The Climate Change Performance Index

A Comparison of the Top 53 CO_2 Emitting Nations

GERMANWATCH

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CLIMATE CHANGE PERFORMANCE index 2006

Who does how much to protect the climate?

The Climate Change Performance Index (CCPI) is an innovative instrument that brings more transparency into international climate politics. On the basis of standardised criteria, it evaluates and compares the climate protection performance of the 53 countries that, together, are responsible for more than 90 percent of the world-wide energy-related CO_2 emissions.[1] The goal of the index is to increase the political and societal pressure on those countries that have neglected their homework on climate change up to now.

The overall results (table 1) show which nations have to do the most catching up. But even the countries that are ranking high cannot just sit back and relax. They rather are the one-eyed among the blind. Furthermore, some of them benefit from specific circumstances that can be considered fortunate from a climate change perspective.

For example, **emissions reductions** in some countries are due to the breakdown of ailing industries after the perestroika or the slump of the coal industry. And in some cases, the geological position of a country, e.g. that of front-runner Iceland, influences its energy supply mix.

In order not to overemphasise these aspects, the CCPI focuses to a larger extent on the changes in actual emissions – the emission trend – and the climate policy of a country. In doing so, the index rewards a country's efforts to reduce CO_2 without forgetting about its overall responsibility.

Furthermore, the CCPI reacts flexibly. Climate change-related decisions made today could have a significant effect on future editions of the index. A good rating could be foiled if a country, for example, were to decide to increase its use of coal because of high oil and gas prices and concerns about energy safety.

Particularly alarming are the bad results for most of the ten largest CO_2 emitters (table 2). These countries produce more than 60 percent of the global CO_2 emissions. Their future willingness to pursue a sustainable climate policy will be an important requirement to avoid a level of climate change that is dangerous on the large scale.

Table 1:

Overall Results of the Climate Change Performance Index

CCPI Rank	Country	Score*	Single-Score Trend Level Policy
1	Iceland	0.65	
2	Latvia	0.62	
3	United Kingdom	0.52	
4	Lithuania	0.50	
5	Germany	0.50	
6	Argentina	0.46	
7	Sweden	0.46	
8	Morocco	0.40	
9	Brazil	0.34	
10	India	0.32	
11	France	0.31	
12	Switzerland	0.31	
13	Hungary	0.28	
14	Denmark	0.28	
15	Netherlands	0.27	
16	Mexico	0.23	
17	Bulgaria	0.21	
18	Slovakia	0.18	

Legend:

- Emissions Trends (50% weighting)
- Emissions Levels (30% weighting)
- Climate Policy (20% weighting)

[1] Included are industrialised countries and countries in transition to market economies (Annex I countries of the Framework Convention on Climate Change) and all countries that produce more than one percent of the global CO_2 emissions.

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CCPI Rank	Country	Score*	Single-Score Trend Level Policy
19	Belgium	0.16	
20	Romania	0.13	
21	Poland	0.13	
22	Turkey	0.10	
23	Slovenia	0.09	
24	Norway	0.08	
25	Portugal	0.07	
26	Croatia	0.07	
27	Algeria	0.02	
28	Austria	0.02	
29	China	0.01	
30	South Africa	0.00	
31	New Zealand	-0,03	
32	Estonia	-0.04	
33	Finland	-0.05	
34	Japan	-0.06	
35	Belarus	-0.07	
36	Indonesia	-0.08	
37	Ukraine	-0.08	
38	Italy	-0.09	
39	Ireland	-0.13	
40	Greece	-0.13	
41	Czech Republic	-0.19	
42	Thailand	-0.20	
43	Spain	-0.25	
44	Luxembourg	-0.27	
45	Malaysia	-0.32	
46	Canada	-0.33	
47	Iran	-0.39	
48	Russia	-0.64	
49	South Korea	-0.68	
50	Australia	-0.75	
51	Kazakhstan	-0.79	
52	USA	-1.03	
53	Saudi Arabia	-1.16	

* rounded

TABLE 2:

Index Ranking of the 10 Largest CO_2 Emitters

Country	Share of the Global CO_2 Emissions* in Percent	CCPI Rank
United Kingdom	2.2	**3**
Germany	3.4	**5**
India	4.2	**10**
China	14.9	**29**
Japan	4.8	**34**
Italy	1.8	**38**
Canada	2.2	**46**
Russia	6.1	**48**
South Korea	1.8	**49**
USA	22.9	**52**

*energy related

1. What is the purpose of the CCPI?

Climate scientists, meanwhile, have agreed that human-induced activities are the main cause for rising global temperatures, which are now 0.7 degrees Celsius[2] above pre-industrial levels.
The consequences are serious already today: Extreme weather events are increasing, glaciers are melting, and the sea level is rising. Most affected are those who are least responsible: poor and marginalised people in developing countries.[3]

Some degree of climate change can no longer be avoided. People affected by it will have to adapt to it as best as they can. Still avoidable, however, is a temperature increase of more than two degrees on global average.[4] If this can be achieved, the danger of uncontrollable major risks will be significantly reduced.

