

Climate and Energy Indicators in the Environmental Performance Index

April 2015

In 2007 UN Secretary-General Ban Ki Moon called climate change “[the defining issue of our era](#).” Since then global greenhouse gas emissions have [increased and accelerated](#). Our understanding of the underlying science of climate change has improved vastly, but the data and indicators we used to measure and track policy response to it has lagged. Most of the climate data are based on [levels of primary CO2 emissions](#), due to the near linear relationship between carbon dioxide and global temperature rise. However, although emissions-based indicators may be a proxy for climate change performance, they are also a proxy for level of economic development. Countries such as Mozambique and the Democratic Republic of Congo may not emit much in comparison to the United States, but that has little to do with outright climate policy than economic underdevelopment.

The 2014 EPI takes a new approach to climate and energy.

In past iterations of the EPI, the primary goal was to develop indicators that, when statistically transformed and normalized, allowed for absolute comparability among countries. The 2014 EPI acknowledges that generally applying the same targets to every country provides little insight into policy. We agree with international climate frameworks like the [United Nations Framework Convention on Climate Change \(UNFCCC\)](#) that emphasize the significant differences between developed and developing countries. For the first time, the EPI scores countries using emissions-based measures that account for differences in economic development.

In doing so, the 2014 EPI aims to provide a blueprint for climate and energy indicators that do not hold countries with different needs and capacities to a monolithic set of metrics. It introduces a tiered set of expectations. Wealthier nations are gauged according to reduced emissions per unit Gross Domestic Product (GDP) (carbon intensity) from 2000 to 2010. Countries within this tier include Annex I parties to the UNFCCC who have taken on emission reduction commitments, a group that includes the European Union, as well as other wealthy countries who have pledged mitigation actions through the [Copenhagen Accord](#), including the United States, Japan, and Canada. The United States, for example, has committed to reduce emissions by 17 percent of 2005 levels by the year 2020. This indicator is an effort to measure the progress of that commitment, which is by no means legally binding or guaranteed.

Denmark, whose government has framed a commitment to reduce emissions to 40 percent of 1990 levels by 2020, is performing particularly well in this category. Its goal is to phase out fossil fuels by 2050. Yet, like its northern European neighbors, Denmark has already made impressive cuts in both household and industrial carbon emissions, largely through efficiency and renewables initiatives. The country has clearly [demonstrated a policy commitment](#) to substantially reduce carbon emissions.

Middle-income countries whose economies are still developing are expected to slow the rate at which the carbon intensity of their economy increases. These countries, including China, India, and Brazil, are judged against a benchmark of a slowed rate of carbon intensity increase. Although ideally they will begin to move toward absolute emission reductions (as in the case of wealthier countries), the tension between industrial growth and populations still mired in poverty makes it

necessary for these countries to continue to grow their economies. The expectation is that they do this as sustainably as possible. For now, the EPI rewards countries that are doing their best to curb the rate of growth in emissions.

China, for example, is the world's largest emitter of greenhouse gases and one of the top energy-consuming countries. It tends to receive heavy criticism for these distinctions. Still, GDP per person in China is very low, with almost 400 million people living on less than US\$2 a day. Despite high economic expansion averaging greater than 10 percent annual growth in GDP, China reported a 20-percent decrease in carbon intensity between 2005 and 2010. At the 2009 UN Copenhagen Climate Summit, [China committed to reduce carbon intensity an additional 40 to 45 percent of 2005 levels by 2020](#). Trends in carbon intensity reduction from the past decade demonstrate China's policy achievements.

As low as China's GDP may be, a whole tier of countries ranked in the EPI is even poorer, with a GNI per capita less than US\$1,035. These LDCs have, in past iterations of the EPI, dominated the rankings, largely due to low economic development. But because of the less significant contribution of LDCs to overall climate emissions, the 2014 EPI does not score these countries on the Climate and Energy category. Their priority should be building their economies, albeit as sustainably as possible, while developing robust energy infrastructures that ensure access to cleaner forms of energy for their people. In terms of climate change, these countries' primary concerns are vulnerability and adaptation to climate change.

Many countries with high proportions of populations lacking access to electricity currently rely on higher-polluting, less sustainable forms of fuel, including biomass like animal dung, wood, and charcoal. Switching to less-polluting, non-solid fuels has both climate impacts and household air pollution impacts. Furthermore, increasing access to electricity provides a range of social and economic benefits for citizens. The 2014 EPI website provides an indicator of Access to Electricity for LDCs, but it does not include the measure when calculating the aggregated score for these countries.

Recognizing these disparate policy goals, the 2014 EPI treats national levels of development as a central determinant of how countries' performance on the Climate and Energy trend indicators are weighted. They are sensitive to countries' differing policy obligations and take into consideration both economic and industrial development. Scores for three of the indicators include weightings tied to Gross National Income (GNI) per capita, as determined by the [World Bank's country classifications](#).

- For wealthy countries (GNI per capita greater than US\$12,616), scores are primarily comprised of an indicator measuring the Trend in Carbon Intensity, as the burden of climate mitigation lies firmly with them.
- For middle-income countries (GNI per capita between US\$1,036 and US\$12,615), the primary measure is the rate at which their carbon intensity growth has slowed. These countries must develop while gradually moving toward more sustainable energy sectors.
- Least Developed Countries (LDCs) are not scored on emissions indicators, since they have historically contributed less significant amounts of carbon dioxide (CO₂) to the atmosphere. Emissions are not as important as transitioning people to more sustainable

forms of energy. Therefore, no score is given to LDCs for Climate and Energy. Instead, an indicator of Access to Electricity is presented but not calculated in the EPI score.

