3.1 Rural population and land use

	Rural population			Land area	Land use							
	% of total		average annual % growth	thousand sq. km	% of land area						Arable land hectares per 100 people	
	Forest area				Permanent cropland		Arable land					
	1990	2009	1990–2009	2009	1990	2010	1990	2008	1990	2008	1990	2008
Afghanistan	82	76	2.1	652.2	2.1	2.1	0.2	0.2	12.1	11.9	42.6	26.9
Albania	64	53	–1.2	27.4	28.8	28.3	4.6	3.2	21.1	22.3	17.6	19.4
Algeria	48	34	–0.1	2,381.7	0.7	0.6	0.2	0.4	3.0	3.1	28.0	21.8
Angola	63	42	0.8	1,246.7	48.9	46.9	0.4	0.2	2.3	2.7	27.2	18.9
Argentina	13	8	–1.6	2,736.7	12.7	10.7	0.4	0.4	9.6	11.7	81.2	80.2
Armenia	33	36	–0.2	28.5	12.2	9.2	*2.1*	1.9	*14.9*	15.8	1.5	14.6
Australia	15	11	–0.1	7,682.3	20.1	19.4	0.0	0.0	6.2	5.7	280.7	205.4
Austria	34	33	0.2	82.5	45.8	47.1	1.0	0.8	17.3	16.7	18.5	16.5
Azerbaijan	46	48	1.3	82.6	11.2	11.3	*3.7*	2.8	*20.5*	22.5	0.8	21.4
Bangladesh	80	72	1.2	130.2	11.5	11.1	2.5	6.1	70.0	60.7	7.9	4.9
Belarus	34	26	–1.7	202.9	38.4	42.5	*0.9*	0.6	*30.0*	27.2	0.5	57.0
Belgium	4	3	–1.3	30.3	22.4	22.4	0.5[a]	0.8	23.3[a]	27.9	0.2	7.9
Benin	66	58	2.7	110.6	52.1	41.2	0.9	2.7	14.6	23.1	33.7	29.4
Bolivia	44	34	0.6	1,083.3	58.0	52.8	0.1	0.2	1.9	3.3	31.5	37.1
Bosnia and Herzegovina	61	52	–1.5	51.2	43.2	42.7	*2.9*	1.8	*16.6*	19.7	3.5	26.7
Botswana	58	40	–0.1	566.7	24.2	20.0	0.0	0.0	0.7	0.4	31.1	13.0
Brazil	25	14	–1.7	8,459.4	68.0	61.4	0.8	0.9	6.0	7.2	33.9	31.8
Bulgaria	34	29	–1.6	108.6	30.1	36.2	2.7	1.7	34.9	28.2	44.2	40.2
Burkina Faso	86	80	2.7	273.6	25.0	20.6	0.2	0.2	12.9	23.0	39.9	41.4
Burundi	94	89	1.7	25.7	11.3	6.7	14.0	15.2	36.2	35.0	16.4	11.1
Cambodia	87	78	1.6	176.5	73.3	57.2	0.6	0.9	20.9	22.1	38.1	26.8
Cameroon	59	42	0.7	472.7	51.4	42.1	2.6	2.5	12.6	12.6	48.6	31.2
Canada	23	20	0.1	9,093.5	34.1	34.1	0.7	0.8	5.0	5.0	163.7	135.4
Central African Republic	63	61	2.0	623.0	37.2	36.3	0.1	0.1	3.1	3.1	65.6	44.5
Chad	79	73	2.8	1,259.2	10.4	9.2	0.0	0.0	2.6	3.4	53.6	39.4
Chile	17	11	–0.7	743.5	20.5	21.8	0.3	0.6	3.8	1.7	21.2	7.5
China	73	56	–0.5	9,327.5	16.8	22.2	0.8	1.5	13.3	11.6	10.9	8.2
Hong Kong SAR, China	1	0	..	1.0	..	..	..	..	..	..	..	..
Colombia	32	25	0.5	1,109.5	56.3	54.5	1.5	1.5	3.0	1.6	10.0	4.1
Congo, Dem. Rep.	72	65	2.5	2,267.1	70.7	68.0	0.5	0.3	2.9	3.0	18.0	10.4
Congo, Rep.	46	38	1.2	341.5	66.5	65.6	0.1	0.2	1.4	1.4	19.6	13.6
Costa Rica	49	36	0.5	51.1	50.2	51.0	4.9	5.9	5.1	3.9	8.4	4.4
Côte d'Ivoire	60	51	1.8	318.0	32.1	32.7	11.0	13.4	7.6	8.8	19.3	13.6
Croatia	46	43	–0.8	56.0	33.1	34.3	*2.0*	1.5	*21.7*	15.4	2.4	19.4
Cuba	27	24	–0.2	106.4	19.2	27.0	4.2	3.8	31.6	33.5	32.0	31.9
Czech Republic	25	27	0.4	77.3	34.0	34.4	*3.1*	3.1	*41.1*	39.2	32.1	29.0
Denmark	15	13	–0.4	42.4	10.5	12.8	0.2	0.2	60.4	56.6	49.8	43.7
Dominican Republic	45	30	–0.4	48.3	40.8	40.8	9.3	10.3	18.6	16.6	12.2	8.0
Ecuador	45	34	0.0	248.4	49.9	39.7	4.8	5.1	5.8	5.0	15.6	9.2
Egypt, Arab Rep.	57	57	2.0	995.5	0.0	0.1	0.4	0.8	2.3	2.8	4.0	3.4
El Salvador	51	39	–0.6	20.7	18.2	13.9	12.5	11.1	26.5	33.1	10.3	11.2
Eritrea	84	79	2.1	101.0	16.0	15.2	*0.0*	0.0	*4.9*	6.6	0.1	13.6
Estonia	29	31	–0.5	42.4	49.3	52.3	*0.3*	0.2	*26.3*	14.1	3.5	44.6
Ethiopia	87	83	2.5	1,000.0	15.1	12.3	*0.5*	0.9	*10.0*	13.6	1.4	16.9
Finland	39	36	0.1	303.9	71.9	72.9	0.0	0.0	7.4	7.4	45.5	42.4
France	26	22	–0.2	547.7	26.5	29.1	2.2	2.0	32.9	33.3	31.7	29.3
Gabon	31	15	–1.5	257.7	85.4	85.4	0.6	0.6	1.1	1.3	31.8	22.4
Gambia, The	62	43	1.5	10.0	44.2	48.0	0.5	0.5	18.2	39.0	20.3	23.5
Georgia	45	47	–1.0	69.5	40.0	39.5	*4.8*	1.7	*11.4*	6.7	1.0	10.9
Germany	27	26	0.0	348.6	30.8	31.8	1.3	0.6	34.3	34.2	15.1	14.5
Ghana	64	49	1.1	227.5	32.7	21.7	6.6	12.5	11.9	19.3	18.0	18.8
Greece	41	39	0.2	128.9	25.6	30.3	8.3	8.7	22.5	16.3	28.5	18.7
Guatemala	59	51	1.6	107.2	44.3	34.1	4.5	8.8	12.1	12.4	14.6	9.7
Guinea	72	65	2.1	245.7	29.6	26.6	2.0	2.8	3.3	9.8	13.1	24.4
Guinea-Bissau	72	70	2.3	28.1	78.8	71.9	4.2	8.9	8.9	10.7	24.5	19.0
Haiti	72	52	0.1	27.6	4.2	3.7	11.6	10.9	28.3	36.3	11.0	10.1
Honduras	60	52	1.5	111.9	72.7	46.4	3.2	3.7	13.1	9.1	29.8	13.9

