



Climate Change  
Performance  
Index

# Background and Methodology

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## Summary

The Climate Change Performance Index (CCPI) is an independent monitoring tool for tracking countries' climate protection performance. It aims to enhance transparency in international climate politics and enables comparison of climate protection efforts and progress made by individual countries. This publication explains how the CCPI 2020 is calculated. Furthermore, it lists the literature and data sources used for these calculations.

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# Foreword: Enhancing Transparency in International Climate Politics

Corresponding to the record-breaking global emissions of the last years, the carbon dioxide (CO<sub>2</sub>) concentration in our atmosphere already exceeds the historic value of 400 parts per million. 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 and thus avoid climate change with all its expected impacts are virtually zero.

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). As of now, the index compares 57 countries + the European Union (EU) that together are responsible for more than 90% of global greenhouse gas (GHG) emissions.

The climate change performance is evaluated according to standardised 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. As an independent monitor-

ing tool of countries' climate protection performance, it aims at enhancing transparency in international climate politics and enables the comparability of climate protection efforts and progress made by individual countries. 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.

By simplifying complex data, the index does not only address experts, but everyone. We would like to emphasise 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. As a tool for climate protection information and communication, the index is also available online for general public interest at: [www.climate-change-performance-index.org](http://www.climate-change-performance-index.org)

The following publication explains the background and the methodology of the Climate Change Performance Index.

As has been the case with the previous editions, the CCPI 2020 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.

# 1 Methodology

The climate change performance is assessed in four categories:

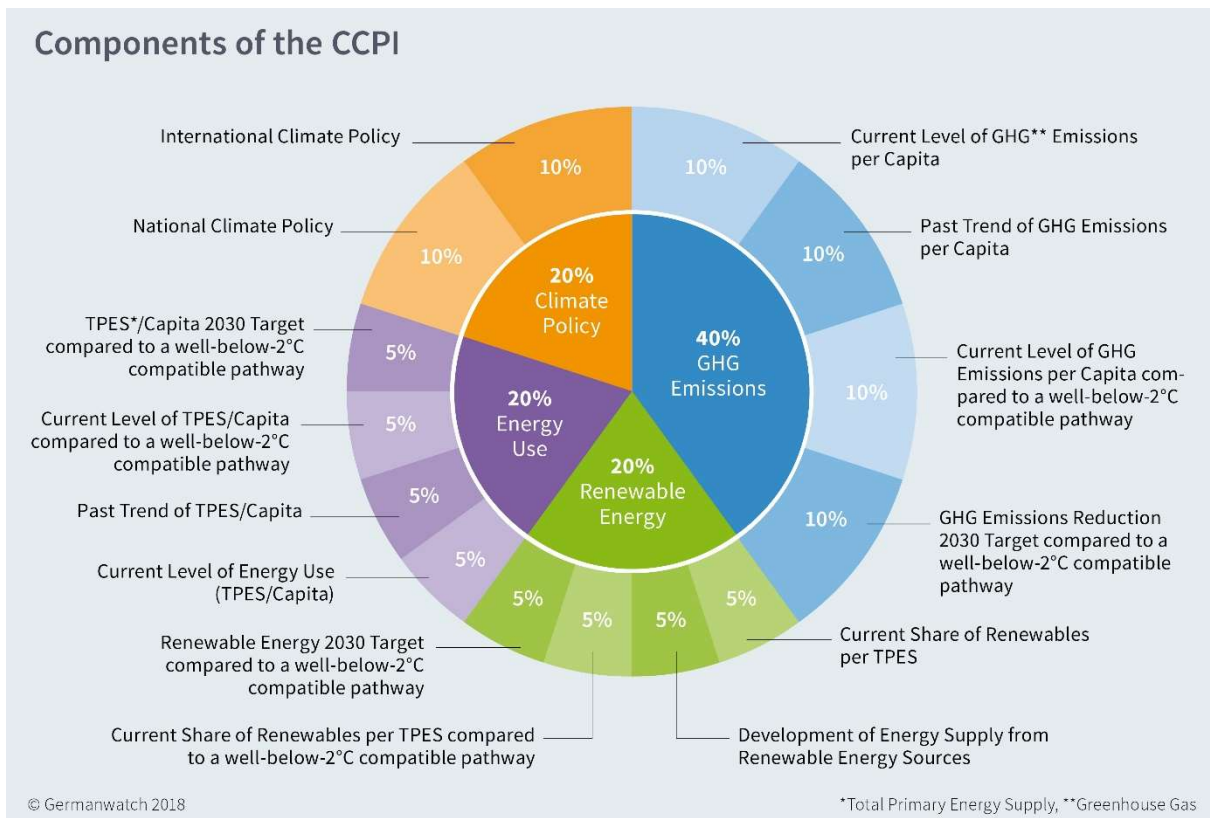
1. "GHG Emissions" (40% of overall score);
2. "Renewable Energy" (20% of overall score);
3. "Energy Use" (20% of overall score);
4. "Climate Policy" (20% of overall score).

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",

"Past Trend (5-year trend)", "2°C-Compatibility of the Current Level" and the "2°C-Compatibility of 2030 Target". These twelve indicators are complemented by two indicators under the category "Climate Policy", measuring the country's performance regarding its national climate policy framework and implementation as well as regarding international climate diplomacy.

Figure 1 gives an overview of the composition and weighting of the four categories and 14 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)**

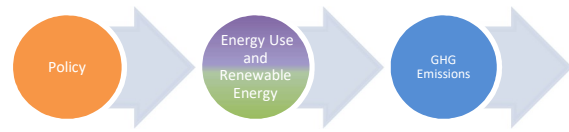


The index rewards policies which aim for climate protection, both at the national level and in the context of international climate diplomacy. Whether or not countries are stimulating and striving towards a better performance can be deduced from their scores in the "Climate Policy" indicators. If these 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" (s. figure 2). Following this logic, the index takes into account the progress in the three areas ultimately showing their effect in a country's GHG emissions performance with a weighting of 20% each:

- an effective climate policy,
- an expansion of renewable energy,
- 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 within this category, 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.

