

	GDP per unit of energy use		Net energy imports ^a		Carbon dioxide emissions					
	2000 PPP \$ per kg oil equivalent		% of energy use		Total million metric tons		Per capita metric tons		kg per 2000 PPP \$ of GDP	
	1990	2002	1990	2002	1990	2000	1990	2000	1990	2000
Afghanistan	..	..	..	..	2.6	0.9	0.1	0.0	..	..
Albania	3.9	6.7	8	60	7.3	2.9	2.2	0.9	0.7	0.2
Algeria	5.7	5.6	-338	-387	80.4	89.4	3.2	2.9	0.6	0.5
Angola	3.6	3.2	-356	-485	4.6	6.4	0.5	0.5	0.2	0.3
Argentina	6.2	6.9	-5	-45	109.7	138.2	3.4	3.9	0.4	0.3
Armenia	1.6	4.8	94	62	3.7	3.5	1.1	1.1	0.5	0.5
Australia	4.1	4.8	-80	-126	266.0	344.8	15.6	18.0	0.7	0.7
Austria	6.9	7.5	68	67	57.5	60.8	7.4	7.6	0.3	0.3
Azerbaijan	..	2.2	-9	-68	47.1	29.0	6.4	3.6	..	1.4
Bangladesh	10.1	10.5	16	20	15.4	29.3	0.1	0.2	0.1	0.1
Belarus	1.2	2.1	90	86	94.6	59.2	9.3	5.9	2.0	1.2
Belgium	4.6	4.8	74	77	100.5	102.2	10.1	10.0	0.5	0.4
Benin	2.3	3.0	-6	31	0.6	1.6	0.1	0.3	0.1	0.3
Bolivia	5.1	4.8	-77	-89	5.5	11.1	0.8	1.3	0.4	0.6
Bosnia and Herzegovina	..	5.3	19	23	4.7	19.3	..	4.8	..	0.9
Botswana	..	..	..	..	2.2	3.9	1.7	2.3	0.3	0.3
Brazil	7.2	6.8	27	15	202.6	307.5	1.4	1.8	0.2	0.2
Bulgaria	2.2	2.9	67	45	75.3	42.3	8.6	5.3	1.2	0.8
Burkina Faso	..	..	..	..	1.0	1.0	0.1	0.1	0.1	0.1
Burundi	..	..	..	..	0.2	0.2	0.0	0.0	0.0	0.1
Cambodia	..	..	..	..	0.5	0.5	0.0	0.0	..	0.0
Cameroon	4.8	4.7	-140	-83	1.5	6.5	0.1	0.4	0.1	0.2
Canada	3.1	3.6	-31	-54	428.8	435.9	15.4	14.2	0.7	0.5
Central African Republic	..	..	..	..	0.2	0.3	0.1	0.1	0.1	0.1
Chad	..	..	..	..	0.1	0.1	0.0	0.0	0.0	0.0
Chile	5.6	6.0	44	64	35.3	59.5	2.7	3.9	0.5	0.4
China	2.1	4.6	-3	1	2,401.7	2,790.5	2.1	2.2	1.3	0.6
Hong Kong, China	10.6	10.6	100	100	26.2	33.1	4.6	5.0	0.2	0.2
Colombia	8.3	9.8	-94	-164	55.9	58.5	1.6	1.4	0.3	0.2
Congo, Dem. Rep.	5.1	2.2	-1	-5	4.1	2.7	0.1	0.1	0.1	0.1
Congo, Rep.	2.3	3.7	-753	-1,330	2.0	1.8	0.8	0.5	0.8	0.5
Costa Rica	9.7	9.4	49	51	2.9	5.4	1.0	1.4	0.1	0.2
Côte d'Ivoire	4.9	3.7	23	0	11.9	10.5	1.0	0.7	0.6	0.4
Croatia	4.8	5.3	35	55	16.8	19.6	3.8	4.5	0.5	0.5
Cuba	..	..	62	54	32.0	30.9	3.0	2.8	..	..
Czech Republic	2.8	3.7	19	26	137.9	118.8	13.4	11.6	1.1	0.8
Denmark	7.1	8.1	45	-46	50.7	44.6	9.9	8.4	0.4	0.3
Dominican Republic	6.9	6.8	75	81	9.4	25.1	1.3	3.0	0.3	0.5
Ecuador	5.9	4.8	-169	-145	16.6	25.5	1.6	2.0	0.5	0.6
Egypt, Arab Rep.	4.8	4.6	-72	-14	75.4	142.2	1.4	2.2	0.5	0.6
El Salvador	7.3	7.1	32	45	2.6	6.7	0.5	1.1	0.1	0.2
Eritrea	..	..	..	..	..	0.6	..	0.1	..	0.2
Estonia	1.7	3.6	34	30	24.9	16.0	16.2	11.7	2.3	1.1
Ethiopia	2.1	2.4	7	7	3.0	5.6	0.1	0.1	0.1	0.1
Finland	3.8	3.7	59	55	52.9	53.4	10.6	10.3	0.5	0.4
France	5.5	5.8	51	49	357.5	362.4	6.3	6.2	0.3	0.2
Gabon	4.7	5.1	-1,078	-698	6.7	3.5	7.0	2.8	1.1	0.5
Gambia, The	..	..	..	..	0.2	0.3	0.2	0.2	0.1	0.1
Georgia	1.4	4.4	83	48	15.1	6.2	2.8	1.2	1.3	0.6
Germany	4.9	6.2	48	61	890.2	785.5	11.1	9.6	0.5	0.4
Ghana	4.7	5.0	18	28	3.5	5.9	0.2	0.3	0.1	0.2
Greece	6.4	6.8	59	65	72.2	89.6	7.1	8.2	0.5	0.5
Guatemala	6.8	6.4	24	27	5.1	9.9	0.6	0.9	0.2	0.2
Guinea	..	..	..	..	1.0	1.3	0.2	0.2	0.1	0.1
Guinea-Bissau	..	..	..	..	0.8	0.3	0.8	0.2	0.8	0.2
Haiti	10.1	6.6	21	27	1.0	1.4	0.2	0.2	0.1	0.1

