance and own targets set for the future in relation to their country-specific well-below-2°C pathway.

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5 Annex

GHG table

Country	Target
Algeria	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Argentina	Quantification of NDC based on Climate Action Tracker 2017
Australia	Quantification of NDC based on Climate Action Tracker 2017
Austria	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Belarus	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Belgium	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Brazil	Quantification of NDC based on Climate Action Tracker 2017
Bulgaria	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Canada	Quantification of NDC based on Climate Action Tracker 2017
China	Quantification of NDC based on Climate Action Tracker 2017
Chinese Taipei	Target of 50% below BAU by 2030 (214MtCO2e) was normalised to 2015 emissions (295MtCO2e)
Croatia	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Cyprus	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Czech Republic	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Denmark	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Egypt	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Estonia	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
EU28	Quantification of NDC based on Climate Action Tracker 2017
Finland	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
France	Applied the national target of 40% reduction below 1990 in 2030
Germany	Applied the national target of 55% reduction below 1990 in 2030
Greece	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Hungary	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf

India	Quantification of NDC based on Climate Action Tracker 2017
Indonesia	Quantification of NDC based on Climate Action Tracker 2016
Ireland	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Islamic Republic of Iran	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Italy	Applied the per capita level of the 2020 target also for 2030
Japan	Quantification of NDC based on Climate Action Tracker 2017
Kazakhstan	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Latvia	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Lithuania	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Luxembourg	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Malaysia	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Malta	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Mexico	Quantification of NDC based on Climate Action Tracker 2016
Morocco	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Netherlands	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
New Zealand	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Norway	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Poland	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Portugal	The target is applied to the national legislation: It says that by 2030 the national GHG emissions (without LULUCF) will be between 52.8 Mton (low scenario) and 61.6 Mton (high scenario). We choose an intermediate level of 57.2 Mton.
Republic of Korea	Target of domestic emission reductions of 25.7% below BAU of 850.6 in 2030. The stronger target of reducing emissions also using offsets by 37% would result in 10.5t/cap
Romania	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRIMAP_GWPSAR.pdf
Russian Federation	Quantification of NDC based on Climate Action Tracker 2017
Saudi Arabia	Quantification of NDC based on Climate Action Tracker 2016
Slovak Republic	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf

Slovenia	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
South Africa	Quantification of NDC based on Climate Action Tracker 2016
Spain	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Sweden	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Switzerland	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Thailand	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
Turkey	Quantification of NDC based on Climate Action Tracker 2017
Ukraine	Applied the average per capita growth (excl. LULUCF) from Climate & Energy College factsheets (SAR) to 2010 per capita levels (excl. LULUCF) http://climatecollege.unimelb.edu.au/files/site1/docs/11/All_NDCFactsheets_UoM-PRI-MAP_GWPSAR.pdf
United Kingdom	Applied the national target of 57% reduction below 1990 in 2030
USA	Assumed not to have a GHG target. The Trump administration announced its intent to cease any implementation of the NDC.

EE table

Country	Target
Algeria	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Argentina	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Australia	Australia sets out a target of 40% increase in energy productivity from 2015 to 2030. Combining a GDP growth of 1.4% per year until 2030 and the 2015 energy consumption per capita, the future energy use per capita is estimated. Source of target: https://scer.govspace.gov.au/files/2015/12/National-Energy-Productivity-Plan-release-version-FINAL.pdf
Austria	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Belarus	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Belgium	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Brazil	For Brazil no explicit economy wide target was available. Emission intensity per capita in 2030 was obtained from the current policy projections of the Climate Action Tracker and adjusted to reflect population trends used in CCPI.
Bulgaria	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Canada	Canada has no national target regarding the energy use per capita. Emission intensity per capita in 2030 was obtained from the current policy projections of the Climate Action Tracker and adjusted to reflect population trends used in CCPI.
China	China indicates a target of a 15% reduction in energy consumption per unit of GDP from 2015 to 2020. Combining a GDP growth of 6% per year until 2020 and the 2015 energy consumption per capita, the future energy use per capita is estimated. The value is assumed to remain constant between 2020 and 2030.
Chinese Taipei	The target of "Target of energy intensity decrease 50% from 2005 to 2025" was applied from 2006 assuming an average annual GDP growth of 2%, the resulting value was assumed to hold for 2030.
Croatia	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Cyprus	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Czech Republic	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.