To accomplish this, an enormous reduction of greenhouse gas emissions is needed.
The German Advisory Council on Global Change (WBGU) recommends that in order to avoid exceeding the two-degree limit, international climate policy has to be geared towards a maximum CO_2 equivalence level of 450 ppm (parts per million) in the atmosphere.[5] This means that CO_2 emissions in fast developing countries will have to be reduced by 45 to 60 percent and in industrialised countries by 80 percent by the middle of this century, as compared to the levels of 1990.

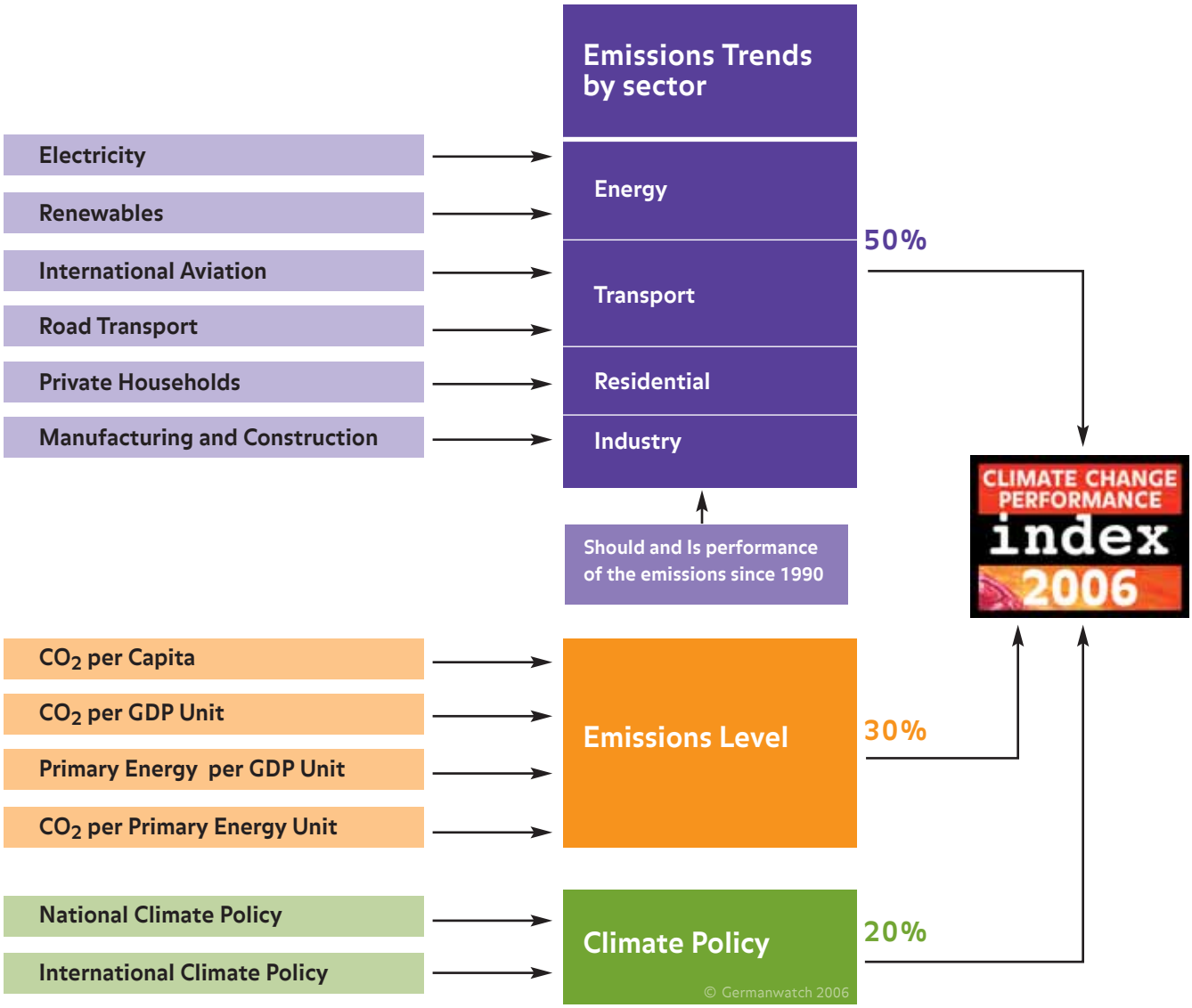
But we are far from achieving this objective. Worldwide CO_2 emissions continue to rise. The entry into force of the Kyoto Protocol was an important step in the direction of a trend reversal. But Kyoto was only a first - and actually way too small - common effort. Beyond 2012 many larger steps will be required. Reaching the goal is not impossible: Promoting renewable energies in line with increased energy efficiency, an active forest protection policy, CO_2 capture and storage[6] as well as market-based economic incentives such as emissions trading and policies like renewable energy laws can bring about the reversal of the trend.