Energy efficiency, dependency, and emissions

	GDP per unit of energy use		Net energy imports ^a		Carbon dioxide emissions					
	2000 PPP \$ per kg oil equivalent		% of energy use		Total million metric tons		Per capita metric tons		kg per 2000 PPP \$ of GDP	
	1990	2002	1990	2002	1990	2000	1990	2000	1990	2000
Honduras	5.1	5.0	30	53	2.6	4.8	0.5	0.7	0.2	0.3
Hungary	4.1	5.3	50	57	58.5	54.2	5.6	5.4	0.5	0.4
India	4.0	5.0	9	18	675.3	1,070.9	0.8	1.1	0.5	0.4
Indonesia	4.3	4.1	-70	-54	165.2	269.6	0.9	1.3	0.4	0.4
Iran, Islamic Rep.	3.6	3.1	-161	-80	212.4	310.3	3.9	4.9	0.8	0.9
Iraq	..	..	-412	-264	49.3	76.3	2.7	3.3	..	..
Ireland	5.1	9.1	67	90	29.8	42.2	8.5	11.1	0.6	0.4
Israel	6.1	6.0	96	97	34.6	63.1	7.4	10.0	0.5	0.5
Italy	8.1	8.5	83	85	398.9	428.2	7.0	7.4	0.3	0.3
Jamaica	3.1	2.5	84	88	8.0	10.8	3.3	4.2	0.9	1.1
Japan	6.4	6.4	83	81	1,070.7	1,184.5	8.7	9.3	0.4	0.4
Jordan	3.5	3.9	95	95	10.2	15.6	3.2	3.2	0.8	0.8
Kazakhstan	1.0	1.8	-12	-106	252.7	121.3	15.3	8.1	3.1	1.8
Kenya	2.1	2.0	18	16	5.8	9.4	0.2	0.3	0.2	0.3
Korea, Dem. Rep.	..	..	13	6	244.6	188.9	12.3	8.5	..	..
Korea, Rep.	4.3	3.9	76	82	241.2	427.0	5.6	9.1	0.6	0.6
Kuwait	..	1.7	-565	-378	42.2	47.9	19.9	21.9	..	1.4
Kyrgyz Republic	1.7	3.1	64	53	11.0	4.6	2.4	0.9	1.3	0.6
Lao PDR	..	..	..	..	0.2	0.4	0.1	0.1	0.1	0.1
Latvia	2.4	4.9	87	56	12.7	6.0	4.8	2.5	0.9	0.3
Lebanon	3.4	3.8	94	96	9.1	15.2	2.5	3.5	1.1	0.8
Lesotho	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	0.5	0.4	0.2	0.1	..	..
Libya	..	..	-534	-272	37.8	57.1	8.8	10.9	..	..
Lithuania	2.8	4.0	61	43	21.4	11.9	5.8	3.4	0.7	0.4
Macedonia, FYR	..	..	..	..	10.6	11.2	5.5	5.5	0.8	0.8
Madagascar	..	..	..	..	0.9	2.3	0.1	0.1	0.1	0.2
Malawi	..	..	..	..	0.6	0.8	0.1	0.1	0.1	0.1
Malaysia	4.5	4.1	-117	-55	55.3	144.4	3.0	6.2	0.6	0.7
Mali	..	..	..	..	0.4	0.6	0.0	0.1	0.1	0.1
Mauritania	..	..	..	..	2.6	3.1	1.3	1.2	0.9	0.7
Mauritius	..	..	..	..	1.2	2.9	1.1	2.4	0.2	0.3
Mexico	5.1	5.6	-57	-46	305.4	424.0	3.7	4.3	0.5	0.5
Moldova	1.4	2.0	99	98	20.9	6.6	4.8	1.5	2.1	1.2
Mongolia	..	..	..	..	10.0	7.5	4.7	3.1	1.8	1.9
Morocco	12.0	10.1	89	95	23.5	36.5	1.0	1.3	0.3	0.4
Mozambique	1.2	2.3	5	0	1.0	1.2	0.1	0.1	0.1	0.1
Myanmar	..	..	0	-26	4.1	9.1	0.1	0.2	..	..
Namibia	12.3	10.2	67	75	0.0	1.8	0.0	1.0	0.0	0.2
Nepal	3.2	3.8	5	11	0.6	3.4	0.0	0.1	0.0	0.1
Netherlands	4.9	5.8	9	23	150.0	138.9	10.0	8.7	0.5	0.3
New Zealand	4.1	4.6	13	17	23.6	32.1	6.8	8.3	0.4	0.4
Nicaragua	5.3	5.7	29	43	2.6	3.7	0.7	0.7	0.2	0.2
Niger	..	..	..	..	1.1	1.2	0.1	0.1	0.2	0.1
Nigeria	1.2	1.3	-112	-101	88.7	36.1	0.9	0.3	1.0	0.3
Norway	5.2	6.1	-460	-776	31.7	49.9	7.5	11.1	0.3	0.3
Oman	4.1	3.0	-740	-478	11.5	19.8	7.1	8.2	0.6	0.7
Pakistan	3.9	4.3	21	25	67.9	104.8	0.6	0.8	0.4	0.4
Panama	7.3	5.9	59	76	3.1	6.3	1.3	2.2	0.3	0.4
Papua New Guinea	..	..	..	..	2.4	2.4	0.6	0.5	0.3	0.2
Paraguay	6.3	6.3	-48	-61	2.3	3.7	0.5	0.7	0.1	0.2
Peru	8.4	10.7	-6	23	21.7	29.5	1.0	1.1	0.3	0.2
Philippines	9.1	7.6	48	48	44.3	77.5	0.7	1.0	0.2	0.3
Poland	2.8	4.4	1	11	347.6	301.3	9.1	7.8	1.2	0.8
Portugal	7.5	6.9	81	86	42.3	59.8	4.3	5.8	0.3	0.3
Puerto Rico	..	..	..	..	11.8	8.7	3.3	2.3	0.2	0.1