Figure 2: **Logic followed by the CCPI**



### Data Sources and Adaptions

The CCPI is using the PRIMAP<sup>1</sup> data base to assess all GHG emissions arising across all sectors. As the PRIMAP data base does not cover Land Use, Land Use Change and Forestry (LULUCF) emissions, the LULUCF emissions are taken from FAO<sup>2</sup>, the national inventory submissions 2018<sup>3</sup> and the biannual country reports<sup>4</sup>. 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)<sup>5</sup>, 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.<sup>6</sup>

The evaluation of the countries' mitigation targets is based on their Nationally Determined Contributions (NDCs), communicated to the UNFCCC.<sup>7</sup> 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).

<sup>1</sup> PRIMAP (annually updated)

<sup>2</sup> FAO (annually updated)

<sup>3</sup> UNFCCC (2018-a)

<sup>4</sup> UNFCCC (2018-b)

<sup>5</sup> IEA (annually updated-a)

<sup>6</sup> 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 of biomass, especially in developing countries. In industrialised countries this quantity is negligible in most cases.

<sup>7</sup> 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 across CCPI editions.

### **Revision of Historic Data in Databases**

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. Consequently, 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.

### **Survey Respondents**

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 anymore, 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.

### **Methodological Changes**

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<sub>2</sub> emissions has been extended to GHG emissions.

The CCPI G20 Edition of July 2017 and the CCPI 2018 were the first index publications based on the new methodology. The CCPI 2020 edition (for 57 selected countries and the EU) ensures a comparability with the previous editions (CCPI 2018 and CCPI 2019).

## 1.1 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 “GHG Emissions” category contributes 40% to the overall score of a country.

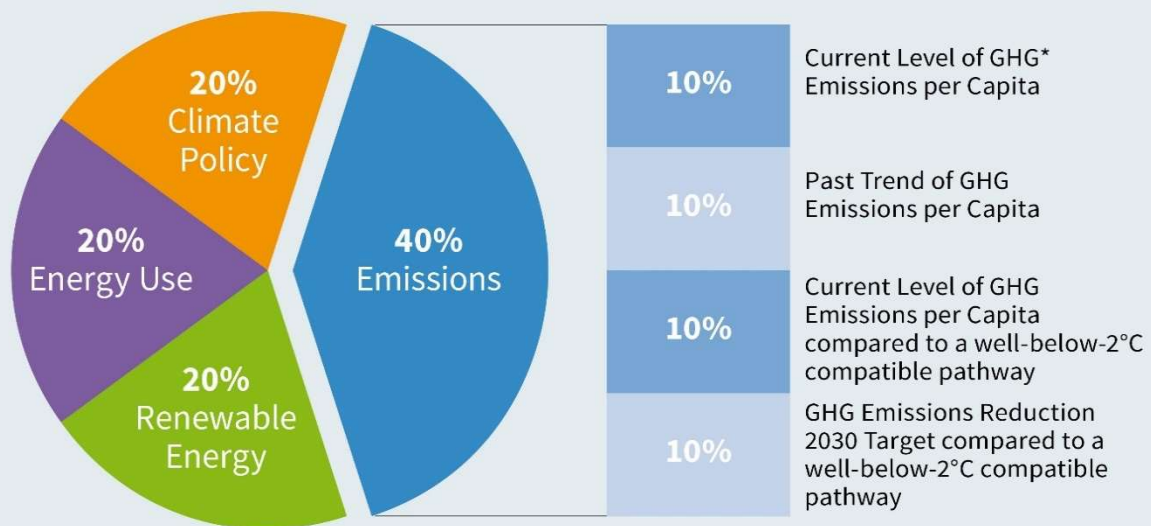
However, the diversity of countries evaluated in the CCPI is enormous. It is therefore indispensable that more than just one perspective be taken on the emissions level and how the GHG emissions of a given country have developed in the recent past.

The “GHG Emissions” category thus is composed of four indicators: “Current Level” and “Past Trend” of per capita GHG 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.

Since the CCPI edition 2018, the index covers all major categories of GHG emissions. This includes energy-related CO<sub>2</sub> emissions, CO<sub>2</sub> emissions from land use, land use change and forestry (LULUCF), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and the so-called F-gases hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>) for which we use data from PRIMAP provided by the Potsdam Institute for Climate Impact Research (PIK)<sup>8</sup>. As the PRIMAP data base does not cover LULUCF emissions, the LULUCF emissions are taken from FAO<sup>9</sup>, the national inventory submissions 2018<sup>10</sup> and the biannual country reports<sup>11</sup> submitted to UNFCCC.

With using overall GHG-related instead of only energy-related CO<sub>2</sub> 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**



© Germanwatch 2018

\*Greenhouse Gas

<sup>8</sup> PRIMAP (annually updated)

<sup>9</sup> FAO (annually updated)

<sup>10</sup> UNFCCC (2018-a)

<sup>11</sup> UNFCCC (2018-b)



## 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.

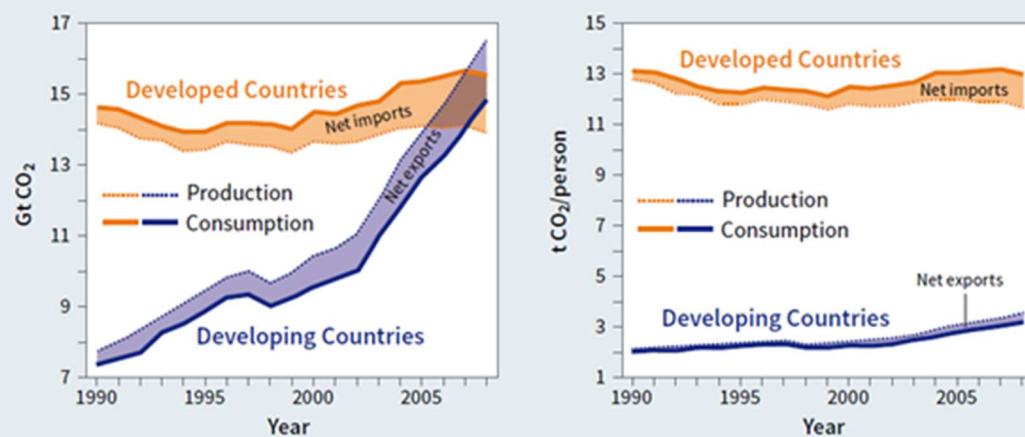
In the course of globalisation, international trade has caused an increasing spatial separation between the production and consumption of goods. Thus, on the one hand, China, Thailand and South Africa, who belong to the group of high-producers and greenhouse gas exporters, currently report emission levels that are considered too high. On the other hand, France, Switzerland and the USA are large importers of CO<sub>2</sub>-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 as 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<sub>2</sub> 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<sub>2</sub> Emissions from Production and Consumption of Goods and Services<sup>10</sup>**