Denmark	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Egypt	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Estonia	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
EU28	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. The reduction was applied to the 2006 emission intensity.
Finland	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
France	The French energy efficiency target is given as a reduction of the total final consumption by 50% in 2050 relative to the base year 2012. The 2030 value was linearly interpolated.
Germany	The German energy efficiency target is given in a reduction of the total final consumption by 50% from 2008 to 2050. The 2030 value was linearly interpolated.
Greece	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Hungary	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
India	For India no explicit economy wide target was available. Emission intensity per capita in 2030 was obtained from the current policy projections of the Climate Action Tracker and adjusted to reflect population trends used in CCPI.
Indonesia	Reduction of intensity of 1% per year between 2009 and 2025. Reduction of 1% applied between 2010 and 2025 combined with a GDP growth of 5% per year. Between 2025 and 2030 no further reduction is assumed and the emission intensity grows proportional to the GDP.
Ireland	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Islamic Republic of Iran	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Italy	The Italian energy efficiency target is given in a reduction of TPES by 17-26% by 2050 compared to 2010. The average target was applied to the 2010 emission intensity.
Japan	For Japan no explicit economy wide target was available. Emission intensity per capita in 2030 was obtained from the current policy projections of the Climate Action Tracker and adjusted to reflect population trends used in CCPI.
Kazakhstan	Target of reduction of energy intensity per GDP (vs. 2008 levels) 30% by 2030. Assumed an annual average GDP growth rate of 2% from 2010 to 2030.
Latvia	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Lithuania	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Luxembourg	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Malaysia	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Malta	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Mexico	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Morocco	Target of "reducing energy consumption by 15% by 2030" could not be evaluated as unclear if below BAU or absolute. Trend from 2010 to 2015 extrapolated to 2030 and used as proxy for a target.
Netherlands	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
New Zealand	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Norway	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Poland	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Portugal	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Republic of Korea	The South Korean energy efficiency target is given as reduction of final energy consumption by 13% from relative to a scenario value by 2035. Combining a GDP growth of 2% per year until 2030 and the 2015 energy consumption per capita, the future energy use per capita is estimated. 2030 value is linearly interpolated. Source of target:
Romania	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.

Russian Federation	The Russian target to reduce energy intensity by 60% from 2007 to 2020. Combining a GDP growth of 6% per year until 2020 and the 2015 energy consumption per capita, the future energy use per capita is estimated and assumed constant until 2030.
Saudi Arabia	For Saudi Arabia no explicit economy wide target was available. Emission intensity per capita in 2030 was obtained from the current policy projections of the Climate Action Tracker and adjusted to reflect population trends used in CCPI.
Slovak Republic	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Slovenia	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
South Africa	For South Africa no explicit economy wide target was available. Emission intensity per capita in 2030 was obtained from the current policy projections of the Climate Action Tracker and adjusted to reflect population trends used in CCPI.
Spain	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Sweden	EU's target is a reduction of 32.5% below the 2007 baseline by 2030. We applied the percentage reduction from 2013 to 2030 required at the EU level to the per capita energy use of each individual member states.
Switzerland	No target. Trend from 2010 to 2015 was extrapolated to 2030 and used as proxy for a target.
Thailand	Target of "25% reduction in energy intensity (energy per unit GDP) by 2030, as compared to 2010" was applied assuming an annual growth rate of GDP of 2%.
Turkey	The Turkish target given as energy intensity reduction of 20% from 2008 to 2023 was converted into an energy use per capita by combining it with GDP forecasts. The value for 2023 was assumed to remain constant until 2030.
Ukraine	The target of "energy intensity reduction of 50% by 2030" was applied to 2013 assuming an average annual GDP growth of 2%.
United Kingdom	The British target given in TPES of 177.6 MTOE which is similar to current levels. Emissions intensity was assumed to remain at 2015 values.
USA	For the United States no explicit economy wide target was available. Emission intensity per capita in 2030 was obtained from the current policy projections of the Climate Action Tracker and adjusted to reflect population trends used in CCPI.

RE table

Country	**Method**
Algeria	Target of 27% share of renewable electricity by 2030 was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Argentina	Target of 23% share of renewable electricity by 2025 was combined with current share of large hydro power, which is assumed to remain constant, and translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant from 2025 and 2030.
Australia	Target of 23.5% share of renewable electricity by 2025 was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant from 2025 and 2030.
Austria	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Belarus	No quantifiable target
Belgium	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Brazil	Target of 166GW renewable capacity installed in 2026 was translated to power generation using capacity factors based on WEO data for Brazil. The power generation was transformed into generation was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant from 2026 and 2030.