It is the duty of all of the countries considered in the CCPI to achieve such ends because they have all signed the UN Convention on Climate Change. According to Article 2 of this convention, they are obliged to avoid dangerous climate change. After the realization of several scientific studies, the EU adopted the upper limit of 2 degrees Celsius as the target for its climate change policy. Now it is essential to increase political and civil society pressure so that words will be translated into real action.

The Climate Change Performance Index has been developed to support this objective. It is an instrument to analyse and compare ongoing emission developments. It brings transparency and is also intended both as an incentive for – and a means to exert pressure towards – improved climate policy.

[2] which is equivalent to 1.26 degrees Fahrenheit
[3] Another index developed by Germanwatch is the Climate Risk Index. It analyses how strong the countries of the world are affected by weather-related damaging events. It shows very clearly that overall damages have increased and that less developed countries are more affected by climate change (www.germanwatch.org/klak/cri.htm).
[4] Compared to pre-industrial levels.
[5] For comparison: In 1900, the CO_2 equivalent level in the atmosphere was 280 ppm, in 2003 it was 375 ppm (CDIAC, 2005).
[6] It is becoming clear that the 450 ppm limit cannot be maintained without this technology and its specific risks.

2. How does the CCPI work?



The CCPI contains three partial ratings that are added up to form a differentiated picture of the climate change performance of the countries evaluated here.

- First, it rates the per-capita emission trend of the previous years. The emissions are measured in four economic sectors[7]: energy, transport, residential and industrial. Each sector is rated individually.
- Second, it shows the absolute, energy-related CO_2 emissions of a country[8] taking into account its particular situation.
- Third, it evaluates the national as well as the international climate policies of a country.

The emission trend accounts for 50 percent and the climate policy for 20 percent of the total CCPI score. Hence these two ratings are weighted higher than the "current state" which accounts for 30 percent. Thus, the CCPI rewards efforts towards the reduction of CO_2 emissions, but prevents that those countries which reduce their emissions from a high level are rated too good.

The data used in the CCPI are taken from the International Energy Agency (IEA), the climate policies were evaluated by 30 international climate protection experts. The individual indicators which enter into the calculation of the CCPI, are listed on the following pages.

[7] Sectors according to the IPCC Guidelines for National Greenhouse Gas Inventories.
[8] The influence of deforestation on CO_2 emissions could not be taken into account.

2.1 Indicators of emissions trends (50%)

Effective political or economic measures that aim at reducing CO_2 emissions ultimately have an impact on the sectors they are targeting. Hence, the CCPI quantifies the development of the trend of CO_2 emissions in the energy, transport, residential and industrial sectors. More precisely, this development is measured by a comparison of the average emissions between the periods 1998-2000 and 2001-2003.[9]

For the calculation of CO_2 emissions in the individual sectors the following indicators are used:

