

Indicator name		Carbon intensity of electricity production			
	Country	Grams of carbon per kilowatt hour	Country	Grams of carbon per kilowatt hour	
1	Estonia	328.9	26	Czech Republic	206.8
2	Moldova	314.2	27	Singapore	206.7
3	Kazakhstan	309.0	28	Lebanon	200.3
4	Qatar	300.4	29	Romania	198.5
5	Poland	286.1	30	Bahrain	187.4
6	China	259.9	31	Trinidad and Tobago	185.3
7	Turkmenistan	245.8	32	Côte d'Ivoire	184.6
8	India	240.7	33	Algeria	183.4
9	Senegal	237.1	34	Kuwait	182.6
10	Malta	234.7	35	Morocco	180.3
11	Bosnia and Herzegovina	232.0	36	Jordan	179.0
12	Cyprus	231.5	37	Ireland	178.7
13	Belarus	229.9	38	Zimbabwe	175.8
14	South Africa	229.7	39	Libya	172.6
15	Serbia and Montenegro	227.6	40	Kenya	170.0
16	Oman	222.8	41	Indonesia	166.8
17	Togo	222.2	42	Hungary	166.3
18	United Arab Emirates	220.7	43	Nicaragua	166.1
19	Greece	220.1	44	Denmark	165.6
20	Israel	215.7	45	Latvia	162.0
21	Australia	215.6	46	Russian Federation	158.8
22	Cuba	214.9	47	Bulgaria	154.8
23	Azerbaijan	212.8	48	Bangladesh	152.2
24	Brunei	208.4	49	Iran	151.8
25	Uzbekistan	207.1	50	Iraq	148.8
<p>Note: These data cover fossil fuel generation, hydropower, nuclear power, renewables and waste. The countries listed generate the highest amounts of greenhouse gases, per unit of electricity generated, and hence have the greatest potential for applying technological solutions in order to reduce their carbon releases. Untapped hydropower options are available in China and India, as has been already discussed, as for many other countries appearing in this table. However, for countries with a high reliance on gas and coal, technological improvements in thermal power generation will become necessary.</p> <p>Based on 2002 data</p>					
Prepared by	UNIDO				
Example	WWDR2, Chapter 9, Table 9.4				
Rationale	This is a measure of the carbon dioxide emissions, associated with climate change, which are produced through electricity generation in various countries. Hydropower is one of the “clean” power options in the sense of not generating greenhouse gases.				
Position in DPSIR chain	Impact				
Definition of indicator	Carbon intensity of electricity production measures the carbon emissions per unit of electricity generated, in a given year (C_e).				
Underlying definitions and concepts	Carbon dioxide from electricity generation is the sum of carbon emissions from combustion of all fossil fuel types used for public electricity generation, public combined heat and power generation, and public heat plants Electricity generation is measured at the terminals of all alternator sets in a power station, and includes all plants producing electricity, as well as combined heat and power plants				
Specification of determinands needed	Annual carbon emissions from electricity generation are measured in kilograms of carbon released per year (C). Electricity generation is measured in gigawatt-hours per year (E_e)				

Computation	The indicator is calculated as : $C_e = C / E_e$
Unit(s) of expression	Grams of carbon per kilowatt-hour (g _C /kWh)
Data sources, availability and quality	World Resources Institute (WRI) Good global coverage
Scale of application	National
Geographical coverage	Global
Interpretation	The carbon intensity of electricity production is one component of the carbon intensity of energy use as a whole. This indicator suggests the availability of fuel switching options in electricity production, i.e. switching from fossil fuels to non-fossil fuel sources in order to reduce greenhouse gas emissions. Electricity generation covers coal, oil, and gas (the fossil fuel sources of energy); hydropower and nuclear power generation, as well as geothermal, solar, wind, tide and wave energy, and that from combustible renewables and waste. The lower the carbon intensity, the more the country relies upon non-fossil fuel sources of energy for electricity generation.
Linkage(s) to other indicators	This indicator links with the indicator on “Evolution of electricity generation by fuel” (State). The carbon intensity of electricity production shows the impact of electricity generation on the earth’s atmosphere, in terms of contributing to climate change.
Alternative methods and definitions	Greenhouse gases include carbon dioxide as well as methane (CH ₄), nitrous oxide (N ₂ O), and the gases containing fluorine such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF ₆). These are the main gases contributing to climate change. In order to reflect the full range of factors relating to climate change, all these gases should be included in the indicator. However, even the data relating to carbon dioxide may have significant errors. The uncertainties are even larger for non-CO ₂ gases, especially nitrous oxide. These uncertainties are greater in developing countries. Hence only the carbon emissions in terms of CO ₂ are used in the indicator.
Related indicator sets	World Resources Institute (WRI) World Development Indicators (World Bank) International Energy Agency (IEA) United Nations Framework Convention on Climate Change (UNFCCC) Carbon Dioxide Information Analysis Centre (CDIAC) Database
Sources of further information	See the Climate Analysis Indicators Tool (CAIT) on the World Resources Institute’s website at http://cait.wri.org (Accessed 02 March 2009)
Other institutions involved	World Bank, UNFCCC