Rural population and land use 3.1

	Rural population			Land area	Land use							
	% of total		average annual % growth	thousand sq. km	Forest area		% of land area Permanent cropland		Arable land		Arable land hectares per 100 people	
	1990	2009	1990–2009	2009	1990	2010	1990	2008	1990	2008	1990	2008
Hungary	34	32	–0.5	89.6	20.0	22.6	2.6	2.2	56.2	51.0	48.7	45.6
India	75	70	1.3	2,973.2	21.5	23.0	2.2	3.8	54.8	53.2	19.2	13.9
Indonesia	69	47	–0.6	1,811.6	65.4	52.1	6.5	8.3	11.2	12.1	11.4	9.7
Iran, Islamic Rep.	44	31	–0.3	1,628.6	6.8	6.8	0.8	1.1	9.3	10.5	27.9	23.7
Iraq	30	34	3.2	437.4	1.8	1.9	0.7	0.6	13.3	11.9	30.7	16.9
Ireland	43	38	0.7	68.9	6.7	10.7	0.0	0.0	15.1	16.0	29.7	24.9
Israel	10	8	1.7	21.6	6.1	7.1	4.1	3.6	15.9	13.9	7.4	4.1
Italy	33	32	0.1	294.1	25.8	31.1	10.1	9.0	30.6	24.2	15.9	11.9
Jamaica	51	47	0.2	10.8	31.9	31.1	9.2	10.2	11.0	11.5	5.0	4.7
Japan	37	33	–0.4	364.5	68.4	68.5	1.3	0.9	13.1	11.8	3.9	3.4
Jordan	28	22	2.1	88.2	1.1	1.1	0.8	0.9	2.0	1.7	5.6	2.6
Kazakhstan	44	42	–0.4	2,699.7	1.3	1.2	*0.1*	0.0	*13.0*	8.4	0.3	144.8
Kenya	82	78	2.5	569.1	6.5	6.1	0.8	0.9	8.8	9.3	21.3	13.7
Korea, Dem. Rep.	42	37	0.3	120.4	68.1	47.1	1.5	1.7	19.0	22.4	11.4	11.3
Korea, Rep.	26	18	–1.2	96.9	64.5	64.2	1.6	*1.9*	19.8	16.0	4.6	3.2
Kosovo	..	..	..	10.9[b]	..	..	..	..	..	*27.6*	..	*16.8*
Kuwait	2	2	0.3	17.8	0.2	0.3	0.1	0.2	0.2	0.6	0.2	0.4
Kyrgyz Republic	62	64	1.1	191.8	4.4	5.0	*0.4*	0.4	6.9	6.7	1.2	24.2
Lao PDR	85	68	1.0	230.8	75.0	68.2	0.3	0.4	3.5	5.4	19.0	20.1
Latvia	31	32	–0.7	62.2	51.1	53.9	*0.4*	0.1	*27.2*	18.8	2.0	51.6
Lebanon	17	13	0.4	10.2	12.8	13.4	11.9	13.9	17.9	14.1	6.2	3.4
Lesotho	86	74	0.5	30.4	1.3	1.4	0.1	0.1	10.4	11.7	19.8	17.3
Liberia	55	39	1.4	96.3	51.2	44.9	1.6	2.3	3.6	4.2	16.2	10.5
Libya	24	22	1.6	1,759.5	0.1	0.1	0.2	0.2	1.0	1.0	41.4	27.8
Lithuania	32	33	–0.5	62.7	31.0	34.5	*0.7*	0.4	*46.0*	29.7	1.5	55.4
Macedonia, FYR	42	33	–1.0	25.2	35.9	39.6	*2.2*	1.4	*23.8*	17.1	3.0	21.2
Madagascar	76	70	2.5	581.5	23.5	21.6	1.0	1.0	4.7	5.1	24.1	15.4
Malawi	88	81	2.0	94.1	41.4	34.4	1.4	1.3	23.9	37.2	23.8	23.6
Malaysia	50	29	–0.7	328.6	68.1	62.3	16.0	17.6	5.2	5.5	9.4	6.7
Mali	77	67	1.5	1,220.2	11.5	10.2	0.1	0.1	1.7	4.0	23.7	38.2
Mauritania	60	59	2.5	1,030.7	0.4	0.2	0.0	0.0	0.4	0.4	20.1	12.4
Mauritius	56	58	1.1	2.0	19.2	17.2	3.0	2.0	49.3	42.9	9.5	6.9
Mexico	29	23	0.1	1,944.0	36.2	33.3	1.0	1.4	12.5	12.8	29.2	23.3
Moldova	53	59	–0.5	32.9	9.7	11.7	12.8	*9.2*	*52.8*	55.4	39.7	50.1
Mongolia	43	43	0.9	1,553.6	8.1	7.0	0.0	0.0	0.9	0.5	61.8	32.2
Morocco	52	44	0.5	446.3	11.3	11.5	1.6	2.1	19.5	18.0	35.1	25.5
Mozambique	79	62	1.5	786.4	55.2	49.6	0.3	0.3	4.4	5.7	25.5	20.1
Myanmar	75	67	0.4	653.5	60.0	48.6	0.8	1.7	14.6	16.2	23.4	21.4
Namibia	72	63	1.5	823.3	10.6	8.9	0.0	0.0	0.8	1.0	46.6	37.6
Nepal	91	82	1.7	143.4	33.7	25.4	0.5	0.8	16.0	16.4	12.0	8.2
Netherlands	31	18	–2.5	33.8	10.2	10.8	0.9	1.0	26.0	31.6	5.9	6.5
New Zealand	15	13	0.5	263.3	29.3	31.4	0.2	0.3	10.0	1.7	76.7	10.6
Nicaragua	48	43	1.2	120.3	37.5	25.9	1.6	1.9	10.8	15.8	31.4	33.5
Niger	85	83	3.4	1,266.7	1.5	1.0	0.0	0.0	8.7	11.4	139.6	98.6
Nigeria	65	51	1.2	910.8	18.9	9.9	2.8	3.3	32.4	41.2	30.3	24.8
Norway	28	23	–0.5	305.5	30.0	32.9	0.0	0.0	2.8	2.8	20.3	17.7
Oman	34	28	1.3	309.5	0.0	0.0	0.1	0.1	0.1	0.2	1.9	2.0
Pakistan	69	63	1.9	770.9	3.3	2.2	0.6	1.1	26.6	26.4	19.0	12.2
Panama	46	26	–1.1	74.3	51.0	43.7	2.1	2.0	6.7	7.4	20.7	16.1
Papua New Guinea	85	88	2.7	452.9	69.6	63.4	1.2	1.4	0.4	0.6	4.6	4.1
Paraguay	51	39	0.7	397.3	53.3	44.3	0.2	0.3	5.3	10.6	49.7	67.3
Peru	31	29	1.1	1,280.0	54.8	53.1	0.3	0.6	2.7	2.9	16.1	12.7
Philippines	51	34	–0.1	298.2	22.0	25.7	14.8	16.8	18.4	17.8	8.8	5.9
Poland	39	39	0.0	304.2	29.2	30.7	1.1	1.3	47.3	41.3	37.7	33.0
Portugal	52	40	–1.0	91.5	36.4	37.8	8.5	6.4	25.6	11.5	23.7	9.9
Puerto Rico	28	1	–15.0	8.9	32.4	62.2	5.6	4.2	7.3	6.8	1.8	1.5
Qatar	8	4	2.7	11.6	0.0	0.0	0.1	0.3	0.9	1.1	2.1	1.0

3.1 Rural population and land use

	Rural population			Land area	Land use							
	% of total		average annual % growth	thousand sq. km	Forest area (% of land area)		Permanent cropland (% of land area)		Arable land (% of land area)		Arable land (hectares per 100 people)	
	1990	2009	1990–2009	2009	1990	2010	1990	2008	1990	2008	1990	2008
Romania	47	46	–0.5	229.9	27.8	28.6	2.6	1.6	41.2	37.9	40.7	40.5
Russian Federation	27	27	–0.1	16,376.9	49.4	49.4	*0.1*	0.1	*8.1*	7.4	0.0	85.7
Rwanda	95	81	1.0	24.7	12.9	17.6	12.4	11.3	35.7	52.3	12.3	13.3
Saudi Arabia	23	18	0.8	2,000.0[c]	0.5	0.5	0.0	0.1	1.7	1.7	20.9	13.9
Senegal	61	57	2.4	192.5	48.6	44.0	0.2	0.3	16.1	18.2	41.0	28.7
Serbia	50	48	–0.4	88.4	26.2	30.7	..	3.4	..	37.4	4.5	44.9
Sierra Leone	67	62	1.3	71.6	43.5	38.1	1.9	1.9	6.8	25.1	11.9	32.3
Singapore	0	0	..	0.7	3.0	2.9	1.5	0.3	1.5	0.7	0.0	0.0
Slovak Republic	44	43	0.1	48.1	40.0	40.2	*1.0*	0.5	*32.5*	28.7	31.0	25.6
Slovenia	50	52	0.3	20.1	59.0	62.2	*1.8*	1.3	9.9	9.0	1.8	9.0
Somalia	70	63	1.1	627.3	13.2	10.8	0.0	0.0	1.6	1.6	15.5	11.2
South Africa	48	39	0.7	1,214.5	6.8	4.7	0.7	0.8	11.1	11.9	38.2	29.7
Spain	25	23	0.5	499.1	27.7	36.4	9.7	9.6	30.7	25.0	39.5	27.4
Sri Lanka	83	85	1.0	62.7	37.5	29.7	15.9	15.1	14.4	19.9	5.3	6.2
Sudan	73	56	0.9	2,376.0	32.1	29.4	0.0	0.1	5.4	8.7	47.2	50.1
Swaziland	77	75	1.5	17.2	27.4	32.7	0.7	0.8	10.5	10.3	20.8	15.2
Sweden	17	15	–0.1	410.3	66.5	68.7	0.0	0.0	6.9	6.4	33.2	28.5
Switzerland	27	27	0.7	40.0	28.8	31.0	0.6	0.6	10.3	10.2	6.1	5.3
Syrian Arab Republic	51	45	2.0	183.6	2.0	2.7	4.0	5.3	26.6	25.6	38.4	22.8
Tajikistan	68	74	1.8	140.0	2.9	2.9	*0.9*	1.0	*6.1*	5.3	1.0	10.8
Tanzania	81	74	2.4	885.8	46.8	37.7	1.1	1.5	10.2	10.8	35.4	22.6
Thailand	71	66	0.6	510.9	38.3	37.1	6.1	7.1	34.2	29.8	30.9	22.6
Timor-Leste	79	72	1.8	14.9	65.0	49.9	3.9	4.4	7.4	10.8	14.9	14.6
Togo	70	57	1.7	54.4	12.6	5.3	1.7	3.1	38.6	45.2	53.5	38.1
Trinidad and Tobago	92	86	0.2	5.1	47.0	44.1	6.8	4.3	7.0	4.9	3.0	1.9
Tunisia	42	33	0.0	155.4	4.1	6.5	12.5	14.2	18.7	18.2	35.7	27.5
Turkey	41	31	0.0	769.6	12.6	14.7	3.9	3.8	32.0	28.0	43.9	29.2
Turkmenistan	55	51	1.4	469.9	8.8	8.8	*0.1*	0.1	*2.9*	3.9	36.7	36.7
Uganda	89	87	3.1	197.1	24.1	15.2	9.4	11.4	25.4	28.7	28.2	17.8
Ukraine	33	32	–0.8	579.3	16.0	16.8	*1.9*	1.6	*57.6*	56.1	0.1	70.2
United Arab Emirates	21	22	5.0	83.6	2.9	3.8	0.2	2.4	0.4	0.8	1.9	1.4
United Kingdom	11	10	–0.2	241.9	10.8	11.9	0.3	0.2	27.4	24.8	11.6	9.8
United States	25	18	–0.6	9,147.4	32.4	33.2	0.2	0.3	20.3	18.6	74.4	56.0
Uruguay	11	8	–1.6	175.0	5.3	10.0	0.3	0.2	7.2	9.4	40.6	49.2
Uzbekistan	60	63	1.9	425.4	7.2	7.7	*0.9*	0.8	*10.5*	10.1	21.8	15.7
Venezuela, RB	16	6	–2.9	882.1	59.0	52.5	0.9	0.7	3.2	3.1	14.3	9.7
Vietnam	80	72	0.9	310.1	28.8	44.5	3.2	10.0	16.4	20.3	8.1	7.3
West Bank and Gaza	32	28	3.0	6.0	1.5	1.5	19.1	19.5	18.1	16.8	..	*2.8*
Yemen, Rep.	79	69	2.7	528.0	1.0	1.0	0.2	0.6	2.9	2.4	12.4	5.6
Zambia	61	64	2.9	743.4	71.0	66.5	0.0	0.0	3.1	3.2	29.0	18.7
Zimbabwe	71	62	0.2	386.9	57.3	40.4	0.3	0.3	7.5	9.6	27.6	29.9
World	**57 w**	**50 w**	**0.6 w**	**129,561.8 s**	**32.1 w**	**31.1 w**	**1.1 w**	**1.1 w**	**9.0 w**	**10.7 w**	**22.2 w**	**20.7 w**
Low income	78	71	1.8	17,303.9	31.9	28.2	0.7	0.9	6.4	8.6	20.1	17.9
Middle income	62	52	0.4	78,352.9	33.9	32.8	1.4	1.4	8.4	11.0	17.7	18.2
Lower middle income	70	59	0.5	30,841.8	26.2	25.9	1.8	2.4	14.9	16.0	15.8	13.1
Upper middle income	33	25	–0.3	47,511.0	38.8	37.2	1.0	0.7	4.2	7.8	24.5	37.4
Low & middle income	64	55	0.7	95,656.7	33.5	31.9	1.2	1.3	8.1	10.6	18.0	18.2
East Asia & Pacific	71	55	–0.3	15,853.7	29.0	29.6	2.2	3.1	12.1	11.3	12.0	9.3
Europe & Central Asia	37	36	0.0	22,686.7	38.4	38.6	*0.4*	0.4	2.1	10.4	12.1	58.8
Latin America & Carib.	29	21	–0.3	20,116.2	51.6	47.0	0.9	1.0	6.6	7.4	30.3	26.4
Middle East & N. Africa	48	42	1.3	8,643.6	2.4	2.4	0.8	1.0	5.9	6.0	22.4	16.0
South Asia	75	70	1.4	4,771.2	16.6	17.1	1.8	2.9	42.6	41.5	18.0	12.8
Sub-Saharan Africa	72	63	1.9	23,585.4	31.3	28.0	0.8	1.0	6.2	8.5	28.4	24.4
High income	27	23	–0.3	33,905.1	28.1	28.9	0.7	0.7	11.8	10.9	41.5	34.0
Euro area	29	27	–0.1	2,552.0	33.6	37.3	4.8	4.2	26.7	24.4	22.1	18.9

a. Includes Luxembourg. b. Data are from national sources. c. Provisional estimate.