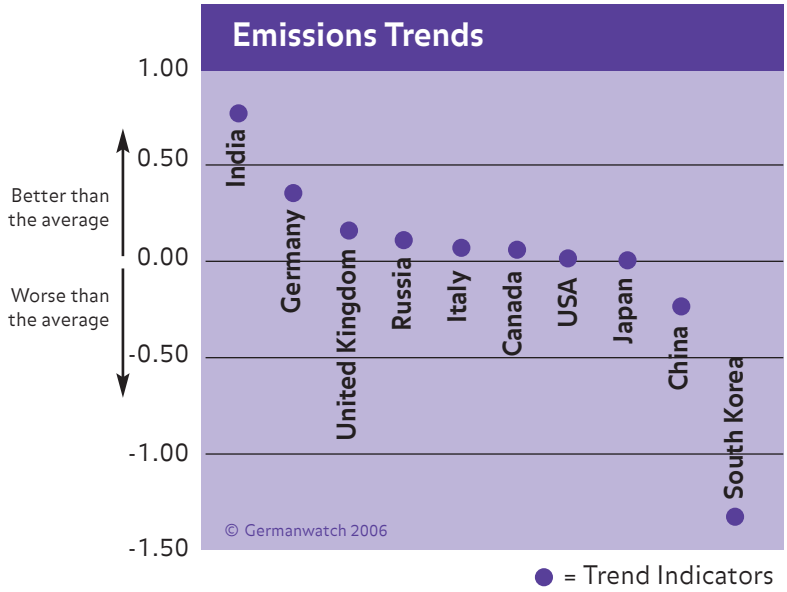
- **Energy:**
  The emissions resulting from electricity generation are evaluated in this sector. Since nuclear power is a risky energy source,[10] nuclear energy is evaluated with CO_2 risk equivalent per energy unit.
  These equivalents match the CO_2 emissions of an efficient coal-fired power plant. This is to avert a positive effect from the construction of new nuclear power plants in upcoming CCPI editions. Furthermore, a country that abandons nuclear energy only receives a good rating if it substitutes its nuclear energy with low-CO_2 alternatives.
  Because of its essential importance for sustainable emissions reduction, the share of renewable energies is considered separately.

- **Transport:**
  Here, the CO_2 emissions from road traffic and - according to the climate impact[11] - international aviation are incorporated.

- **Residential:**
  In this sector, the energy used for the heating of buildings is considered. It also represent private households.

- **Industrial:**
  Here, the CO_2 emissions from the manufacturing and construction industries are included.

This figure below shows the sectoral per-capita emissions trends of the ten largest CO_2 emitters. The comparison between target and actual performance is included (see "Weighting of trend indicators"). India has the best rank, primarily because its emissions increased less than the allotted target even though it experienced a strong population growth.



Weighting Trend Indicators

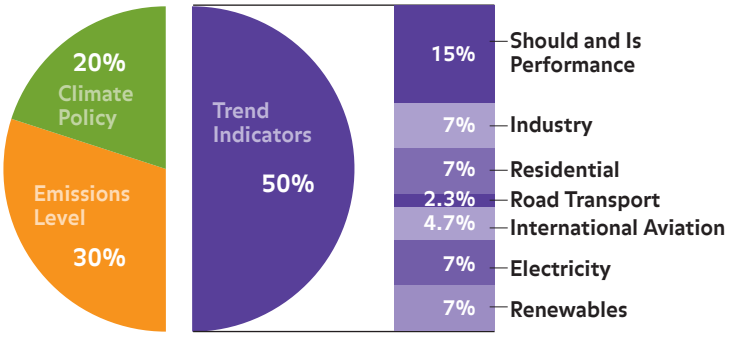
The trend indicators account for 50 percent of the CCPI score. These 50 percent are divided into the raw data **of the actual trend** (which accounts for 35 percentage points) and a **comparison between target and actual trend** ("target-performance comparison," accounting for 15 percentage points). The latter is due to the fact that the analysed countries have different climate protection responsibilities according to their state of development.

The individual sectors' shares in the assessment of the actual trend are determined by their relevance for climate change. For example, the electricity sector causes about 40 percent of energy-related global CO_2 emissions. The transport, residential and industrial sectors cause about 20 percent each. The weighting of the emissions trend reflects these shares of the different sectors (see figure top right).

[9] Calculating with periods has the advantage that extreme values can be averaged.
[10] Hohmeyer (1989).
[11] The additional impacts of long distance flights on the atmosphere, which are here weighted 2.7 times higher than short distance flights, are taken into account.

The target-performance comparison is used to adjust the assessment of the actual trend. It compares the trend of actual per-capita CO_2 emissions between 1990 and 2003 with the "desired" target trend for the same period. This desired target trend was calculated by using a scenario developed by the IPCC, the central UN panel of worldwide climate scientists.[12] In this scenario, the CO_2 equivalence concentration of 450 ppm in the atmosphere is not exceeded; global warming would thus remain below the two-degree limit with a relatively high probability. As suggested by the WGBU, the development path towards that aim is calculated according to the principle of "common but differentiated responsibilities" in a way that per-capita emissions of all countries gradually converge until the year 2050, that industrialised countries hence reduce their CO_2 emissions twice as fast as the rapidly developing countries.