Historic CO<sub>2</sub> 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

### 1.1.1 Current Level of GHG Emissions per Capita

Even with an 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 and 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.

### 1.1.2 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.

### 1.1.3 Current Level of GHG Emissions per Capita Compared to a Well-Below-2°C Compatible Pathway

The benchmark for a well-below-2°C compatible pathway 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 align-

ment 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<sub>2</sub> emissions need to decline to net zero by around 2050.<sup>12</sup>

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

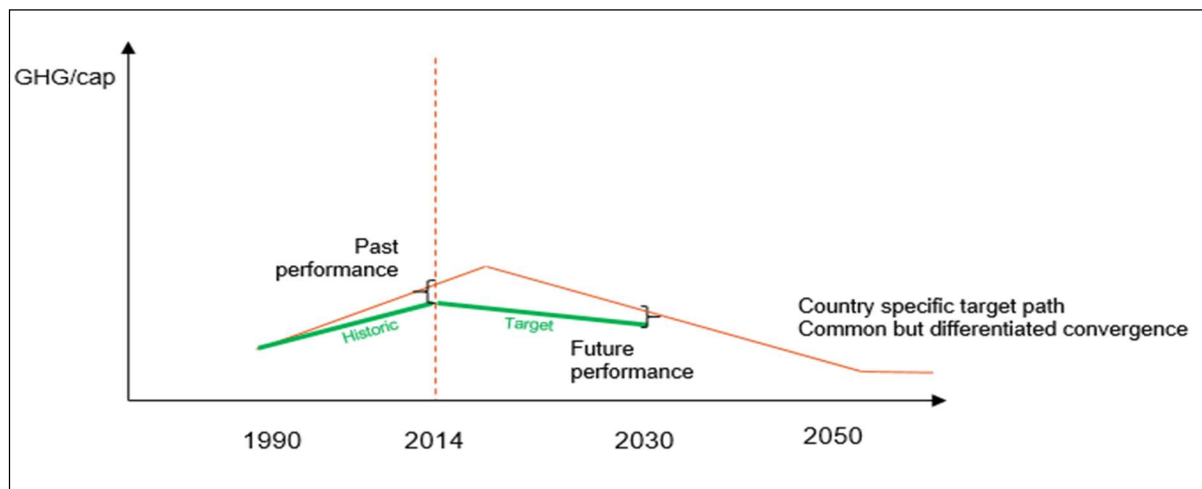


Illustration: Germanwatch/NewClimate Institute

<sup>12</sup> IPCC (2018)

The calculation of individual country target pathways is based on the common but differentiated convergence approach (CDC).<sup>13</sup> 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. “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 (2017) level of per capita emissions to this pathway.

### 1.1.4 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 (see 2.1.3).

GHG targets are usually not presented in absolute terms in the targets communicated by the countries in their NDCs, or other formal commitments, and need to be interpreted to arrive at absolute GHG emission limits for 2030 that are implied by the targets. We take other studies as a starting point, which have done this interpretation. We take absolute emissions from the sources (Climate Action Tracker (CAT)<sup>14</sup> or NDC & INDC Factsheets by PIK and the University of Melbourne<sup>15</sup>), divide this by the population in both target and base year to obtain the emissions per capita in both years – that allows for the calculation of growth factors. The CAT country assessments are updated up to twice a year, so it is the preferred source. If a country is not included in the CAT analysis the respective factsheet is used to quantify the emissions. We apply the resulting growth factors to

the CCPI tool emission values in the base year, to arrive at a target value that is consistent with the emissions dataset used in the other CCPI indicators. We apply the growth rates from the CAT and factsheets, which *exclude* LULUCF, to emissions from CCPI, which *include* LULUCF.

We choose this approach due to the lack of consistent LULUCF projections across all the countries in the index. LULUCF emissions estimates vary strongly between different datasets and the methodologies used for those estimates. Our current approach has the underlying assumption that the growth of the LULUCF sector is equivalent to the growth in the other sectors of the economy.

Both the CAT and the factsheets use UN population medium fertility variant projections, which we use to adjust the absolute emissions to per capita.

Some countries have updated their targets but are not analysed separately by the CAT: France, Germany, Portugal, United Kingdom and Chinese Taipei. In these cases, we quantify the absolute emissions level in 2030 individually using the respective target definitions as described in the annex.

## 1.2 Renewable Energy (20% of Overall Score)

Since 2016 was the first year with a constant CO<sub>2</sub> concentration in the atmosphere above 400 parts per million, swift action is required.<sup>16</sup> Most of the researchers anticipate that a permanent transgression of this threshold will lead to a temperature rise

above 2°C.<sup>17</sup> Therefore, a constant expansion of renewable energies and a decline in fossil fuel combustion are essential.