Rural population and land use 3.1

About the data

With more than 3 billion people, including 70 percent of the world's poor people, living in rural areas, adequate indicators to monitor progress in rural areas are essential. However, few indicators are disaggregated between rural and urban areas (for some that are, see tables 2.7, 3.5, and 3.11). The table shows indicators of rural population and land use. Rural population is approximated as the midyear nonurban population. While a practical means of identifying the rural population, it is not precise (see box 3.1a for further discussion).

The data in the table show that land use patterns are changing. They also indicate major differences in resource endowments and uses among countries. True comparability of the data is limited, however, by variations in definitions, statistical methods, and quality of data. Countries use different definitions of rural and urban population and land use. The Food and Agriculture Organization of the United Nations (FAO), the primary compiler of the data, occasionally adjusts its definitions of land use categories and revises earlier data. Because the data reflect changes in reporting procedures as well as actual changes in land use, apparent trends should be interpreted cautiously.

Satellite images show land use that differs from that of ground-based measures in area under cultivation and type of land use. Moreover, land use data in some countries (India is an example) are based on reporting systems designed for collecting tax revenue. With land taxes no longer a major source of government revenue, the quality and coverage of land use data have declined. Data on forest area may be particularly unreliable because of irregular surveys and differences in definitions (see *About the data* for table 3.4). The forest area statistics released by FAO between 1948 and 1963 were based mostly on data from country questionnaires. Remote sensing, statistical modeling, and expert analysis of country surveys have been applied since 1980 to improve the forest coverage estimates. FAO's *Global Forest Resources Assessment 2010* covers 233 countries and is the most comprehensive assessment of forests, forestry, and the benefits of forest resources in both scope and number of countries and people involved. It examines status and trends for about 90 variables on the extent, condition, uses, and values of forests and other wooded land.

What is rural? Urban? 3.1a

The rural population identified in table 3.1 is approximated as the difference between total population and urban population, calculated using the urban share reported by the United Nations Population Division. There is no universal standard for distinguishing rural from urban areas, and any urban-rural dichotomy is an oversimplification (see *About the data* for table 3.11). The two distinct images—isolated farm, thriving metropolis—represent poles on a continuum. Life changes along a variety of dimensions, moving from the most remote forest outpost through fields and pastures, past tiny hamlets, through small towns with weekly farm markets, into intensively cultivated areas near large towns and small cities, eventually reaching the center of a megacity. Along the way access to infrastructure, social services, and nonfarm employment increase, and with them population density and income. Because rurality has many dimensions, for policy purposes the rural-urban dichotomy presented in tables 3.1, 3.5, and 3.11 is inadequate. A 2005 World Bank Policy Research Paper proposes an operational definition of rurality based on population density and distance to large cities (Chomitz, Buys, and Thomas 2005). The report argues that these criteria are important gradients along which economic behavior and appropriate development interventions vary substantially. Where population densities are low, markets of all kinds are thin, and the unit cost of delivering most social services and many types of infrastructure is high. Where large urban areas are distant, farm-gate or factory-gate prices of outputs will be low and input prices will be high, and it will be difficult to recruit skilled people to public service or private enterprises. Thus, low population density and remoteness together define a set of rural areas that face special development challenges.

Using these criteria and the Gridded Population of the World (CIESIN 2005), the authors' estimates of the rural population for Latin America and the Caribbean differ substantially from those in table 3.1. Their estimates range from 13 percent of the population, based on a population density of less than 20 people per square kilometer, to 64 percent, based on a population density of more than 500 people per square kilometer. Taking remoteness into account, the estimated rural population would be 13–52 percent. The estimate for Latin America and the Caribbean in table 3.1 is 21 percent.

Definitions

• **Rural population** is calculated as the difference between the total population and the urban population (see *Definitions* for tables 2.1 and 3.11). • **Land area** is a country's total area, excluding area under inland water bodies and national claims to the continental shelf and to exclusive economic zones. In most cases the definition of inland water bodies includes major rivers and lakes. (See table 1.1 for the total surface area of countries.) Variations from year to year may be due to updated or revised data rather than to change in area. • **Land use** is a country's total area, excluding area under inland water bodies and national claims to the continental shelf and to exclusive economic zones. In most cases definitions of inland water bodies includes major rivers and lakes. (See table 1.1 for the total surface area of countries.) Variations from year to year may be due to updated or revised data rather than to change in area. • **Forest area** is land under natural or planted stands of trees of at least 5 meters in situ, whether productive or not, and excludes tree stands in agricultural production systems (for example, in fruit plantations and agroforestry systems) and trees in urban parks and gardens. • **Permanent cropland** is land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee, and rubber. Land under flowering shrubs, fruit trees, nut trees, and vines is included, but land under trees grown for wood or timber is not. • **Arable land** is land defined by the FAO as under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded.

Data sources

Data on urban population shares used to estimate rural population are from the United Nations Population Division's *World Urbanization Prospects: The 2009 Revision,* and data on total population are World Bank estimates. Data on land area, permanent cropland, and arable land are from the FAO's electronic files. The FAO gathers these data from national agencies through annual questionnaires and by analyzing the results of national agricultural censuses. Data on forest area are from the FAO's *Global Forest Resources Assessment 2010.*

3.2 Agricultural inputs

	Agricultural land[a]			Average annual precipitation	Land under cereal production		Fertilizer consumption		Agricultural employment		Agricultural machinery	
	% of land area		% irrigated	millimeters	thousand hectares		% of fertilizer production	kilograms per hectare of arable land	% of total employment		Tractors per 100 sq. km of arable land	
	1990	2008	2008	2008	1990	2009	2008	2008	1990	2008	1990	2008
Afghanistan	58	58	5.8	327	2,253.0	3,188.0	146.9	3.2	..	..	0.2	1.2
Albania	41	43	10.0	1,485	321.0	146.2	..	38.4	..	*58.0*	212.4	121.9
Algeria	16	17	2.1	89	2,366.0	3,176.3	226.4	6.8	..	..	129.1	139.6
Angola	46	46	..	1,010	775.1	1,752.1	..	8.3	*5.1*	..	..	..
Argentina	47	49	..	591	9,015.0	8,031.6	305.9	38.8	0.4	*0.8*	100.2	..
Armenia	*41*	61	8.9	562	*162.8*	169.3	..	18.1	..	*46.2*	*345.5*	327.8
Australia	60	54	0.4	534	13,428.8	19,805.6	161.3	33.9	5.6	*3.4*	..	..
Austria	42	38	*1.4*	1,110	948.4	838.0	..	109.6	7.9	5.6	2,373.7	*2,390.3*
Azerbaijan	53	58	30.0	447	*627.0*	1,113.8	..	20.9	30.9	*38.7*	*194.8*	116.1
Bangladesh	77	71	*62.0*	2,666	11,140.6	12,032.5	141.1	164.5	*64.9*	*48.1*	2.4	*3.9*
Belarus	*46*	44	0.7	618	*2,603.0*	2,418.0	22.0	237.4	..	..	*206.9*	89.8
Belgium	44[b]	45	*1.7*	847	368.2[b]	345.0	..	..	3.1	1.8	1,523.3[b]	*1,127.1*
Benin	21	31	..	1,039	643.9	976.1	..	0.0	..	..	1.0	..
Bolivia	33	34	..	1,146	582.5	897.0	..	5.5	1.2	..	24.8	..
Bosnia and Herzegovina	*43*	42	..	1,028	*304.1*	295.8	..	11.9	..	..	*235.3*	..
Botswana	46	46	*0.0*	416	205.1	85.7	..	..	..	*29.9*	140.5	134.8
Brazil	29	31	..	1,782	18,512.4	20,220.4	313.5	165.7	22.8	*19.3*	143.8	*129.2*
Bulgaria	56	48	*1.4*	608	2,055.3	1,829.2	68.4	81.8	18.5	*7.5*	135.8	173.5
Burkina Faso	35	45	..	748	2,528.9	4,178.6	..	3.9	..	..	2.4	..
Burundi	83	85	..	1,274	217.5	222.0	..	2.2	..	..	1.8	..
Cambodia	25	31	..	1,904	1,900.0	2,888.0	..	22.7	..	..	3.3	11.8
Cameroon	19	19	..	1,604	657.6	1,223.3	..	8.6	..	..	0.9	..
Canada	7	7	..	537	21,547.9	14,863.2	25.1	56.9	4.1	*2.5*	164.8	*162.5*
Central African Republic	8	8	..	1,343	110.5	264.3	..	..	..	..	..	..
Chad	38	39	..	322	1,075.4	2,486.7	..	..	*83.0*	..	..	..
Chile	21	21	*5.6*	1,522	823.5	567.5	102.8	588.8	19.3	*12.3*	127.6	*425.9*
China	57	56	*10.2*	..	93,555.2	88,592.8	99.2	468.0	53.4	..	66.6	277.1
Hong Kong SAR, China	..	..	..	..	..	..	..	..	0.9	*0.2*	..	..
Colombia	41	38	..	2,612	1,742.8	1,186.0	278.7	492.4	1.4	*18.4*	96.8	..
Congo, Dem. Rep.	10	10	..	1,543	1,863.6	1,977.3	..	1.0	..	..	..	..
Congo, Rep.	31	31	..	1,646	9.6	27.5	..	1.1	..	..	..	..
Costa Rica	45	35	..	2,926	92.6	74.4	..	707.5	25.9	*13.2*	..	..
Côte d'Ivoire	60	64	..	1,348	1,400.0	853.5	..	18.9	..	..	19.9	..
Croatia	*43*	23	*0.7*	1,113	*592.7*	562.7	70.7	387.6	..	*12.8*	*35.2*	..
Cuba	63	62	..	1,335	230.5	419.9	554.4	39.7	*24.9*	*18.7*	226.2	*203.2*
Czech Republic	*55*	55	0.2	677	*1,613.6*	1,544.4	117.1	135.1	*7.7*	3.3	264.6	276.4
Denmark	66	63	9.5	703	1,570.3	1,497.7	..	128.3	5.5	2.7	634.7	*486.3*
Dominican Republic	53	52	..	1,410	122.2	158.2	..	..	*20.3*	*14.5*	25.9	..
Ecuador	28	30	10.2	2,087	802.2	819.1	..	214.1	7.5	*8.3*	54.2	..
Egypt, Arab Rep.	3	4	..	51	2,283.4	3,129.8	68.5	723.6	39.0	*31.2*	249.6	372.1
El Salvador	68	75	*2.1*	1,724	425.4	363.0	..	118.4	*10.2*	*18.9*	..	..
Eritrea	*73*	75	..	384	*329.3*	492.3	..	0.0	..	..	*5.0*	..
Estonia	*32*	19	..	626	*453.7*	316.4	65.4	100.3	21.0	3.7	*455.3*	*604.7*
Ethiopia	*31*	35	*0.5*	848	*4,040.3*	8,748.0	..	7.7	..	*8.6*	..	..
Finland	8	8	*2.8*	536	1,212.6	1,133.1	77.4	134.2	8.8	4.5	916.5	*784.7*
France	56	53	*5.4*	867	9,060.4	9,388.2	153.8	146.1	5.6	3.0	800.0	*635.3*
Gabon	20	20	..	1,831	14.4	20.5	..	14.1	*41.6*	..	..	..
Gambia, The	64	66	..	836	90.0	295.2	..	2.6	*64.7*	..	..	..
Georgia	46	36	4.0	1,026	*248.5*	193.8	13.0	37.1	..	*53.4*	*295.6*	*594.0*
Germany	52	49	..	700	6,944.9	6,908.4	55.7	160.4	*4.1*	2.2	1,309.4	*646.0*
Ghana	55	69	..	1,187	853.0	1,570.7	..	6.4	*62.0*	..	7.1	*4.5*
Greece	72	36	*27.4*	652	1,470.4	1,174.8	472.4	143.8	23.9	11.4	744.2	*1,196.9*
Guatemala	40	39	..	1,996	718.5	855.9	..	92.0	12.9	*33.2*	..	..
Guinea	49	56	..	1,651	729.6	1,863.0	..	1.5	..	..	45.0	..
Guinea-Bissau	51	58	..	1,577	109.3	152.6	..	..	..	..	0.8	..
Haiti	58	65	..	1,440	351.5	437.0	..	..	65.6	..	2.6	..
Honduras	30	28	..	1,976	465.1	382.6	..	107.7	50.1	*39.2*	30.9	..