By making a target-performance comparison, the CCPI grants temporary emission allowances to fast developing countries without losing sight of the ultimate objective to reduce CO_2 emissions. Furthermore, it particularly rewards those countries that have reduced their emissions according to or even beyond their Kyoto commitments since 1990.



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2.2 Indicators of emissions levels (30%)

The following table displays the share of the ten largest CO_2 emitters in terms of global CO_2 emissions, gross domestic product (GDP), energy consumption and population, and how they rank in the CCPI.

TABLE 3: **Key Data for the 10 Largest CO_2 Emitters**

	CCPI Rank	Share of Global CO_2 Emissions*	Share of Global GDP	Share of Global Primary Energy Supply	Share of Global Population
United Kingdom	**3**	2.2%	3.2%	2.2%	0.9%
Germany	**5**	3.4%	4.2%	3.2%	1.3%
India	**10**	4.2%	5.9%	5.2%	17.0%
China	**29**	14.9%	12.3%	13.1%	20.6%
Japan	**34**	4.8%	6.9%	4.8%	2.0%
Italy	**38**	1.8%	3.0%	1.7%	0.9%
Canada	**46**	2.2%	1.9%	2.4%	0.5%
Russia	**48**	6.1%	2.5%	6.0%	2.3%
South Korea	**49**	1.8%	1.8%	1.9%	0.8%
USA	**52**	22.9%	20.9%	21.3%	4.6%
Sum		64.3%	70.0%	61.8%	50.9%

*energy related

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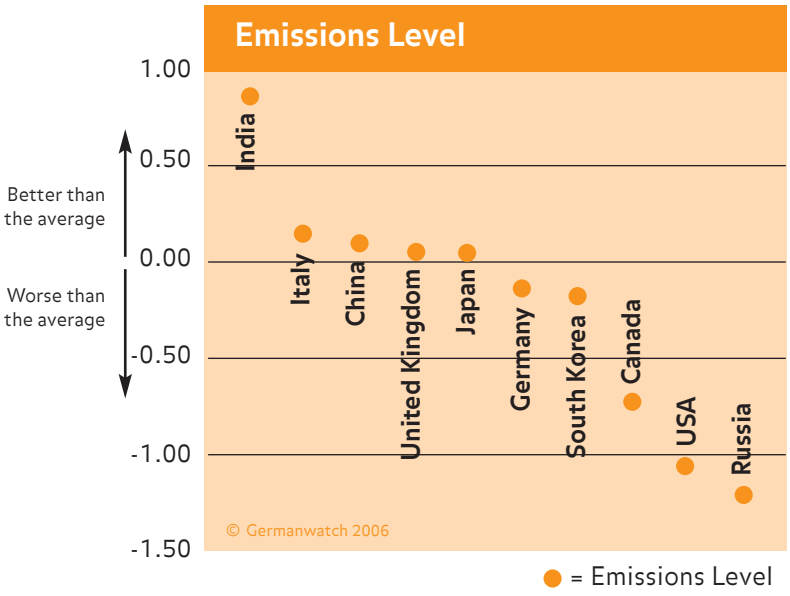
[12] IPCC Scenario SRES B1

The following indicators of emissions levels refer to these core data.
CO_2 emissions are compared to these factors. Moreover, the energy efficiency of a country is assessed, thus resulting in the following four base indicators:

- CO_2 emissions per capita
- CO_2 emissions per unit of GDP [13]
- Primary energy consumption per unit of GDP
- CO_2 emissions per primary energy consumption



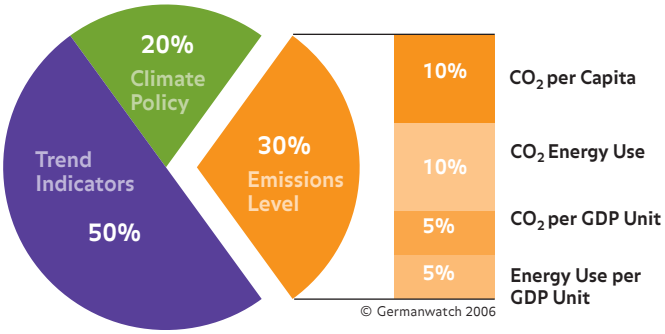
The above illustration shows how the ten largest CO_2 emitters rank in relation to the average of all the examined countries. Again, India ranks at the top while Russia brings up the rear in this assessment.