Bulgaria	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Canada	No target
China	Target of 700GW renewable capacity installed in 2020 was translated to power generation using capacity factors based on WEO data for China. The power generation was transformed into generation was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant from 2020 and 2030.
Chinese Taipei	Target of 13% share of renewable electricity by 2030 was translated to renewables share in TPES in 2030 assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Croatia	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Cyprus	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2014 level.
Czech Republic	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Denmark	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Egypt	Target of 20% share of renewable electricity by 2020 was translated to renewables share in TPES in 2030 assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Estonia	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
EU28	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to the 2015 level.
Finland	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
France	Target of 40% share of renewable electricity by 2030, incl. hydro, was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Germany	Target of 65% share of renewable electricity by 2030, incl. hydro, was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Greece	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Hungary	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
India	Target of 338GW renewable capacity, incl. hydro, installed in 2026 was translated to power generation using capacity factors based on WEO data for India. The power generation was transformed into generation was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant from 2026 and 2030.
Indonesia	Target of 23% of Total Primary Energy Supply by 2025. Share is assumed to remain constant until 2030.
Ireland	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Islamic Republic of Iran	Target of 5GW renewable power (excl. hydro) installed by 2020 is translated into 8% renewable electricity, adding a third of capacity (5 GW) and share to the currently 10 GW hydro / 5% share in electricity production. This was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Italy	Target of 55% share of renewable electricity by 2030, incl. hydro, was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).

Japan	Target of 24% share of renewable electricity by 2030, incl. hydro, was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Kazakhstan	Target of 30% share of renewable electricity by 2030 was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Latvia	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Lithuania	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Luxembourg	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Malaysia	Target of 12% share of renewable electricity by 2030 was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Malta	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2014 level.
Mexico	Target of 32% share of renewable electricity by 2031was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). The target is assumed to be reached in 2030.
Morocco	Target of 52 % of installed electricity production capacity from renewable sources by 2030 was translated into 35% share of renewables assuming factor 1.5 for capacity of the renewables over average production. This was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Netherlands	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
New Zealand	Target of 90% share of renewable electricity by 2025 was translated to renewables share in TPES in 2030 assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Norway	Target of 67.5% share of renewable in gross final energy consumption in 2020 was assumed to apply for TPES
Poland	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Portugal	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2014 level.
Republic of Korea	Target of 12% share of renewable electricity by 2029, incl. hydro, was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant until 2030.
Romania	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Russian Federation	Target of 19% share of renewable electricity by 2020 was combined with current share of large hydro power, which is assumed to remain constant, and translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant from 2025 and 2030. Share is assumed to remain constant until 2030.
Saudi Arabia	Target of 9.5GW renewable capacity installed by 2030 is assumed to represent 5% share of renewable electricity based on estimates of the Climate Action Tracker. This share was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Slovak Republic	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Slovenia	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.

South Africa	Target of 24GW renewable capacity installed in 2030 was translated to power generation using average capacity factors from the WEO. The power generation was transformed into generation was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh).
Spain	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Sweden	The EU's target is 32% in gross final energy demand, which is 15 percentage points above the 2015 level. We applied this 15 percentage points increase to each member state's 2015 level.
Switzerland	Target of increasing share of renewables in final consumption from 16.2% in 2008 to 24% in 2020 was applied as increase in renewables share in TPES of 8 percentage points between 2010 to 2030
Thailand	The target of 30% renewables in total final energy consumption by 2036 assumed to apply to renewables in TPES, linearly interpolated from 2014 to 2030
Turkey	Target of 38% share of renewable electricity by 2023 was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant until 2030.
Ukraine	Target of 11% share of renewables in total final energy consumption by 2020 applied as percentage of renewables in TPES in 2030
United Kingdom	Target of 30% share of renewable electricity by 2020, incl. hydro, was translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant until 2030.
USA	Target of 20% share of renewable electricity by 2030 beyond hydropower was combined with current share of large hydro power, which is assumed to remain constant, and translated to renewables share in TPES assuming renewables input increases proportionally to share in electricity production and that replacing fossil electricity reduces TPES by a factor one to two (approximately 1kWh from renewables instead of 1kWh coal (produced with efficiency 1 to 3) reduces TPES by (-3+1) kWh). Share is assumed to remain constant from 2025 and 2030.

Legend for general assumptions used for many countries:

a) the share of electric energy remains constant in the total final consumption
b) the average efficiencies of transforming primary energy into secondary energy (before losses and energy industry own use) remain constant for energy from renewable and from fossil sources with respect to today.
c) the "energy industry own use" is distributed between the electric and non-electric energy sector according to the share they hold in the TPES - in both sectors renewable energy generation is assumed not to consume any energy for energy generation.
d) within the non-electric sector, the share of renewable energy remains constant in TPES and TFC respectively.
e) the share of renewable energy the in final consumption of electricity is the same as the share of renewable energy in electricity generation, i.e. losses affect equally electricity from renewable and fossil sources.

Germanwatch

Following the motto of *Observing. Analysing. Acting.* Germanwatch has been actively promoting global equity and livelihood preservation since 1991. We focus on the politics and economics of the Global North and their worldwide consequences. The situation of marginalised people in the Global South is the starting point for our work. Together with our members and supporters, and with other actors in civil society, we strive to serve as a strong lobbying force for sustainable development. We aim at our goals by advocating for prevention of dangerous climate change and its negative impacts, for guaranteeing food security, and for corporate compliance with human rights standards.

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