Agricultural inputs 3.2

	Agricultural land[a]			Average annual precipitation	Land under cereal production		Fertilizer consumption		Agricultural employment		Agricultural machinery	
	% of land area		% irrigated	millimeters	thousand hectares		% of fertilizer production	kilograms per hectare of arable land	% of total employment		Tractors per 100 sq. km of arable land	
	1990	2008	2008	2008	1990	2009	2008	2008	1990	2008	1990	2008
Hungary	72	64	1.4	589	2,778.6	2,883.6	227.2	94.3	18.2	4.5	97.7	*261.9*
India	61	60	..	1,083	102,536.5	99,880.0	190.6	153.5	..	..	60.7	..
Indonesia	25	27	*16.3*	2,702	13,660.5	17,044.2	117.6	189.1	55.9	*41.2*	2.2	..
Iran, Islamic Rep.	38	30	19.0	228	9,468.1	9,095.5	148.1	90.9	..	*22.8*	141.5	*182.8*
Iraq	23	22	..	216	3,256.3	2,141.4	132.8	43.8	..	..	65.8	..
Ireland	82	61	..	1,118	298.9	293.5	..	480.3	15.1	5.6	1,623.4	*1,476.4*
Israel	27	23	..	435	113.8	79.1	2.6	252.6	4.1	*1.6*	798.8	705.3
Italy	57	46	*19.2*	832	4,413.4	3,453.8	264.9	156.0	8.8	3.8	1,586.5	..
Jamaica	44	43	..	2,051	2.1	1.5	..	51.3	*27.3*	*18.2*	..	..
Japan	16	13	35.1	1,668	2,471.5	1,936.2	135.7	278.2	7.2	*4.2*	4,492.9	*4,382.4*
Jordan	12	11	9.5	111	105.8	48.3	3.1	337.4	6.6	..	340.4	366.8
Kazakhstan	82	77	..	250	*22,152.4*	16,575.0	38.1	3.1	..	..	*62.0*	*17.7*
Kenya	47	48	*0.1*	630	1,785.5	2,329.0	..	33.3	..	..	20.0	..
Korea, Dem. Rep.	21	25	..	1,054	1,605.0	1,265.5	..	..	..	..	..	..
Korea, Rep.	22	19	*51.6*	1,274	1,441.0	1,018.5	134.0	479.5	17.9	*7.4*	211.0	1,632.5
Kosovo	..	*52*	..	..	..	..	..	..	..	..	..	..
Kuwait	8	8	..	121	0.5	1.4	3.2	1,250.9	*1.3*	..	220.0	95.6
Kyrgyz Republic	*53*	56	9.3	533	*578.0*	612.4	..	19.0	32.7	*36.3*	*189.4*	191.1
Lao PDR	7	10	..	1,834	687.0	1,048.9	..	..	..	..	..	..
Latvia	*41*	29	*0.0*	641	*696.7*	540.9	..	124.3	..	7.7	*363.7*	*501.4*
Lebanon	59	67	*19.9*	661	41.2	67.9	8.6	56.2	..	..	174.9	..
Lesotho	76	78	..	788	233.5	179.2	..	..	..	..	57.7	..
Liberia	26	27	..	2,391	175.0	190.0	..	..	..	..	..	..
Libya	9	9	..	56	404.1	342.9	17.2	27.3	..	..	184.3	..
Lithuania	*54*	43	..	656	*1,134.0*	1,103.5	13.5	79.1	..	7.7	*256.0*	631.6
Macedonia, FYR	*51*	42	*2.7*	619	*235.2*	178.9	..	56.2	..	*18.2*	*730.3*	*1,243.8*
Madagascar	62	70	2.2	1,513	1,326.9	1,476.5	..	4.3	..	*82.0*	4.9	..
Malawi	45	58	..	1,181	1,425.3	1,780.1	3,197.3	1.7	..	..	..	..
Malaysia	22	24	..	2,875	700.7	678.6	242.6	929.9	26.0	*14.8*	152.9	..
Mali	26	32	..	282	2,438.7	3,988.4	..	9.0	..	..	10.2	*2.7*
Mauritania	38	38	..	92	118.9	242.9	..	..	..	..	8.4	*9.8*
Mauritius	56	48	21.4	2,041	0.6	0.1	..	210.1	16.7	*9.1*	..	..
Mexico	53	53	*5.2*	752	10,543.1	10,182.4	319.7	44.7	22.6	*13.5*	123.5	*97.2*
Moldova	*78*	76	9.1	450	*675.6*	881.6	..	12.5	33.8	*32.8*	*310.1*	197.5
Mongolia	81	75	..	241	654.1	252.4	..	8.2	*39.5*	40.6	80.3	38.0
Morocco	68	67	4.4	346	5,603.3	5,316.7	40.0	53.8	3.9	*43.3*	45.0	..
Mozambique	61	62	..	1,032	1,549.5	1,892.0	..	0.0	..	..	..	..
Myanmar	16	18	*24.8*	2,091	5,221.4	8,912.0	1,515.4	3.3	69.7	..	13.6	10.9
Namibia	47	47	..	285	214.2	307.2	..	0.3	*48.2*	..	..	..
Nepal	29	29	27.7	1,500	3,045.2	3,418.0	..	7.7	*81.2*	..	21.9	122.9
Netherlands	59	57	*10.6*	778	195.3	220.8	17.9	269.1	4.5	2.7	2,073.1	*1,301.5*
New Zealand	61	43	..	1,732	172.5	162.7	320.3	1,721.0	10.6	*7.2*	..	..
Nicaragua	33	43	..	2,391	320.0	438.2	..	32.3	39.3	*29.1*	20.0	..
Niger	26	34	..	151	6,882.3	9,929.1	..	0.4	..	..	0.2	..
Nigeria	79	86	..	1,150	15,400.0	18,899.0	1,929.1	13.3	..	..	4.7	*6.6*
Norway	3	3	*5.4*	1,414	356.4	305.9	24.4	219.0	6.4	2.8	1,779.1	*1,539.1*
Oman	3	6	..	125	2.4	5.0	2.4	395.0	*9.3*	..	41.1	..
Pakistan	34	34	73.0	494	11,864.1	13,689.0	115.6	163.3	51.1	*43.6*	129.7	*204.8*
Panama	29	30	..	2,692	184.6	144.3	..	35.3	*29.1*	*14.7*	102.0	..
Papua New Guinea	2	2	..	3,142	1.7	3.3	..	78.6	..	..	59.4	..
Paraguay	43	51	..	1,130	393.7	1,344.8	..	66.8	*1.9*	*29.5*	71.6	61.5
Peru	17	17	..	1,738	683.7	1,286.1	..	81.6	1.2	*9.3*	36.3	..
Philippines	37	40	..	2,348	7,138.5	7,216.3	973.8	131.2	45.2	*36.1*	65.2	..
Poland	62	53	*0.5*	600	8,530.9	8,582.8	100.0	190.4	25.2	*14.7*	823.6	1,246.0
Portugal	43	38	*12.0*	854	760.0	305.9	190.1	236.5	17.9	11.5	563.1	*1,397.7*
Puerto Rico	49	21	*8.5*	2,054	0.5	0.3	..	..	3.6	*1.1*	438.5	*525.0*
Romania	64	59	1.9	637	5,704.1	5,265.5	42.1	45.6	29.1	28.7	140.6	200.4