Photo: Dietmar Putscher

Weighting Emissions Level

The base indicators of emissions levels account for 30 percent of the total CCPI score. The pie chart below shows how they were considered in the overall assessment.

Since two base indicators of emissions levels consider the countries' GDP, these indicators – CO_2 per unit of GDP (CO_2 intensity) and primary energy per unit of GDP (energy intensity) – are weighted half as much as the indicators CO_2 per capita and CO_2 per unit of primary energy. Thus, a double counting of the GDP is avoided.



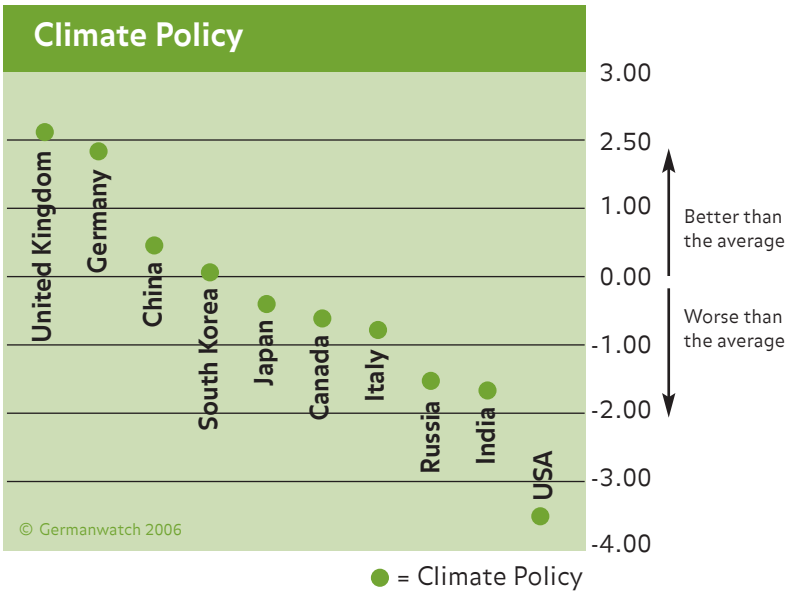
[13] Measured in purchasing power parities.

2.3 Indicators of climate policy (20%)

These indicators consider the fact that measures taken for CO_2 reduction often need several years to show their full effect. Furthermore, due to time needed to attain a thorough collection of information, the most current CO_2 emissions data are about two years old.

To enable an evaluation that is as up to date as possible and to directly reward measures that lead to emissions reductions, the CCPI incorporates the current climate policy of the countries into the assessment. Both the evaluation of a country's national efforts and its role played in international climate negotiations are taken into account. Without a strong, internationally coordinated climate policy, chances are low that ambitious climate protection targets will be achieved.

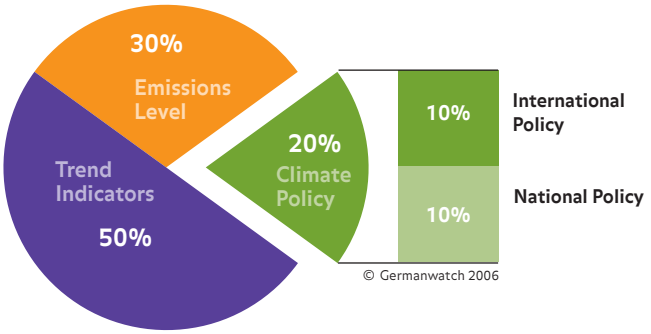
The figure on the right shows how differently experts rated the national and international climate policy of the ten largest CO_2 emitters. China's relatively good result is remarkable. It can be explained by its now strong national and international engagement for renewable energy, the new climate protection regulations in the transport sector and its now relatively constructive role in the UN climate negotiations.



Weighting Climate Policy

The climate policy of the evaluated countries accounts for 20 percent of the CCPI score. At first glance, this does not seem to be very much. Nevertheless, this partial rating can influence the final result for a country significantly. While the emissions levels can only be lowered step by step - thus an improvement of the balance takes some time - switching to a good climate policy can make the overall evaluation go up much faster.
For example, the United States drops ten positions due to its bad ratings for blocking climate policy. Great Britain, on the other hand, has been playing a strong role in climate protection for years and climbs up about ten positions after the good marks for its climate policy are taken into account.