3.8

Energy efficiency, dependency, and emissions

	GDP per unit of energy use		Net energy imports ^a		Carbon dioxide emissions					
	2000 PPP \$ per kg oil equivalent		% of energy use		Total million metric tons		Per capita metric tons		kg per 2000 PPP \$ of GDP	
	1990	2002	1990	2002	1990	2000	1990	2000	1990	2000
Romania	2.4	3.8	35	23	155.1	86.3	6.7	3.8	1.0	0.7
Russian Federation	1.6	1.9	-44	-67	1,984.0	1,435.1	13.3	9.9	1.6	1.4
Rwanda	..	..	..	..	0.5	0.6	0.1	0.1	0.1	0.1
Saudi Arabia	2.8	2.1	-469	-266	177.9	374.3	11.3	18.1	1.0	1.4
Senegal	4.6	4.8	39	43	2.9	4.2	0.4	0.4	0.3	0.3
Serbia and Montenegro	..	..	21	33	..	39.5	..	3.7	..	..
Sierra Leone	..	..	..	..	0.3	0.6	0.1	0.1	0.1	0.2
Singapore	3.3	3.8	..	100	41.9	59.0	13.8	14.7	0.9	0.6
Slovak Republic	2.7	3.6	75	64	44.7	35.4	8.4	6.6	1.0	0.6
Slovenia	4.8	5.1	45	51	12.3	14.6	6.2	7.3	0.5	0.4
Somalia	..	..	..	..	0.0	..	0.0	..	..	..
South Africa	3.9	3.9	-26	-29	291.1	327.3	8.3	7.4	0.8	0.8
Spain	6.8	6.5	62	76	211.8	282.9	5.5	7.0	0.3	0.3
Sri Lanka	7.0	8.0	24	44	3.9	10.2	0.2	0.6	0.1	0.2
Sudan	2.7	3.6	17	-58	3.5	5.2	0.1	0.2	0.1	0.1
Swaziland	..	..	..	..	0.4	0.4	0.6	0.4	0.1	0.1
Sweden	3.9	4.4	36	37	48.5	46.9	5.7	5.3	0.3	0.2
Switzerland	7.7	7.8	61	56	42.7	39.1	6.4	5.4	0.2	0.2
Syrian Arab Republic	2.7	3.2	-89	-103	35.8	54.2	3.0	3.3	1.1	1.0
Tajikistan	0.9	1.8	83	59	20.6	4.0	3.7	0.6	2.5	0.8
Tanzania	1.4	1.4	8	7	2.3	4.3	0.1	0.1	0.2	0.2
Thailand	5.7	5.0	40	46	95.7	198.6	1.7	3.3	0.4	0.5
Togo	5.8	4.9	22	30	0.7	1.8	0.2	0.4	0.1	0.2
Trinidad and Tobago	1.5	1.3	-118	-130	16.9	26.4	13.9	20.5	2.0	2.3
Tunisia	6.7	7.7	-11	16	13.3	18.4	1.6	1.9	0.4	0.3
Turkey	5.6	5.7	51	68	143.8	221.6	2.6	3.3	0.5	0.5