3.2 Agricultural inputs

	Agricultural land[a]			Average annual precipitation	Land under cereal production		Fertilizer consumption		Agricultural employment		Agricultural machinery	
	% of land area		% irrigated	millimeters	thousand hectares		% of fertilizer production	kilograms per hectare of arable land	% of total employment		Tractors per 100 sq. km of arable land	
	1990	2008	2008	2008	1990	2009	2008	2008	1990	2008	1990	2008
Russian Federation	*14*	13	2.0	460	*59,541.3*	41,715.7	11.9	15.9	13.9	*9.0*	*97.8*	30.0
Rwanda	76	82	..	1,212	254.1	368.2	..	8.3	*90.1*	..	1.0	..
Qatar	5	6	..	74	1.1	2.0	0.3	276.9	..	*3.0*	84.0	*56.2*
Saudi Arabia	..	..	..	59	974.6	466.4	14.5	75.2	..	*4.7*	19.2	..
Senegal	46	48	*0.7*	686	1,229.0	1,647.2	53.7	2.4	..	*33.7*	1.6	..
Serbia	..	*57*	0.5	..	..	1,919.0	*252.9*	*115.2*	..	*20.8*	..	17.7
Sierra Leone	39	58	..	2,526	468.6	1,111.4	..	..	..	..	4.1	..
Singapore	3	1	..	2,497	..	1,918.9	..	..	0.4	*1.1*	..	..
Slovak Republic	*51*	40	1.3	824	*836.6*	768.7	81.1	130.0	..	4.0	*197.5*	154.7
Slovenia	*28*	25	0.8	1,162	*112.5*	101.9	..	283.6	*10.7*	*10.2*	..	..
Somalia	70	70	..	282	732.5	470.2	..	..	..	..	16.0	*12.0*
South Africa	80	82	..	495	6,162.9	3,318.7	262.4	49.7	..	*8.8*	107.9	..
Spain	61	56	*11.9*	636	7,551.4	6,043.3	84.8	106.5	11.5	4.3	483.1	824.4
Sri Lanka	37	42	..	1,712	869.8	1,017.9	2,961.4	284.3	47.8	*31.3*	..	..
Sudan	52	58	1.3	416	3,734.6	9,453.8	..	3.6	..	..	7.2	12.4
Swaziland	72	71	..	788	85.7	48.7	..	..	..	..	228.9	*87.1*
Sweden	8	8	..	624	1,285.2	1,032.1	414.7	142.1	3.4	*2.2*	601.9	*592.4*
Switzerland	40	39	..	1,537	211.9	153.0	..	226.3	4.2	*3.9*	2,783.1	*2,597.2*
Syrian Arab Republic	73	76	9.8	252	4,134.4	2,774.1	184.5	88.0	*26.5*	..	128.1	233.9
Tajikistan	*32*	34	15.0	691	*266.5*	409.5	*452.5*	0.0	*44.7*	..	*415.4*	216.1
Tanzania	38	39	..	1,071	2,629.3	5,087.0	..	6.0	..	*74.6*	8.2	..
Thailand	42	38	..	1,622	10,536.9	12,282.7	1,462.8	130.9	63.3	*41.7*	33.0	..
Timor-Leste	21	25	..	..	82.6	103.4	..	..	..	..	8.5	..
Togo	59	67	..	1,168	648.0	826.7	..	4.9	..	..	0.5	0.5
Trinidad and Tobago	15	11	..	2,200	5.9	2.1	17.8	2,337.2	12.3	*4.3*	..	..
Tunisia	56	64	4.0	207	1,445.7	876.6	8.7	32.1	*25.8*	..	82.4	142.6
Turkey	52	51	13.3	593	13,640.1	11,955.9	242.3	88.7	46.9	26.2	279.8	488.5
Turkmenistan	69	69	..	161	*331.3*	970.3	..	..	..	..	*464.7*	..
Uganda	61	66	..	1,180	1,055.0	1,826.0	..	3.4	..	..	..	..
Ukraine	*72*	71	5.3	565	*12,542.3*	15,114.8	40.7	32.8	19.8	*16.7*	*153.3*	103.3
United Arab Emirates	3	7	..	78	1.3	0.0	7.6	336.3	..	*4.9*	51.4	..
United Kingdom	75	73	..	1,220	3,657.3	3,173.0	133.5	208.2	2.1	1.4	*760.6*	..
United States	47	45	..	715	65,700.0	58,001.4	96.2	103.1	2.9	*1.4*	238.4	*257.6*
Uruguay	85	85	1.2	1,265	514.6	1,049.4	1,492.7	118.3	0.0	*11.0*	260.4	222.4
Uzbekistan	65	63	..	206	*1,225.3*	1,607.5	..	..	..	..	..	..
Venezuela, RB	25	24	..	1,875	753.9	1,237.1	74.5	232.9	13.4	*8.7*	..	..
Vietnam	21	32	..	1,821	6,474.6	8,528.5	218.6	286.6	..	..	47.0	..
West Bank and Gaza	62	61	*4.6*	402	0.0	35.0	..	..	..	*15.6*	442.2	767.9
Yemen, Rep.	45	45	*3.3*	167	844.9	672.8	..	14.3	*52.6*	..	39.0	..
Zambia	27	30	..	1,020	895.2	1,062.5	..	50.1	49.8	..	*27.2*	..
Zimbabwe	34	41	..	657	1,576.1	2,236.8	164.7	27.9	..	..	60.1	..
World	**37 w**	**38 w**	**..**		**708,090.3 s**	**708,451.8 s**	**94.9 w**	**119.4 w**	**.. w**	**.. w**	**186.4 w**	**.. w**
Low income	35	37	..		63,834.3	92,275.5	221.9	16.7	..	..	15.7	..
Middle income	37	38	..		482,334.4	468,186.3	103.8	139.6	..	..	91.7	..
Lower middle income	49	50	..		307,764.8	321,963.9	115.0	191.8	..	..	66.0	..
Upper middle income	30	30	..		174,569.6	146,222.5	76.9	70.7	*20.8*	*14.9*	125.1	..
Low & middle income	37	38	..		546,168.7	560,461.8	104.8	123.1	..	..	85.0	..
East Asia & Pacific	49	48	..		142,232.3	148,824.2	108.5	..	*53.6*	..	53.2	..
Europe & Central Asia	28	28	..		127,839.3	104,480.3	26.9	33.3	*22.9*	*16.3*	132.3	111.0
Latin America & Carib.	34	35	..		47,401.7	50,290.2	279.7	111.8	*18.7*	*15.8*	120.9	..
Middle East & N. Africa	24	23	..		29,953.1	27,642.2	57.6	95.3	..	..	114.6	*190.2*
South Asia	55	55	..		131,803.8	133,310.2	176.9	148.0	..	..	62.2	*119.9*
Sub-Saharan Africa	42	45	..		66,938.5	95,914.7	578.1	11.6	..	..	20.2	..
High income	39	37	..		161,921.6	147,990.0	73.6	109.3	*6.5*	*3.5*	*474.9*	..
Euro area	51	44	..		34,697.5	31,367.7	95.1	150.5	*7.2*	3.8	977.3	*811.1*

a. Includes permanent pastures, arable land, and land under permanent crops. b. Includes Luxembourg.

About the data

Agriculture is still a major sector in many economies, and agricultural activities provide developing countries with food and revenue. But agricultural activities also can degrade natural resources. Poor farming practices can cause soil erosion and loss of soil fertility. Efforts to increase productivity by using chemical fertilizers, pesticides, and intensive irrigation have environmental costs and health impacts. Excessive use of chemical fertilizers can alter the chemistry of soil. Pesticide poisoning is common in developing countries. And salinization of irrigated land diminishes soil fertility. Thus, inappropriate use of inputs for agricultural production has far-reaching effects.

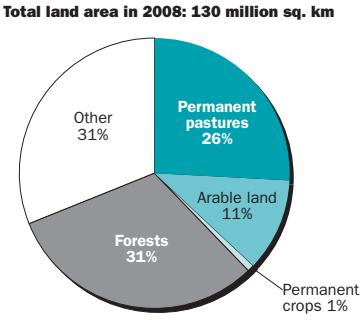
The table provides indicators of major inputs to agricultural production: land, fertilizer, labor, and machinery. There is no single correct mix of inputs: appropriate levels and application rates vary by country and over time and depend on the type of crops, the climate and soils, and the production process used.

The agriculture sector is the most water-intensive sector, and water delivery in agriculture is increasingly important. The table shows irrigated agricultural land as share of total agricultural land area and data on average precipitation to illustrate how countries obtain water for agricultural use.

The data here and in table 3.3 are collected by the Food and Agriculture Organization of the United Nations (FAO) through annual questionnaires. The FAO tries to impose standard definitions and reporting methods, but complete consistency across countries and over time is not possible. Thus, data on agricultural land in different climates may not be comparable. For example, permanent pastures are quite different in nature and intensity in African countries and dry Middle Eastern countries. Data on agricul-tural employment, in particular, should be used with caution. In many countries much agricultural employment is informal and unrecorded, including substantial work performed by women and children. To address some of these concerns, this indicator is heavily footnoted in the database in sources, definition, and coverage.

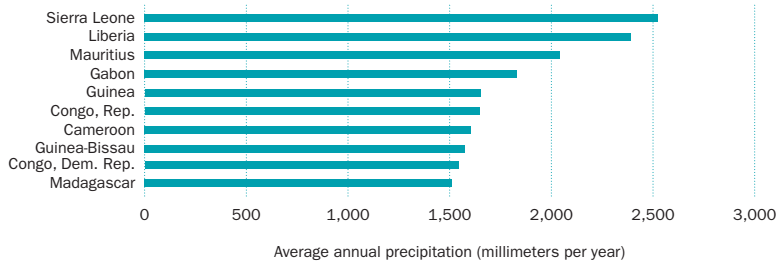
Fertilizer consumption measures the quantity of plant nutrients. Consumption is calculated as production plus imports minus exports. Because some chemical compounds used for fertilizers have other industrial applications, the consumption data may overstate the quantity available for crops. Fertilizer consumption as a share of production shows the agriculture sector's vulnerability to import and energy price fluctuation. The FAO recently revised the time series for fertilizer consumption and irrigation for 2002 onward, but recent data are not available for all countries. FAO collects fertilizer statistics for production, imports, exports, and consumption through the new FAO fertilizer resources questionnaire. In the previous release, the data were based on total consumption of fertilizers, but the data in the recent release are based on the nutrients in fertilizers. Some countries compile fertilizer data on a calendar year basis, while others do so on a crop year basis (July–June). Previous editions of *World Development Indicators* reported data on a crop year basis, but this edition uses the calendar year, as adopted by the FAO. Caution should thus be used when comparing data over time.

Nearly 40 percent of land globally is devoted to agriculture **3.2a**



Note: Agricultural land includes permanent pastures, arable land, and land under permanent crops.
Source: Tables 3.1 and 3.2.

Rainfed agriculture plays a significant role in Sub-Saharan agriculture where about 95 percent of cropland depends on precipitation, 2008 **3.2b**



Source: Table 3.2.