<sup>13</sup> Höhne, N. et al. (2006)

<sup>14</sup> Climate Action Tracker (2019)

<sup>15</sup> Meinshausen, M. and Alexander, R. (2017)

<sup>16</sup> Betts, R.A. et al. (2016)

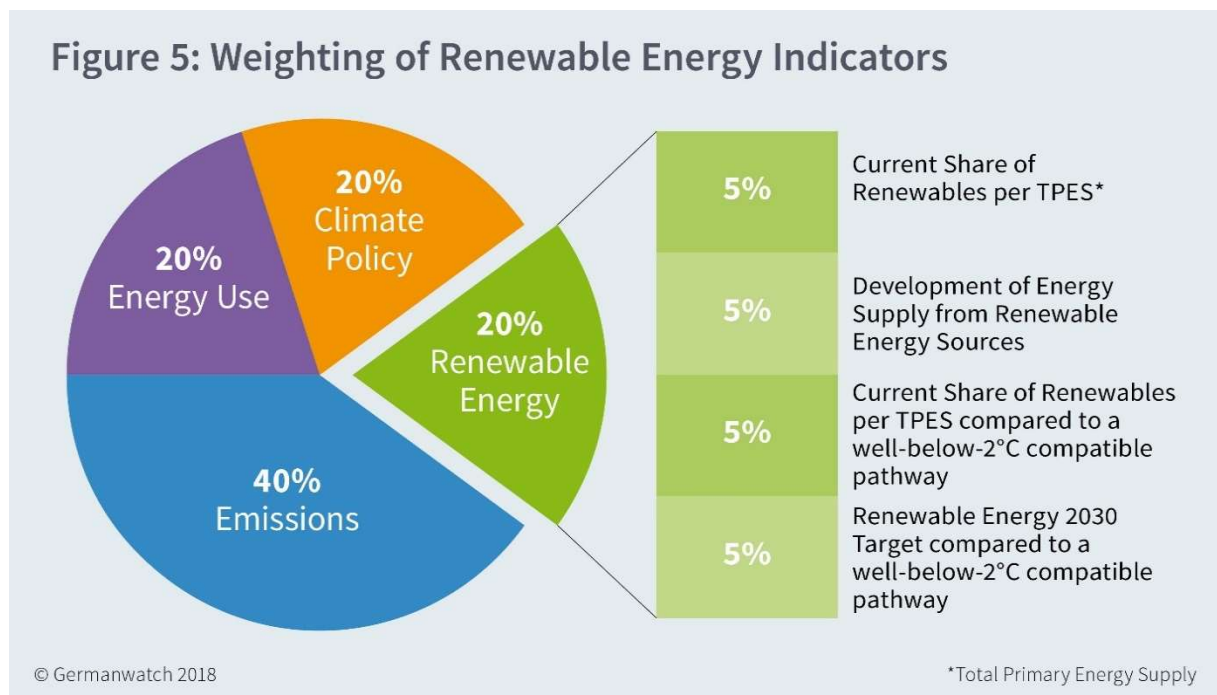
<sup>17</sup> OECD (2012)

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<sub>2</sub> in 2015.<sup>18</sup> This shows that a targeted increase in the share of renewable energies can make a vital contribution to climate change protection efforts. The “Renewable Energy” 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 are 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.



<sup>18</sup> BMWi (2015)

### **1.2.1 Current Share of Renewable Energy Sources per Total Primary Energy Supply (TPES)**

To recognise 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.<sup>19</sup>

### **1.2.2 Past Trend of Energy Supply from Renewable Energy Sources per TPES**

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 risks surrounding an expansion of

hydropower (see box 3) 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 energy.

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<sup>19</sup> 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 also increasingly 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. Also, both fields of conflict are 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.

### 1.2.3 Current Share of Renewables per TPES Compared to a Well-Below-2°C Compatible Pathway

The benchmark for a well-below-2°C compatible pathway 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.<sup>20</sup> Many non-governmental organisations 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

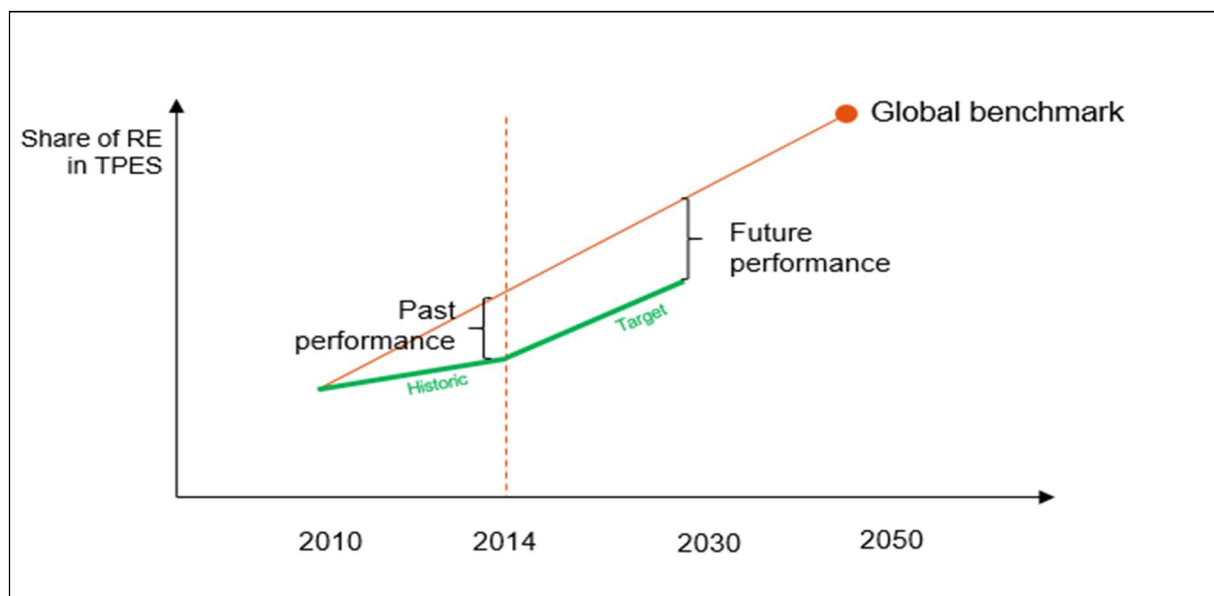


Illustration: Germanwatch/NewClimate Institute

### 1.2.4 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 renewable 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:

<sup>20</sup> WWF et al. (2011)

- Countries that provided renewable energy targets as share of the TPES are taken directly.
- Country-specific capacity factors, based on the World Energy Outlook (2018) 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 energy 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).