Turkmenistan	1.7	1.4	-332	-223	28.0	34.6	7.2	7.5	1.5	2.0
Uganda	..	..	..	..	0.8	1.5	0.0	0.1	0.1	0.1
Ukraine	1.7	1.8	50	45	600.0	342.8	11.5	6.9	1.6	1.7
United Arab Emirates	2.6	..	-514	-294	60.9	58.9	34.3	18.1	1.3	1.6
United Kingdom	5.5	6.6	2	-14	569.3	567.8	9.9	9.6	0.5	0.4
United States	3.7	4.4	14	27	4,815.9	5,601.5	19.3	19.8	0.7	0.6
Uruguay	9.9	10.0	49	51	3.9	5.4	1.3	1.6	0.2	0.2
Uzbekistan	0.7	0.8	10	-8	113.3	118.6	5.3	4.8	3.4	3.2
Venezuela, RB	2.6	2.4	-239	-289	113.8	157.7	5.8	6.5	1.0	1.2
Vietnam	3.3	4.2	-2	-25	22.5	57.5	0.3	0.7	0.3	0.4
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	2.8	3.8	-247	-441	9.4	8.4	0.7	0.5	1.2	0.6
Zambia	1.4	1.3	10	5	2.4	1.8	0.3	0.2	0.3	0.2
Zimbabwe	3.0	3.0	9	13	16.6	14.8	1.6	1.2	0.6	0.5
World	3.9 w	4.6 w	-2 w	-1 w	21,172.6 t	22,942.1 t	3.9 w	3.8 w	0.6 w	0.5 w
Low income	3.5	4.1	-6	-6	1,419.3	1,764.4	0.8	0.8	0.4	0.4
Middle income	2.9	4.1	-33	-35	9,388.0	9,408.8	3.6	3.2	0.9	0.6
Lower middle income	2.8	4.1	-20	-22	7,811.9	7,397.3	3.4	2.9	1.0	0.6
Upper middle income	4.0	4.3	-96	-91	1,565.8	2,014.3	5.2	6.3	0.7	0.6
Low & middle income	3.0	4.1	-28	-29	10,805.5	11,173.2	2.4	2.2	0.8	0.6
East Asia & Pacific	2.6	4.6	-7	-4	3,051.6	3,752.7	1.9	2.1	1.0	0.5
Europe & Central Asia	2.1	2.5	-9	-23	4,845.2	3,144.8	10.2	6.7	1.3	1.1
Latin America & Carib.	5.9	6.1	-35	-42	964.0	1,359.2	2.2	2.7	0.4	0.4
Middle East & N. Africa	4.1	3.5	-273	-168	751.8	1,228.3	3.3	4.2	0.7	0.8
South Asia	4.2	5.1	10	19	765.9	1,220.3	0.7	0.9	0.4	0.4
Sub-Saharan Africa	2.8	2.8	-53	-56	473.4	480.5	0.9	0.7	0.5	0.4
High income	4.6	5.2	24	26	10,377.8	11,789.3	11.8	12.4	0.5	0.5
Europe EMU	5.7	6.4	56	63	2,349.7	2,414.6	6.9	7.9	0.3	0.3