Moreover, this partial rating is crucial for a country's ranking in upcoming editions of the CCPI because only an active climate policy can lower the national level of CO_2 emissions and create a positive trend.



3. Country Comparison: Germany - USA

The following examples of calculations for Germany and the USA point out that the CCPI allows a differentiated analysis in each of the three evaluation categories. **Important: The final result of the CCPI is calculated based on the average score, not the average rank.** Very positive or negative scores in single categories can influence the final result to a great extent. Therefore the ranks regarding particular indicators may vary quite significantly from the final result. Examples for single results that carry a lot of weight are the immensely high CO_2 per capita value of the United States or the very good marks for the international climate policy of Germany.

It is also interesting to note how countries are ranked in the particular sub-categories. For Germany, the trend in the transport sector appears to be relatively good. Germany is one of the very few industrialised countries that were able to reduce their emissions in this sector.[14] Because the massive increase in oil prices influenced each country in a similar way, it stands to reason that the Eco-Tax, which was introduced in Germany in 1998, prompted the slight decline of emissions, which can also partly be traced back to "fuel tourism".[15] However, the slightly positive tendency in Germany should not detract from the larger reduction potential that can still be attained in this sector through higher energy efficiency, alternative fuels, and incorporation into the emissions trading system.

The CCPI also points out that there is an increasing need for action in the German residential sector. Measures like the enhancement of efficiency, better isolation and the usage of thermal power plants that are powered by renewable energy are promising options. We will see if the activities in this field planned by the new German administration will show positive effects in future editions of the CCPI.

Table 4: **Germany**

		Indicator	Score	Rank	Weight	Rank
Emissions Levels		CO_2 per Capita	-0.59	41	10%	**32**
		CO_2 per GDP	0.45	21	5%	
		Primary Energy per GDP	0.65	16	5%	
		CO_2 per Primary Energy	-0.34	37	10%	
Emissions Trends by Sectors	Energy	Electricity	0.18	23	7%	**11**
		Renewable Energy	0.52	10	7%	
	Transport	International Aviation	0.10	30	4.7%	
		Road Transport	1.08	4	2.3%	
	Residential	Private Households	0.06	31	7%	
	Industrial	Manufacturing Industries and Construction	0.52	14	7%	
		Should and Is Performance since 1990	0.30	20	15%	
Climate Policy		International	2.59	1	10%	**2**
		National	1.09	4	10%	
Sum		**0.50**			**5**	

[14] Between the periods 1998-2000 and 2001-2003, emissions declined by 4.6 percent.

[15] "Fuel tourism", which means the crossing of national borders to buy cheaper gas, was one of the reasons why the transport emissions of Austria increased by 18.9 percent.

The example of the United States shows that countries with a poor rating on emissions levels would have good prospects to reach a better CCPI rank. Because of their adverse position in national and international climate policies the United States blows this chance.

TABLE 5: **USA**

		Indicator	Score	Rank	Weight	Rank
Emissions Levels		CO_2 per Capita	-2.67	52	10%	**48**
		CO_2 per GDP	-0.13	36	5%	
		Primary Energy per GDP	0.06	32	5%	
		CO_2 per Primary Energy	-0.46	39	10%	
Emissions Trends by Sectors	Energy	Electricity	0.28	16	7%	**27**
		Renewable Energy	0.10	31	7%	
	Transport	International Aviation	0.80	7	4.7%	
		Road Transport	0.48	20	2.3%	
	Residential	Private Households	0.19	22	7%	
	Industrial	Manufacturing Industries and Construction	0.29	21	7%	
		Should and Is Performance since 1990	-0.64	41	15%	
Climate Policy		International	-3.25	53	10%	**53**
		National	-3.75	53	10%	
Sum		**-1.03**			**52**	

4. Climate Change Performance Index by country group

The following tables show countries categorised by groups permit a comparison of countries with more or less similar basic conditions.
Compared are OECD member states (table 6), EU member states (table 7), as well as transition countries (table 8), fast developing countries (table 9) and ASEAN member states (table 10).