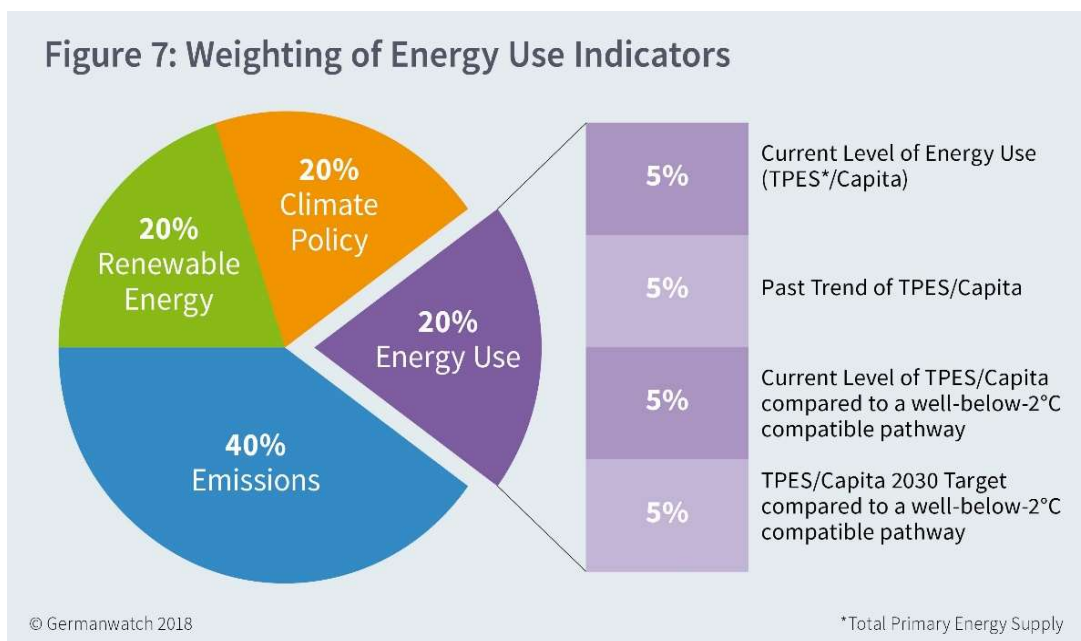
### 1.3 Energy Use (20% of Overall Score)

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 available across all countries at the present time. The CCPI therefore assesses the per

capita energy use of a country and measures progress in this category.<sup>21</sup> As in the categories "GHG 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).



<sup>21</sup> 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.



### 1.3.1 Current Level of Energy Use Measured as TPES per Capita

To recognise 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.

### 1.3.2 Past Trend of Energy Use measured as TPES per Capita

In accordance with the categories “Renewable Energy” and “GHG 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.

### 1.3.3 Current Level of TPES per Capita Compared to a 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.<sup>22</sup>

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 well-below-2° compatible 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 (TPES).

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 triple its energy use per capita 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 one 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.

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<sup>22</sup> Clarke, L. et al. (2014)

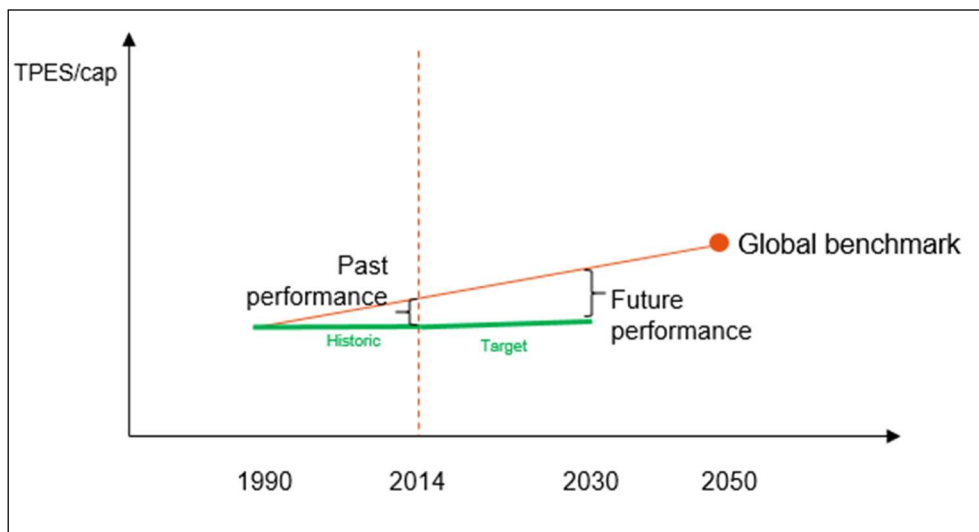
Figure 8: **Energy use pathway**

Illustration: Germanwatch/NewClimate Institute

### 1.3.4 Energy Use TPES per Capita 2030 Target Compared to a 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 standardised 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.<sup>23</sup>

Where no explicit economy-wide target was available, we used a proxy to estimate total energy supply per capita in 2030. Up to 2019, the CCPI used a mix of three methods:

- Calculate energy supply per capita trend in the last five years. Apply the trend from the latest historical value up to 2030.

- Apply an estimation of GDP growth as a proxy for energy demand growth.
- Use CAT current policies projections and apply growth factors.

In the 2020 version, we replace this approach with only one method: We apply the trend in per capita energy use of the previous years to the latest historical year, for the following reasons:

Historical GDP growth is highly volatile. Using historical GDP growth does not account for a reliable projection of future economic growth. This is due to:

- GDP growth forecasts are rare and unreliable since they often cannot correctly predict the impact of implemented policies and other market volatilities for the next several years;

<sup>23</sup> UN (2017)

- Considering the Kaya Identity<sup>24</sup>, looking only at GDP growth would ignore improvements in EE that happen independently of the existence of an EE target.