A third indicator in this category is the Trend in CO₂ Emissions per kilowatt hour (kWh) of electricity produced, determined for most countries as a trend from 2000 to 2010. For those countries that already perform at the lowest levels of carbon intensity per kWh of electricity produced, a score is calculated as an absolute level of CO₂ emissions per kWh of electricity and heat produced, divided by the total amount of electricity and heat production.

Table 1. Top 10 performers on each of the 2014 EPI's Climate and Energy Indicators

Trend in Carbon Intensity	Change of Trend in Carbon Intensity	Trend in CO₂ emissions per kWh electricity generation	Access to Electricity
Russia	Nigeria	Iceland	Kyrgyzstan
Singapore	Papua New Guinea	Albania	Tajikistan
Slovakia	Congo	Paraguay	Nepal
Estonia	Jamaica	Switzerland	Guinea-Bissau
Portugal	Bolivia	Norway	Bangladesh
Spain	Gabon	Portugal	Comoros
Sweden	Albania	Moldova	Afghanistan
Czech Republic	Azerbaijan	Qatar	Zimbabwe
Poland	China	Spain	Haiti
Croatia	Egypt	Armenia	Eritrea

Table 2. Bottom 10 performers on each of the 2014 EPI's Climate and Energy Indicators

Trend in Carbon Intensity	Change of Trend in Carbon Intensity	Trend in CO₂ emissions per kWh electricity generation	Access to Electricity
Bahrain	Botswana	Cuba	Madagascar
Israel	Mongolia	Chile	Burkina Faso
Trinidad and Tobago	Libya	Argentina	Sierra Leone
Uruguay	St. Lucia	Bolivia	Rwanda
UAE	Saint Vincent and the Grenadines	Uruguay	Central African Republic
Antigua and Barbuda	Belize	Ghana	Malawi
Barbados	Guyana	Botswana	Niger
Oman	Grenada	Gabon	Burundi
Bahamas	Namibia	Congo	Chad
Brunei	Palau	Peru	Liberia

Figure 1. Infographic explaining how the 2014 EPI indicators are calculated.

How do we know?

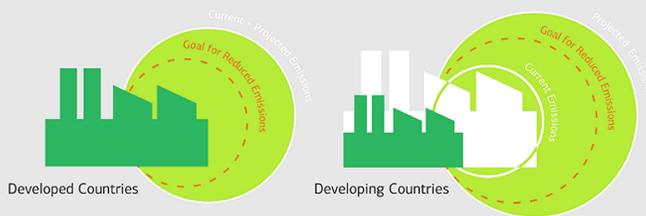
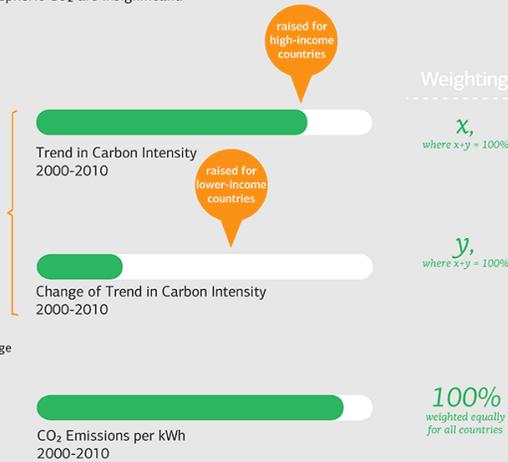
Whereas other indicator scores reflect the degree to which a target has been met, there are no globally agreed-upon targets for CO₂ reductions. Therefore, the EPI Climate and Energy indicators should not be interpreted as a proximity-to-target, but rather a relative position globally. The EPI indicators for Climate and Energy are weighted depending on a country's level of economic development. Least-developed countries (LDCs) are not scored on emissions indicators, as their historic contributions of atmospheric CO₂ are insignificant.

SCORING

The score for this indicator is based on three trends: Trend in Carbon Intensity, Change of Trend in Carbon Intensity, and Trend in CO₂ Emissions per kWh.

The Trend in Carbon Intensity and Change of Trend in Carbon Intensity indicators are weighted according to a country's GDP. Wealthier countries have scores weighted more on Trend in Carbon Intensity (x), while scores for lower-income countries are weighted more on Change of Trend in Carbon Intensity (y).

Trend in CO₂ emissions per kWh scores countries based on the change in the carbon intensity of the average unit of electricity and heat produced. A few top performers are scored solely on their CO₂ emissions per kWh for the year 2010, as they already perform well enough that there is little room for additional improvement.



WHY WEIGHT THE INDICATORS?

Climate change is largely the legacy of developed and industrialized countries. These include OECD states in Europe, as well as the U.S., Japan, Australia, and Canada. Expectations under current climate arrangements, including the Kyoto Protocol, are that these countries will reduce their emissions to a baseline (i.e., 1990 levels) by a certain target date. We score this group based on their efforts to reduce emissions.

Developing countries, particularly major emerging economies like China and India, are or will be responsible for the majority of future emissions. Still, nobody expects these countries to deliberately stop growing. It is vital that they at least slow the rate at which carbon intensity grows. Our scores for this group emphasize the need for slowed growth in intensity. Countries that slow their rates of emissions growth are scored better than countries that remain steady or are increasing emissions more rapidly than at earlier times.



ACCESS TO ENERGY

For LDCs, emissions are simply not as important as transitioning people to more sustainable and accessible forms of energy. No score is given to LDCs for Climate and Energy. Instead, an indicator showing Access to Electricity is presented but not calculated in the overall EPI score.