Definitions

• **Agricultural land** is permanent pastures, arable, and land under permanent crops. Permanent pasture is land used for five or more years for forage, including natural and cultivated crops. Arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. Land under permanent crops is land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee, and rubber. Land under flowering shrubs, fruit trees, nut trees, and vines is included, but land under trees grown for wood or timber is not. • **Irrigated land** refers to areas purposely provided with water, including land irrigated by controlled flooding. • **Average annual precipitation** is the long-term average in depth (over space and time) of annual precipitation in the country. Precipitation is defined as any kind of water that falls from clouds as a liquid or a solid. • **Land under cereal production** refers to harvested areas, although some countries report only sown or cultivated area. • **Fertilizer consumption** is the quantity of plant nutrients applied to arable land. Fertilizer products cover nitrogen, potash, and phosphate fertilizers (including ground rock phosphate). Traditional nutrients—animal and plant manures—are not included. • **Fertilizer production** is fertilizer consumption, exports, and nonfertilizer use of fertilizer products minus fertilizer imports. • **Agricultural employment** is employment in agriculture, forestry, hunting, and fishing (see table 2.3). • **Agricultural machinery** refers to wheel and crawler tractors (excluding garden tractors) in use in agriculture at the end of the calendar year specified or during the first quarter of the following year.

Data sources

Data on agricultural inputs are from electronic files that the FAO makes available to the World Bank and from the FAO web site (www.fao.org).

3.3 Agricultural output and productivity

	Crop production index		Food production index		Livestock production index		Cereal yield		Agricultural productivity	
	1999–2001 = 100		1999–2001 = 100		1999–2001 = 100		kilograms per hectare		Agriculture value added per worker 2000 $	
	1990	2009	1990	2009	1990	2009	1990	2009	1990	2009
Afghanistan	96.0	176.0	77.0	127.0	63.0	89.0	1,201	1,983	..	..
Albania	107.0	140.0	82.0	115.0	65.0	92.0	2,794	4,315	764	..
Algeria	66.0	196.0	69.0	163.0	80.0	121.0	688	1,654	1,703	2,184
Angola	56.0	250.0	61.0	198.0	72.0	92.0	321	588	200	313
Argentina	64.0	101.0	72.0	106.0	90.0	108.0	2,232	3,167	6,702	9,987
Armenia	*106.0*	195.0	*108.0*	191.0	*108.0*	177.0	*1,843*	2,230	*1,607*	5,049
Australia	58.0	88.0	68.0	95.0	82.0	95.0	1,716	1,764	20,150	*29,257*
Austria	97.0	108.0	89.0	97.0	90.0	94.0	5,577	6,136	13,413	24,715
Azerbaijan	*136.0*	152.0	*107.0*	151.0	*102.0*	152.0	*2,113*	2,607	*1,000*	1,342
Bangladesh	74.0	130.0	72.0	132.0	70.0	137.0	2,491	3,890	251	435
Belarus	*110.0*	161.0	*135.0*	157.0	*146.0*	150.0	*2,741*	3,372	*2,042*	5,184
Belgium	72.0[a]	113.0	85.0[a]	96.0	88.0[a]	91.0	5,755[a]	9,632	..	42,035
Benin	53.0	110.0	58.0	116.0	88.0	135.0	848	1,330	422	..
Bolivia	62.0	126.0	72.0	133.0	80.0	139.0	1,361	2,089	681	733
Bosnia and Herzegovina	*107.0*	125.0	*119.0*	138.0	*119.0*	167.0	*3,553*	4,539	..	14,299
Botswana	102.0	120.0	109.0	113.0	110.0	112.0	265	465	770	597
Brazil	74.0	149.0	65.0	148.0	58.0	142.0	1,755	3,526	1,625	3,760
Bulgaria	160.0	103.0	151.0	76.0	165.0	63.0	3,954	3,413	3,983	10,227
Burkina Faso	62.0	144.0	62.0	136.0	65.0	132.0	600	1,035	113	..
Burundi	109.0	108.0	109.0	110.0	131.0	118.0	1,349	1,313	116	..
Cambodia	66.0	202.0	64.0	184.0	59.0	109.0	1,362	2,947	..	411
Cameroon	69.0	117.0	72.0	120.0	83.0	105.0	1,241	1,574	419	*730*
Canada	90.0	119.0	84.0	119.0	76.0	105.0	2,636	3,301	28,898	44,752
Central African Republic	75.0	110.0	68.0	123.0	64.0	132.0	807	948	321	..
Chad	59.0	118.0	64.0	125.0	82.0	120.0	559	812	168	..
Chile	74.0	113.0	71.0	120.0	66.0	134.0	3,620	5,472	3,453	6,618
China	68.0	130.0	59.0	133.0	45.0	133.0	4,323	5,460	263	525
Hong Kong SAR, China	..	..	..	..	..	..	..	..	..	..
Colombia	91.0	120.0	81.0	128.0	79.0	140.0	2,475	4,017	3,122	2,861
Congo, Dem. Rep.	122.0	97.0	119.0	98.0	102.0	96.0	800	772	209	168
Congo, Rep.	81.0	116.0	79.0	123.0	73.0	157.0	624	776	..	..
Costa Rica	68.0	118.0	68.0	126.0	77.0	126.0	3,097	3,770	2,984	5,232
Côte d'Ivoire	71.0	109.0	73.0	120.0	90.0	132.0	887	1,724	653	926
Croatia	*80.0*	96.0	*100.0*	104.0	*126.0*	129.0	*3,975*	6,117	*5,546*	15,137
Cuba	119.0	82.0	127.0	83.0	152.0	109.0	2,342	2,069	4,117	*3,647*
Czech Republic	..	98.0	..	99.0	..	90.0	..	5,074	..	*5,687*
Denmark	113.0	113.0	100.0	107.0	86.0	104.0	6,118	6,810	14,588	45,905
Dominican Republic	118.0	111.0	101.0	131.0	74.0	151.0	3,996	4,246	1,925	4,579
Ecuador	75.0	114.0	67.0	126.0	61.0	140.0	1,724	2,974	2,105	1,766
Egypt, Arab Rep.	66.0	136.0	64.0	139.0	62.0	134.0	5,703	7,635	1,737	3,024
El Salvador	95.0	102.0	85.0	116.0	74.0	131.0	1,939	2,727	1,742	2,778
Eritrea	..	154.0	..	126.0	..	101.0	..	938	..	66
Estonia	*121.0*	127.0	*180.0*	134.0	*192.0*	118.0	*1,304*	2,761	*3,288*	*3,207*
Ethiopia	..	153.0	..	151.0	..	140.0	..	1,652	..	215
Finland	116.0	115.0	113.0	104.0	111.0	100.0	3,543	3,760	17,163	43,813
France	96.0	101.0	97.0	98.0	95.0	94.0	6,083	7,460	21,423	58,070
Gabon	81.0	104.0	91.0	103.0	84.0	100.0	1,643	1,663	1,216	1,869
Gambia, The	55.0	114.0	60.0	117.0	95.0	132.0	1,004	1,053	272	275
Georgia	*122.0*	61.0	*99.0*	66.0	*78.0*	67.0	*1,998*	1,917	*2,359*	1,872
Germany	86.0	102.0	102.0	103.0	115.0	105.0	5,411	7,201	13,669	31,659
Ghana	43.0	156.0	46.0	155.0	89.0	127.0	989	1,660	..	..
Greece	75.0	76.0	84.0	83.0	105.0	99.0	3,036	4,103	6,707	10,779
Guatemala	73.0	138.0	72.0	141.0	81.0	118.0	1,998	1,624	2,243	2,783
Guinea	71.0	133.0	72.0	133.0	56.0	167.0	1,455	1,711	156	225
Guinea-Bissau	72.0	120.0	73.0	122.0	78.0	128.0	1,531	1,422	..	..
Haiti	111.0	110.0	101.0	112.0	65.0	111.0	1,027	961	..	..
Honduras	100.0	153.0	90.0	145.0	66.0	133.0	1,468	1,752	1,180	1,958