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.<sup>25</sup>

## 1.4 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 categories “GHG Emissions”, “Energy Use” and “Renewable Energy”. 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 category “Climate Policy” is assessed annually in a comprehensive research study. Its basis is the performance rating by climate and energy policy experts from non-governmental organisations, universities and think tanks within the countries that are evaluated. In a questionnaire, they give a rating on a scale from one (“weak”) to five (“strong”) on the most important measures of their government. In order to obtain more differentiated results, there is also the possibility to further evaluate and comment on single aspects. Both the national and international efforts and impulses of climate policies are scored (s. 2.4.1 and 2.4.2).

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. For the CCPI 2020, about 350 national climate experts contributed to the evaluation of the 57 countries plus the EU. They each evaluated their own country’s national and international policy. The latter is also rated by climate policy experts who closely observe the participation of the respective countries at climate conferences.

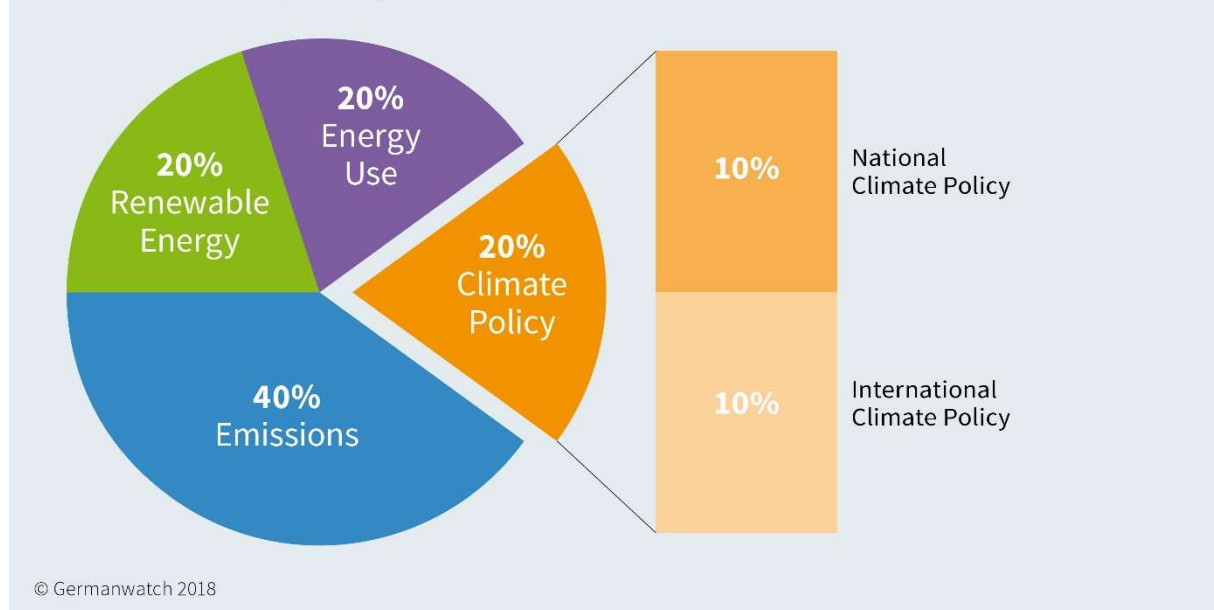
Climate policy has an overall weight of 20%, with national and international policy making up 10% each. Despite the apparently low influence of climate policy, this category has quite a considerable influence on short-term changes in the overall ranking. Unlike the rather “sluggish” categories of “Emissions”, “Renewable Energy” 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 – policy therefore plays a decisive role for future scores within the CCPI.

<sup>24</sup> The Kaya Identity is an equation for quantifying the total CO<sub>2</sub> emissions. It states that the total level of CO<sub>2</sub> emissions can be

expressed as a product based on the four factors: human population, GDP per capita, energy intensity and carbon intensity.

<sup>25</sup> IEA (annually updated-c)

**Figure 9: Weighting of Climate Policy Indicators**



### 1.4.1 National Climate Policy

For the indicator “National Climate Policy”, the annual climate policy performance questionnaire covers concrete policies on 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. Within each of these policy areas, experts evaluate both strength and the level of implementation of the respective policy framework.

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.

### 1.4.2 International Climate Policy

The CCPI also evaluates countries’ performance at UNFCCC conferences and other international conferences and multilateral agreements. The questionnaire asks experts to assess the recent performance of their country in international fora.

## 2 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 performed 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  $X_i$ ,

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

$i: 1, \dots, n$ : number of partial indicators (currently 14)

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

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 2020, one can see that Sweden as the highest-ranking country 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.climate-change-performance-index.org/](http://www.climate-change-performance-index.org/)

## Development and Prospects

The CCPI was first introduced to a professional audience at the COP11 – Montreal Climate Conference in 2005.

Since the beginning CAN International supports the index through its international network of experts working on the issue of climate protection.

Following a methodological evaluation of the seventh 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 2017.

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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## 4 Annex

### GHG Table

Country	Method
<b>Algeria</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Argentina</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Australia</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Austria</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Belarus</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Belgium</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Brazil</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Bulgaria</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Canada</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Chile</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>China</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Chinese Taipei</b>	Chinese Taipei has a national target of 50% reduction below business-as-usual level of 428 MtCO <sub>2</sub> e in 2030. The quantification of the absolute emissions in 2030 is based on the information available at: <a href="https://topics.amcham.com.tw/2016/04/politics-policies-climate-change/">https://topics.amcham.com.tw/2016/04/politics-policies-climate-change/</a> <a href="http://www.lse.ac.uk/GranthamInstitute/law/greenhouse-gas-reduction-and-management-act/">http://www.lse.ac.uk/GranthamInstitute/law/greenhouse-gas-reduction-and-management-act/</a>
<b>Croatia</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Cyprus</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Czech Republic</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Denmark</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Egypt</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Estonia</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>European Union (28)</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Finland</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>France</b>	The French national target is a 40% reduction below 1990 level in 2030. The quantification is based on the reference values presented in the Low Carbon Strategy: <a href="https://unfccc.int/sites/default/files/resource/National_Low_Carbon_Strategy_v2_EN.pdf">https://unfccc.int/sites/default/files/resource/National_Low_Carbon_Strategy_v2_EN.pdf</a>
<b>Germany</b>	The German national target is a 55% reduction below 1990 level in 2030. The quantification is based on the 2030 total emissions level as presented in <a href="http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/klimaschutzplan_2050_kurz_en_bf.pdf">http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/klimaschutzplan_2050_kurz_en_bf.pdf</a>
<b>Greece</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Hungary</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>India</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Indonesia</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Ireland</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Islamic Republic of Iran</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Italy</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)