TABLE 6: **OECD Member Countries**

Rank	Country	Score	Rank	Country	Score	Rank	Country	Score
1	Iceland	0.65	**18**	Slovakia	0.18	**38**	Italy	-0.09
3	United Kingdom	0.52	**19**	Belgium	0.16	**39**	Ireland	-0.13
5	Germany	0.50	**21**	Poland	0.13	**40**	Greece	-0.13
7	Sweden	0.46	**22**	Turkey	0.10	**41**	Czech Republic	-0.19
11	France	0.31	**24**	Norway	0.08	**43**	Spain	-0.25
12	Switzerland	0.31	**25**	Portugal	0.07	**44**	Luxembourg	-0.27
13	Hungary	0.28	**28**	Austria	0.02	**46**	Canada	-0.33
14	Denmark	0.28	**31**	New Zealand	-0.03	**49**	South Korea	-0.68
15	Netherlands	0.27	**33**	Finland	-0.05	**50**	Australia	-0.75
16	Mexico	0.23	**34**	Japan	-0.06	**52**	USA	-1.03

Members of the Kyoto Protocol
Without Kyoto Commitment
Refused to ratify the Kyoto Protocol

TABLE 7: **EU Member Countries**

Rank	Country	Score	Rank	Country	Score	Rank	Country	Score
2	Latvia	0.62	15	Netherlands	0.27	33	Finland	-0.05
3	United Kingdom	0.52	18	Slovakia	0.18	38	Italy	-0.09
4	Lithuania	0.50	19	Belgium	0.16	39	Ireland	-0.13
5	Germany	0.50	21	Poland	0.13	40	Greece	-0.13
7	Sweden	0.46	23	Slovenia	0.09	41	Czech Republic	-0.19
11	France	0.31	25	Portugal	0.07	43	Spain	-0.25
13	Hungary	0.28	28	Austria	0.02	44	Luxembourg	-0.27
14	Denmark	0.28	32	Estonia	-0.04			

TABLE 8:
Countries in Transition

Rank	Country	Score	Rank	Country	Score
2	Latvia	0.62	23	Slovenia	0.09
4	Lithuania	0.50	26	Croatia	0.07
13	Hungary	0.28	32	Estonia	-0.04
17	Bulgaria	0.21	35	Belarus	-0.07
18	Slovakia	0.18	41	Czech Republic	-0.19
20	Romania	0.13	48	Russia	-0.64
21	Poland	0.13	51	Kazakhstan	-0.79

TABLE 9:
Newly Industrialising Countries

Rank	Country	Score
6	Argentina	0.46
9	Brazil	0.34
10	India	0.32
16	Mexico	0.23
29	China	0.01
30	South Africa	0.00
36	Indonesia	-0.08
42	Thailand	-0.20
45	Malaysia	-0.32
47	Iran	-0.39
49	South Korea	-0.68

TABLE 10:
ASEAN Countries (plus China, India, Japan and South Korea)

Rank	Country	Score	Rank	Country	Score
10	India	0.32	42	Thailand	-0.20
29	China	0.01	45	Malaysia	-0.32
34	Japan	-0.06	49	South Korea	-0.68
36	Indonesia	-0.08			

5. Future prospects

The Climate Change Performance Index (CCPI) was introduced to a professional audience for the first time at the global climate summit in Montreal 2005 (COP11 of the United Nations Framework Convention on Climate Change). The feedback from the international experts was included in the final version.

The CCPI, however, was not intended to be used only by experts, but by everybody. It helps to shed light on the shared responsibilities, broken promises, and encouraging first steps in international climate politics. Climate protection concerns everyone – therefore it must be addressed by everyone. In this respect, the CPPI should serve both as a warning and an incentive.

In the future, the CCPI will be presented at the beginning of each global climate summit.

We would be pleased to give you more detailed information about the possibilities of a specific analysis for a particular country. Moreover, you are welcome to sign up to our mailing list which provides information on the further developments of the CCPI. **If you are interested, please call +49-228-60492-0 or send an e-mail to burck@germanwatch.org.**

6. Additional literature and data sources

BP (2005): Statistical Review of World Energy.
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7. Annex: Method used for developing the CCPI

The method used for developing the CCPI is based on an OECD guidance for creating performance indicators[16].
For the standardisation of the particular indicators the "standard deviation from the average value" was used.

$$\text{Score} = \left(\frac{\text{actual value} - \text{mean value}}{\text{standard deviation}} \right)$$

This method of normalisation is convenient for the comparison of a large number of countries because it circumvents extreme values that would hamper the calculation.

In terms of the CCPI score, 0 indicates the average of all countries in a category. Positive values show an above-average performance, negative values a below-average performance. The following formula was used for calculating the final result of the CCPI:

$$I = \sum_{i=1}^{n} w_i X_i \quad \mathbf{I}: \text{CCPI}, \ \mathbf{X_i}: \text{normalised variable}$$

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

i: 1,...., n.

[16] Freudenberg (2003)

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