Agricultural output and productivity

3.3

	Crop production index		Food production index		Livestock production index		Cereal yield		Agricultural productivity	
	1999–2001 = 100		1999–2001 = 100		1999–2001 = 100		kilograms per hectare		Agriculture value added per worker 2000 $	
	1990	2009	1990	2009	1990	2009	1990	2009	1990	2009
Hungary	119.0	102.0	123.0	100.0	140.0	85.0	4,521	4,713	4,232	*10,948*
India	78.0	116.0	75.0	119.0	70.0	133.0	1,891	2,471	362	468
Indonesia	80.0	145.0	80.0	146.0	81.0	157.0	3,800	4,813	512	734
Iran, Islamic Rep.	71.0	117.0	69.0	124.0	64.0	142.0	1,445	2,291	1,906	*3,061*
Iraq	105.0	83.0	111.0	92.0	140.0	128.0	1,061	1,222	..	..
Ireland	91.0	84.0	94.0	90.0	93.0	93.0	6,577	6,798	..	13,573
Israel	112.0	108.0	90.0	122.0	69.0	130.0	3,484	3,250	..	..
Italy	88.0	91.0	90.0	95.0	94.0	103.0	3,945	5,035	10,410	29,498
Jamaica	83.0	95.0	75.0	100.0	64.0	110.0	1,116	1,253	2,224	2,716
Japan	115.0	89.0	109.0	95.0	106.0	101.0	5,846	5,920	20,934	*52,062*
Jordan	102.0	157.0	81.0	156.0	52.0	139.0	1,220	1,044	2,077	3,030
Kazakhstan	*163.0*	150.0	*163.0*	145.0	*178.0*	141.0	*1,338*	1,254	*1,781*	2,033
Kenya	79.0	107.0	83.0	126.0	89.0	147.0	1,562	1,204	400	334
Korea, Dem. Rep.	111.0	107.0	104.0	112.0	124.0	133.0	3,926	3,698	..	..
Korea, Rep.	88.0	96.0	79.0	101.0	62.0	106.0	5,853	7,073	5,338	19,105
Kosovo	..	..	..	..	..	..	..	..	..	..
Kuwait	57.0	122.0	53.0	114.0	63.0	102.0	3,653	2,679	..	..
Kyrgyz Republic	*68.0*	108.0	*78.0*	103.0	*110.0*	105.0	*2,772*	3,034	*684*	*1,041*
Lao PDR	65.0	157.0	60.0	148.0	57.0	126.0	2,268	3,808	387	*516*
Latvia	*129.0*	147.0	*222.0*	138.0	*274.0*	126.0	*1,641*	3,075	*1,896*	3,636
Lebanon	99.0	96.0	92.0	111.0	64.0	149.0	1,878	2,828	..	41,037
Lesotho	101.0	72.0	91.0	72.0	86.0	78.0	1,036	421	260	207
Liberia	71.0	115.0	88.0	131.0	91.0	127.0	1,029	1,553	..	..
Libya	78.0	102.0	77.0	109.0	77.0	116.0	674	623	..	..
Lithuania	*79.0*	138.0	*157.0*	138.0	*185.0*	116.0	*1,938*	3,450	..	*5,369*
Macedonia, FYR	*108.0*	112.0	*108.0*	115.0	*101.0*	115.0	*2,652*	3,387	*2,413*	5,811
Madagascar	93.0	115.0	91.0	114.0	99.0	111.0	1,945	2,291	214	192
Malawi	54.0	141.0	47.0	129.0	78.0	153.0	992	1,599	89	162
Malaysia	74.0	141.0	67.0	144.0	71.0	133.0	2,740	3,750	3,850	6,529
Mali	68.0	162.0	79.0	183.0	94.0	153.0	726	1,588	406	*523*
Mauritania	60.0	116.0	86.0	116.0	91.0	115.0	870	873	653	408
Mauritius	108.0	95.0	95.0	106.0	57.0	138.0	4,193	7,895	3,446	5,556
Mexico	81.0	111.0	74.0	117.0	68.0	123.0	2,424	3,111	2,275	3,364
Moldova	*135.0*	100.0	*159.0*	105.0	*197.0*	98.0	*2,928*	2,417	*1,349*	1,531
Mongolia	293.0	270.0	101.0	110.0	94.0	101.0	1,098	1,552	1,241	1,888
Morocco	100.0	142.0	93.0	140.0	81.0	128.0	1,120	1,003	1,806	3,306
Mozambique	70.0	130.0	68.0	102.0	47.0	89.0	474	846	132	220
Myanmar	60.0	151.0	61.0	162.0	51.0	248.0	2,762	3,585	..	..
Namibia	77.0	140.0	98.0	101.0	101.0	90.0	457	465	1,267	1,638
Nepal	75.0	135.0	76.0	130.0	78.0	120.0	1,920	2,374	247	238
Netherlands	92.0	100.0	102.0	94.0	101.0	101.0	6,959	9,032	23,593	45,969
New Zealand	78.0	109.0	74.0	115.0	77.0	114.0	5,034	6,922	19,782	25,446
Nicaragua	70.0	117.0	63.0	135.0	59.0	149.0	1,524	1,872	..	2,495
Niger	64.0	210.0	61.0	186.0	56.0	153.0	310	489	235	..
Nigeria	60.0	134.0	60.0	135.0	70.0	121.0	1,148	1,598	..	..
Norway	143.0	90.0	112.0	95.0	101.0	95.0	4,399	3,094	17,454	40,666
Oman	59.0	95.0	57.0	102.0	65.0	122.0	2,160	3,358	1,037	..
Pakistan	77.0	125.0	67.0	132.0	64.0	135.0	1,766	2,803	739	903
Panama	116.0	114.0	91.0	116.0	67.0	116.0	1,867	2,735	2,303	4,185
Papua New Guinea	76.0	112.0	77.0	119.0	79.0	127.0	2,395	3,727	563	672
Paraguay	93.0	122.0	76.0	136.0	81.0	134.0	1,979	2,358	1,657	1,338
Peru	51.0	145.0	55.0	153.0	65.0	158.0	2,601	3,910	907	1,545
Philippines	87.0	131.0	78.0	131.0	57.0	134.0	2,065	3,229	911	1,204
Poland	124.0	99.0	119.0	111.0	123.0	110.0	3,284	3,475	*1,605*	2,776
Portugal	110.0	86.0	101.0	95.0	82.0	103.0	1,878	3,455	4,495	6,764
Puerto Rico	153.0	105.0	125.0	94.0	119.0	91.0	1,080	1,897	..	..
Qatar	51.0	121.0	64.0	77.0	77.0	46.0	2,897	3,820	..	..

3.3 Agricultural output and productivity

	Crop production index		Food production index		Livestock production index		Cereal yield		Agricultural productivity	
	1999–2001 = 100		1999–2001 = 100		1999–2001 = 100		kilograms per hectare		Agriculture value added per worker 2000 $	
	1990	2009	1990	2009	1990	2009	1990	2009	1990	2009
Romania	98.0	100.0	105.0	107.0	124.0	115.0	3,011	2,825	2,351	8,993
Russian Federation	*126.0*	136.0	*129.0*	130.0	*147.0*	118.0	*1,743*	2,279	*1,917*	3,031
Rwanda	97.0	132.0	94.0	134.0	79.0	158.0	1,043	1,097	172	..
Saudi Arabia	118.0	124.0	103.0	124.0	64.0	135.0	4,245	5,212	7,863	20,431
Senegal	72.0	130.0	73.0	134.0	80.0	144.0	795	1,135	252	245
Serbia	*98.0*[b]	..	*109.0*[b]	..	*103.0*[b]	..	*2,926*[b]	4,626	..	..
Sierra Leone	127.0	204.0	121.0	201.0	105.0	144.0	1,202	989	..	..
Singapore	223.0	440.0	335.0	132.0	481.0	105.0	..	..	..	*49,867*
Slovak Republic	..	102.0	..	97.0	..	80.0	..	4,335	..	9,728
Slovenia	*82.0*	94.0	*76.0*	97.0	*76.0*	97.0	*3,279*	5,266	*13,217*	67,838
Somalia	144.0	96.0	101.0	104.0	95.0	105.0	793	417	..	..
South Africa	86.0	111.0	87.0	122.0	93.0	130.0	1,877	4,395	2,290	3,641
Spain	91.0	97.0	88.0	97.0	77.0	103.0	2,485	2,957	8,947	21,831
Sri Lanka	90.0	115.0	91.0	120.0	88.0	123.0	2,965	3,722	678	926
Sudan	49.0	112.0	51.0	119.0	58.0	123.0	456	587	501	922
Swaziland	112.0	101.0	106.0	115.0	108.0	140.0	1,278	560	1,025	1,176
Sweden	126.0	103.0	110.0	100.0	100.0	93.0	4,964	5,086	23,307	51,057
Switzerland	112.0	103.0	104.0	104.0	103.0	106.0	5,984	6,579	20,451	26,726
Syrian Arab Republic	66.0	115.0	71.0	131.0	74.0	143.0	750	1,707	2,613	4,717
Tajikistan	*123.0*	148.0	*134.0*	162.0	*196.0*	168.0	*1,020*	2,250	*370*	542
Tanzania	91.0	154.0	86.0	134.0	75.0	104.0	1,506	1,224	220	283
Thailand	76.0	129.0	77.0	126.0	74.0	111.0	2,009	2,954	446	708
Timor-Leste	88.0	105.0	94.0	111.0	89.0	114.0	1,608	1,276	..	..
Togo	71.0	109.0	74.0	132.0	85.0	137.0	747	1,136	351	..
Trinidad and Tobago	120.0	89.0	90.0	125.0	72.0	149.0	2,826	2,659	1,825	1,502
Tunisia	93.0	119.0	81.0	115.0	57.0	110.0	1,143	1,401	2,736	3,602
Turkey	87.0	112.0	88.0	119.0	91.0	125.0	2,214	2,808	2,175	3,491
Turkmenistan	*98.0*	128.0	*60.0*	137.0	*64.0*	129.0	*2,210*	2,974	*1,272*	2,930
Uganda	77.0	109.0	78.0	112.0	79.0	120.0	1,498	1,539	177	203
Ukraine	*131.0*	155.0	*147.0*	123.0	*170.0*	101.0	*2,834*	3,004	*1,232*	2,461
United Arab Emirates	16.0	52.0	19.0	45.0	54.0	125.0	2,216	2,000	9,042	..
United Kingdom	101.0	96.0	105.0	98.0	105.0	99.0	6,171	7,008	21,400	26,370
United States	86.0	112.0	82.0	115.0	81.0	108.0	4,755	7,238	18,523	49,512
Uruguay	66.0	187.0	74.0	144.0	83.0	127.0	2,182	4,047	6,166	9,064
Uzbekistan	*107.0*	145.0	*93.0*	155.0	*99.0*	137.0	*1,777*	4,578	*1,427*	2,584
Venezuela, RB	77.0	116.0	73.0	122.0	73.0	128.0	2,486	3,826	4,443	7,941
Vietnam	57.0	137.0	59.0	138.0	50.0	157.0	3,073	5,075	225	356
West Bank and Gaza	..	104.0	..	102.0	..	93.0	..	*1,684*	..	..
Yemen, Rep.	75.0	130.0	71.0	144.0	63.0	165.0	908	1,003	428	..
Zambia	81.0	170.0	87.0	135.0	83.0	106.0	1,352	2,068	212	216
Zimbabwe	77.0	55.0	87.0	82.0	79.0	107.0	1,625	313	270	141
World	**81.0**[c] **w**	**122.2 w**	**80.0**[c] **w**	**123.0 w**	**82.0**[c] **w**	**120.3 w**	**2,755**[c] **w**	**3,514 w**	**803 w**	**998 w**
Low income	76.2	134.1	76.5	134.4	78.3	131.0	1,561	1,966	236	278
Middle income	73.6	128.2	68.8	130.2	62.5	131.5	2,563	3,210	489	777
Lower middle income	71.9	128.6	66.5	130.5	56.5	132.6	2,696	3,446	360	604
Upper middle income	79.2	126.9	75.6	129.3	75.1	129.4	2,103	2,690	2,270	3,683
Low & middle income	73.8	128.7	69.4	130.5	63.3	131.4	2,429	3,005	460	704
East Asia & Pacific	69.9	133.1	62.7	135.1	48.8	135.2	3,795	4,843	313	570
Europe & Central Asia	*111.3*	129.3	*117.7*	126.2	*136.8*	119.1	2,596	2,471	2,188	3,182
Latin America & Carib.	75.8	128.1	71.2	131.2	69.7	132.6	2,089	3,282	2,227	3,436
Middle East & N. Africa	74.7	127.3	72.8	131.6	69.3	134.7	1,471	2,352	1,760	*2,896*
South Asia	78.0	119.3	74.5	122.7	69.2	132.9	1,926	2,628	372	495
Sub-Saharan Africa	71.1	128.7	72.9	130.0	80.1	125.1	1,033	1,302	304	318
High income	90.7	103.9	90.4	106.3	90.7	104.1	4,138	5,439	14,116	25,066
Euro area	90.9	96.9	95.6	97.7	98.2	100.0	4,490	5,822	11,982	26,730

a. Includes Luxembourg. b. Includes Montenegro. c. FAO estimate.