<b>Japan</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Kazakhstan</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Korea</b>	Quantification of domestic target in 2030 based on Climate Action Tracker 2019
<b>Latvia</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Lithuania</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Luxembourg</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Malaysia</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Malta</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Mexico</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Morocco</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Netherlands</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>New Zealand</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Norway</b>	Quantification of domestic target in 2030 based on Climate Action Tracker 2019
<b>Poland</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Portugal</b>	To quantify the absolute emissions level in 2030 we used the national target that stipulates emissions between 52.8 and 61.6 MtCO <sub>2e</sub> in 2030 as presented at <a href="https://apambiente.pt/_zdata/DMMC/RCM%2056_2015.pdf">https://apambiente.pt/_zdata/DMMC/RCM%2056_2015.pdf</a>
<b>Romania</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Russian Federation</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Saudi Arabia</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Slovak Republic</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Slovenia</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>South Africa</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Spain</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Sweden</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Switzerland</b>	Quantification of the domestic target of -30% 2030 based on Climate Action Tracker 2019
<b>Thailand</b>	Quantification of emissions based on total emissions level (excl. LULUCF) in 2030 from Climate & Energy College factsheets (AR4)
<b>Turkey</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>Ukraine</b>	Quantification of emissions in 2030 based on Climate Action Tracker 2019
<b>United Kingdom</b>	Applied the national target of 57% reduction below 1990 level in 2030. To quantify the absolute emissions level by 2030 we used the 1990 reference from the country factsheet available at <a href="http://climatecollege.unimelb.edu.au/files/site1/factsheets/UnitedKingdomOfGreatBritain_INDCFactsheet_UoM-PRIMAP_GWPAR4.pdf">http://climatecollege.unimelb.edu.au/files/site1/factsheets/UnitedKingdomOfGreatBritain_INDCFactsheet_UoM-PRIMAP_GWPAR4.pdf</a>
<b>United States</b>	We assume that the current administration does not support any GHG target and does not pursue the target of the Obama Administration.

## EE Table

Country	Method
<b>Algeria</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Argentina</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Australia</b>	Australia sets out a target to increase in energy productivity by 40% between 2015 to 2030. Combining a GDP growth of 1.23% per year until 2030 and the 2015 energy consumption per capita, the future energy use per capita is estimated

<b>Austria</b>	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.
<b>Belarus</b>	Belarus has a target to reduce energy intensity by 60% from 2005 by 2020. Combining a GDP growth of 2% per year until 2020 and the 2005 energy consumption per capita, the future energy use per capita is estimated and assumed constant until 2030
<b>Belgium</b>	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.
<b>Brazil</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Bulgaria</b>	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.
<b>Canada</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Chile</b>	Chile has a target to reduce energy demand by 12% by 2020 compared to a business as usual scenario. This target translates into an energy demand in 2020 16% higher in comparison to 2011 values. We assume the TPES per capita will remain constant between 2020 and 2030.
<b>China</b>	China's primary energy consumption cap of 6,000 Mtce in 2030 was applied as growth over the 4,640 Mtce in 2018 to per capita energy use in 2018 and adjusted for population growth between 2018 and 2030
<b>Chinese Taipei</b>	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.
<b>Croatia</b>	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.
<b>Cyprus</b>	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.
<b>Czech Republic</b>	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.
<b>Denmark</b>	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.
<b>Egypt</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Estonia</b>	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.
<b>European Union (28)</b>	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.
<b>Finland</b>	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.
<b>France</b>	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.
<b>Germany</b>	The German energy efficiency target is given as a reduction of the total final consumption by 50% from 2008 to 2050. The 2030 value was linearly interpolated.
<b>Greece</b>	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.
<b>Hungary</b>	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.
<b>India</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Indonesia</b>	Reduction of intensity of 1% per year between 2009-2025 is applied between 2009 and 2025 combined with a GDP growth of 3.94% per year. Between 2025 and 2030 no further reduction is assumed and the emission intensity grows proportional to the GDP.
<b>Ireland</b>	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.
<b>Islamic Republic of Iran</b>	Target to reduce energy intensity by 50% from 2010 to 2020. Combining a GDP growth of 0.51% per year until 2020 and the 2010 energy consumption per capita, the future energy use per capita is estimated and assumed constant until 2030.
<b>Italy</b>	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.
<b>Japan</b>	Japan presents in their energy outlook the country's energy demand to be 9.69% lower than 2013 in 2030 due to energy efficiency improvements.
<b>Kazakhstan</b>	Target of reduction of energy intensity per GDP (vs. 2008 levels) 30% by 2030. Assumed an annual average GDP growth rate of 1.98% from 2010 to 2030.
<b>Korea</b>	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 2.32% per year until 2030 and the 2015 energy consumption per capita, the future energy use per capita is estimated. 2030 value is linearly interpolated.
<b>Latvia</b>	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.