a. A negative value indicates that a country is a net exporter.

About the data

The ratio of GDP to energy use provides a measure of energy efficiency. To produce comparable and consistent estimates of real GDP across countries relative to physical inputs to GDP—that is, units of energy use—GDP is converted to 2000 constant international dollars using purchasing power parity (PPP) rates. Differences in this ratio over time and across countries reflect in part structural changes in the economy, changes in the energy efficiency of particular sectors, and differences in fuel mixes.

Because commercial energy is widely traded, it is necessary to distinguish between its production and its use. Net energy imports show the extent to which an economy's use exceeds its domestic production. High-income countries are net energy importers; middle-income countries have been their main suppliers.

Carbon dioxide emissions, largely a by-product of energy production and use (see table 3.7), account for the largest share of greenhouse gases, which are associated with global warming. Anthropogenic carbon dioxide emissions result primarily from fossil fuel combustion and cement manufacturing. In combustion, different fossil fuels release different amounts of carbon dioxide for the same level of energy use. Burning oil releases about 50 percent more carbon dioxide than burning natural gas, and burning coal releases about twice as much. Cement manufacturing releases about half a metric ton of carbon dioxide for each metric ton of cement produced.

The Carbon Dioxide Information Analysis Center (CDIAC), sponsored by the U.S. Department of Energy, calculates annual anthropogenic emissions of carbon dioxide. These calculations are based on data on fossil fuel consumption (from the World Energy Data Set maintained by the United Nations Statistics Division) and data on world cement manufacturing (from the Cement Manufacturing Data Set maintained by the U.S. Bureau of Mines). Emissions

of carbon dioxide are often calculated and reported in terms of their content of elemental carbon. For this table these values were converted to the actual mass of carbon dioxide by multiplying the carbon mass by 3.664 (the ratio of the mass of carbon to that of carbon dioxide).

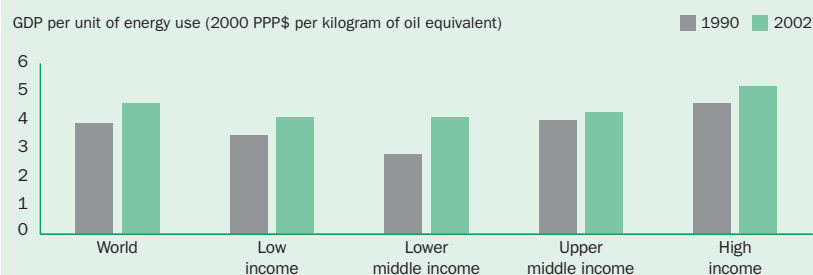
Although the estimates of global carbon dioxide emissions are probably within 10 percent of actual emissions (as calculated from global average fuel chemistry and use), country estimates may have larger error bounds. Trends estimated from a consistent time series tend to be more accurate than individual values. Each year the CDIAC recalculates the entire time series from 1950 to the present, incorporating its most recent findings and the latest corrections to its database. Estimates do not include fuels supplied to ships and aircraft engaged in international transport because of the difficulty of apportioning these fuels among the countries benefiting from that transport.

Definitions

- GDP per unit of energy use is the PPP GDP per kilogram of oil equivalent of energy use. PPP GDP is gross domestic product converted to 1995 constant international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as a U.S. dollar has in the United States.
- Net energy imports are estimated as energy use less production, both measured in oil equivalents. A negative value indicates that the country is a net exporter.
- Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring.

3.8a

All income groups are using energy more efficiently now



Source: Table 3.8.

Data sources

The underlying data on energy production and use are from electronic files of the International Energy Agency. The data on carbon dioxide emissions are from the CDIAC, Environmental Sciences Division, Oak Ridge National Laboratory, in the U.S. state of Tennessee.