<b>Lithuania</b>	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.
<b>Luxembourg</b>	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.
<b>Malaysia</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Malta</b>	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.
<b>Mexico</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Morocco</b>	Target of "reducing energy consumption by 15% by 2030" was evaluated as a reduction below an increase in energy consumption that follows the GDP growth.
<b>Netherlands</b>	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.
<b>New Zealand</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Norway</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Poland</b>	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.
<b>Portugal</b>	From 129 toe/€M of GDP in 2013 to 101 toe/€M of GDP in 2030.
<b>Romania</b>	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.
<b>Russian Federation</b>	Russian has a target to reduce energy intensity by 40% between 2007 and 2020. Combining a GDP growth of 1.7% per year until 2020 and the 2007 energy consumption per capita, the future energy use per capita is estimated and assumed constant until 2030.
<b>Saudi Arabia</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Slovak Republic</b>	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.
<b>Slovenia</b>	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.
<b>South Africa</b>	Country has no energy efficiency target. The TPES per capita is assumed to follow the trend observed in the last five years (between 2012 and 2017)
<b>Spain</b>	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.
<b>Sweden</b>	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.
<b>Switzerland</b>	Target to reduce average per capita energy consumption by 43% below 2000 values in 2035 was applied and then a linear interpolation was used to obtain the 2030 approximate value.
<b>Thailand</b>	Target of 30% reduction in energy intensity (energy per unit GDP) by 2036, as compared to 2010 was applied assuming a linear interpolation between 2030 and 2036 and an annual growth rate of GDP of 3%.
<b>Turkey</b>	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.
<b>Ukraine</b>	The target of "energy intensity reduction of 50% by 2030" was applied to 2013 assuming the average annual GDP growth of the past 5 years.
<b>United Kingdom</b>	The British target given in TPES of 177.6 MTOE which is similar to current levels. Energy intensity was assumed to remain at 2015 values.
<b>United States</b>	We assume that the current administration does not support any energy efficiency target and does not pursue the target of the Obama Administration to double U.S. energy productivity over 2010 levels by 2030.

## RE Table

<b>Country</b>	<b>Method</b>
<b>Algeria</b>	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).
<b>Argentina</b>	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.

<b>Australia</b>	Target of 23.5% share of renewable electricity by 2020 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.
<b>Austria</b>	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-point increase to each member state's 2015 level.
<b>Belarus</b>	No quantifiable target
<b>Belgium</b>	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-point increase to each member state's 2015 level.
<b>Brazil</b>	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.
<b>Bulgaria</b>	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-point increase to each member state's 2015 level.
<b>Canada</b>	No quantifiable target
<b>Chile</b>	Target of 59% 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).
<b>China</b>	Target of 770GW 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.
<b>Chinese Taipei</b>	Target of 20% 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).
<b>Croatia</b>	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-point increase to each member state's 2015 level.
<b>Cyprus</b>	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-point increase to each member state's 2015 level.
<b>Czech Republic</b>	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-point increase to each member state's 2015 level.
<b>Denmark</b>	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-point increase to each member state's 2015 level.
<b>Egypt</b>	Target of 23% share of renewable electricity by 2022 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).
<b>Estonia</b>	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-point increase to each member state's 2015 level.
<b>European Union (28)</b>	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-point increase to each member state's 2015 level.
<b>Finland</b>	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-point increase to each member state's 2015 level.
<b>France</b>	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).
<b>Germany</b>	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).
<b>Greece</b>	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-point increase to each member state's 2015 level.
<b>Hungary</b>	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-point increase to each member state's 2015 level.
<b>India</b>	The expected renewable installed capacity and power generation under the current policy scenario of the WEO 2018 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.
<b>Indonesia</b>	Target of 23% of Total Primary Energy Supply by 2025. Share is assumed to remain constant until 2030.
<b>Ireland</b>	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-point increase to each member state's 2015 level.
<b>Islamic Republic of Iran</b>	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).
<b>Italy</b>	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).
<b>Japan</b>	The long-term electricity demand and supply outlook (i.e. energy mix target underlying the NDC) presents a target for TPES of 13-14%.
<b>Kazakhstan</b>	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).
<b>Korea</b>	Target of 20% 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). Share is assumed to remain constant until 2030.
<b>Latvia</b>	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-point increase to each member state's 2015 level.
<b>Lithuania</b>	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-point increase to each member state's 2015 level.
<b>Luxembourg</b>	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-point increase to each member state's 2015 level.
<b>Malaysia</b>	Target of 18% share of renewable electricity by 2020 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).
<b>Malta</b>	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-point increase to each member state's 2015 level.
<b>Mexico</b>	Target of 40% 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). The target is assumed to be reached in 2030.
<b>Morocco</b>	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).
<b>Netherlands</b>	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-point increase to each member state's 2015 level.
<b>New Zealand</b>	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).
<b>Norway</b>	Target of 67.5% share of renewable in gross final energy consumption in 2020 was assumed to apply for TPES
<b>Poland</b>	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-point increase to each member state's 2015 level.
<b>Portugal</b>	Target of 40% share of renewables in gross energy consumption by 2030 applied as percentage of renewables in TPES in 2030
<b>Romania</b>	Overall target of 24% of renewables in gross final energy consumption was assumed as share in TPES.
<b>Russian Federation</b>	Target of 4.5% 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.
<b>Saudi Arabia</b>	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).
<b>Slovak Republic</b>	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-point increase to each member state's 2015 level.
<b>Slovenia</b>	The overall renewable energy target is to have at least a 25% of share of energy generated from renewable sources in gross final energy consumption.
<b>South Africa</b>	The power generation shares from the Integrated Resource Electricity Plan (IRP) published in 2019 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).
<b>Spain</b>	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-point increase to each member state's 2015 level.
<b>Sweden</b>	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-point increase to each member state's 2015 level.
<b>Switzerland</b>	Target of increasing renewable electricity from non-hydro sources to 11,400 GWh and hydro up to 37,400 GWh in 2035, was translated into share in electricity generation. The share was linearly interpolated between 2016 values and 2035. The electricity share was converted 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).
<b>Thailand</b>	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
<b>Turkey</b>	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.
<b>Ukraine</b>	The national energy strategy up to 2035 presents a value for renewable TPES by 2030.
<b>United Kingdom</b>	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.
<b>United States</b>	We assume that the current administration does not pursue any of the renewable energy targets that were set by the Obama Administration.

#### Legend for General Assumptions Used for Many Countries:

- The share of electric energy remains constant in the total final consumption.
- 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.
- 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.
- Within the non-electric sector, the share of renewable energy remains constant in TPES and TFC respectively.
- The share of renewable energy in the 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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For Global Equity and the Preservation of Livelihood.