Agricultural output and productivity 3.3

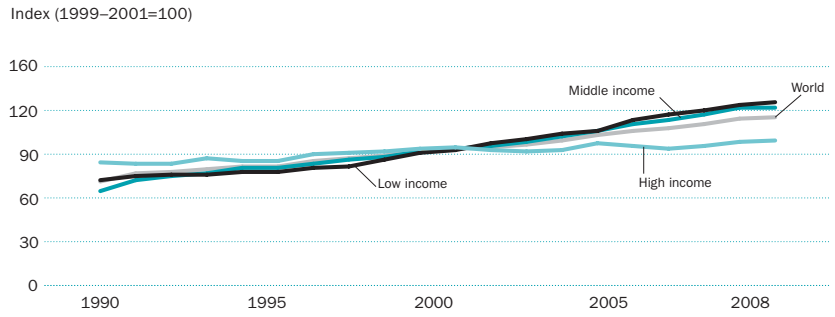
About the data

The agricultural production indexes in the table are prepared by the Food and Agriculture Organization of the United Nations (FAO). The FAO obtains data from official and semiofficial reports of crop yields, area under production, and livestock numbers. If data are unavailable, the FAO makes estimates. The indexes are calculated using the Laspeyres formula: production quantities of each commodity are weighted by average international commodity prices in the base period and summed for each year. Because the FAO's indexes are based on the concept of agriculture as a single enterprise, estimates of the amounts retained for seed and feed are subtracted from the production data to avoid double counting. The aggregates represent production available for any use except as seed and feed and presented as "net". The FAO's indexes may differ from those from other sources because of differences in coverage, weights, concepts, time periods, calculation methods, and use of international prices.

To facilitate cross-country comparisons, the FAO uses international commodity prices to value production. These prices, expressed in international dollars (equivalent in purchasing power to the U.S. dollar), are derived using a Geary-Khamis formula applied to agricultural outputs (see Inter-Secretariat Working Group on National Accounts 1993, sections 16.93–96). This method assigns a single price to each commodity so that, for example, one metric ton of wheat has the same price regardless of where it was produced. The use of international prices eliminates fluctuations in the value of output due to transitory movements of nominal exchange rates unrelated to the purchasing power of the domestic currency.

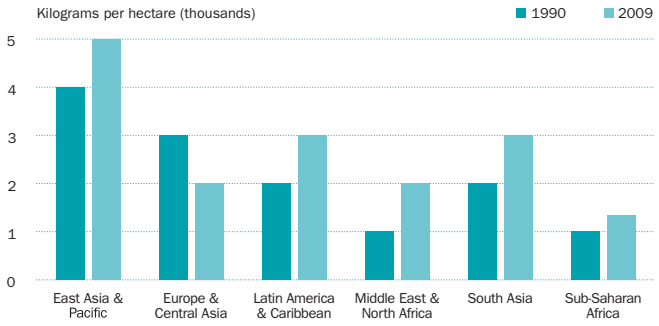
Data on cereal yield may be affected by a variety of reporting and timing differences. Millet and sorghum, which are grown as feed for livestock and poultry in Europe and North America, are used as food in Africa, Asia, and countries of the former Soviet Union. So some cereal crops are excluded from the data for some countries and included elsewhere, depending on their use.

The food production index has increased steadily since early 1960, and the index for low-income economies has been higher than the world average since early 2000 **3.3a**



Source: Table 3.3.

Cereal yield in Sub-Saharan Africa increased between 1990 and 2009 but still is the lowest among the regions **3.3b**



Source: Table 3.3.

Definitions

• **Crop production index** is agricultural production for each period relative to the average over the base period 1999–2001. It includes all crops except fodder crops. The regional and income group aggregates for the FAO's production indexes are calculated from the underlying values in international dollars, normalized to the average over the base period 1999–2001. • **Food production index** covers food crops that are considered edible and that contain nutrients. Coffee and tea are excluded because, although edible, they have no nutritive value. • **Livestock production index** includes meat and milk from all sources, dairy products such as cheese, and eggs, honey, raw silk, wool, and hides and skins. • **Cereal yield,** measured in kilograms per hectare of harvested land, includes wheat, rice, maize, barley, oats, rye, millet, sorghum, buckwheat, and mixed grains. Production data on cereals refer to crops harvested for dry grain only. Cereal crops harvested for hay or harvested green for food, feed, or silage, and those used for grazing, are excluded. The FAO allocates production data to the calendar year in which the bulk of the harvest took place. But most of a crop harvested near the end of a year will be used in the following year. • **Agricultural productivity** is the ratio of agricultural value added, measured in 2000 U.S. dollars, to the number of workers in agriculture. Agricultural productivity is measured by value added per unit of input. (For further discussion of the calculation of value added in national accounts, see *About the data* for tables 4.1 and 4.2.) Agricultural value added includes that from forestry and fishing. Thus interpretations of land productivity should be made with caution.

Data sources

Data on agricultural production indexes, cereal yield, and agricultural employment are from electronic files that the FAO makes available to the World Bank. The files may contain more recent information than published versions. Data on agricultural value added are from the World Bank's national accounts files.

3.4 Deforestation and biodiversity

	Forest area		Average annual deforestation[a]		Threatened species				GEF benefits index for biodiversity	Terrestrial protected areas		Marine protected areas	
	thousand sq. km		%		Mammals	Birds	Fish	Higher plants[b]	0–100 (no biodiversity to maximum biodiversity)	% of total land area		% of territorial waters	
	1990	2010	1990–2000	2000–10	2010	2010	2010	2010	2008	1990	2009	1990	2009
Afghanistan	14	14	0.00	0.00	11	13	5	2	3.4	0.4	0.4	..	..
Albania	8	8	0.26	–0.09	3	6	38	0	0.2	4.3	9.8	0.1	1.5
Algeria	17	15	0.54	0.57	14	11	33	15	2.9	6.3	6.3	0.2	0.3
Angola	610	585	0.21	0.21	15	21	37	33	8.3	12.4	12.4	0.1	0.1
Argentina	348	294	0.88	0.80	37	50	36	44	17.7	4.6	5.4	0.8	1.1
Armenia	3	3	1.31	1.48	9	10	3	1	0.2	6.9	8.0	..	..
Australia	1,545	1,493	–0.03	0.37	55	52	100	67	87.7	7.4	10.5	10.9	28.3
Austria	38	39	–0.16	–0.13	3	8	11	4	0.3	20.1	22.9	..	..
Azerbaijan	9	9	0.00	0.00	7	15	10	0	0.8	6.2	7.1	..	..
Bangladesh	15	14	0.18	0.18	34	29	19	16	1.4	1.5	1.6	0.4	0.8
Belarus	78	86	–0.62	–0.42	4	4	2	0	0.0	6.5	7.3	..	..
Belgium	7	7	0.15	–0.16	3	2	10	1	0.0	0.6	0.9	0.0	0.0
Benin	58	46	1.29	1.03	11	5	27	14	0.2	23.8	23.8	0.0	0.0
Bolivia	628	572	0.44	0.49	20	33	0	72	12.5	8.5	18.2	..	..
Bosnia and Herzegovina	22	22	0.11	0.00	4	6	31	1	0.4	0.5	0.6	0.7	0.7
Botswana	137	114	0.90	0.99	7	9	2	0	1.4	30.3	30.9	..	..
Brazil	5,748	5,195	0.51	0.49	80	123	80	387	100.0	10.8	28.0	11.4	20.1
Bulgaria	33	39	–0.14	–1.53	7	12	18	0	0.8	1.9	9.1	0.1	3.0
Burkina Faso	68	56	0.91	1.00	9	6	4	3	0.3	13.3	13.9	..	..
Burundi	3	2	3.71	1.40	10	10	17	2	0.3	3.8	4.8	..	..
Cambodia	129	101	1.14	1.33	37	24	28	30	3.5	0.0	24.0	0.0	0.9
Cameroon	243	199	0.94	1.04	39	16	110	378	12.5	7.0	9.2	0.4	0.4
Canada	3,101	3,101	0.00	0.00	12	15	32	2	21.5	6.0	8.0	0.8	1.2
Central African Republic	232	226	0.13	0.13	8	7	3	17	1.5	14.4	14.7	..	..
Chad	131	115	0.62	0.66	13	9	1	2	2.2	9.4	9.4	..	..
Chile	153	162	–0.37	–0.25	20	34	19	41	15.3	16.0	16.5	3.4	3.7
China	1,571	2,069	–1.20	–1.57	74	85	97	453	66.6	13.5	16.6	0.4	1.4
Hong Kong SAR, China	..	..	..	..	2	17	11	6	..	41.1	41.8	0.0	0.0
Colombia	625	605	0.16	0.17	51	91	50	227	51.5	20.3	20.4	3.7	5.9
Congo, Dem. Rep.	1,604	1,541	0.20	0.20	30	34	81	83	19.9	10.0	10.0	3.7	4.3
Congo, Rep.	227	224	0.08	0.06	11	3	45	37	3.6	5.4	9.4	0.0	2.1
Costa Rica	26	26	0.76	–0.92	9	19	46	116	9.7	18.7	20.9	12.1	12.3
Côte d'Ivoire	102	104	–0.10	–0.07	24	14	43	106	3.4	22.6	22.6	0.1	0.1
Croatia	19	19	–0.19	–0.18	7	10	56	3	0.6	7.1	7.3	1.2	1.2
Cuba	21	29	–1.70	–1.66	14	17	30	166	12.5	4.3	6.2	1.3	2.7
Czech Republic	26	27	–0.03	–0.08	2	6	2	4	0.1	13.7	15.1	..	..
Denmark	4	5	–0.89	–1.13	2	2	14	3	0.2	4.8	5.0	3.7	3.8
Dominican Republic	20	20	0.00	0.00	6	14	17	30	6.0	22.1	22.1	30.4	30.4
Ecuador	138	99	1.53	1.81	43	71	49	1,837	29.3	21.6	25.1	0.1	13.0
Egypt, Arab Rep.	0	1	–2.98	–1.72	17	10	36	2	2.9	1.9	5.9	4.4	9.3
El Salvador	4	3	1.26	1.45	5	5	12	27	0.9	0.6	0.8	3.2	3.2
Eritrea	16	15	0.28	0.28	10	10	18	3	0.8	4.9	5.0	0.0	0.0
Estonia	21	22	–0.71	0.12	1	3	4	0	0.1	19.6	20.0	26.1	26.1
Ethiopia	151	123	0.97	1.08	32	23	14	26	8.4	17.7	18.4	..	..
Finland	219	222	–0.26	0.14	1	4	5	1	0.2	4.2	9.1	3.5	5.0
France	145	160	–0.55	–0.38	9	7	40	15	5.3	10.1	15.1	1.1	3.4
Gabon	220	220	0.00	0.00	14	5	59	120	3.0	4.2	14.9	0.2	7.1
Gambia, The	4	5	–0.42	–0.40	10	6	21	4	0.1	1.5	1.5	0.1	0.1
Georgia	28	27	0.04	0.09	10	10	9	0	0.6	2.8	3.7	0.2	0.4
Germany	107	111	–0.31	0.00	6	6	21	12	0.6	31.8	40.5	35.7	36.3
Ghana	74	49	1.99	2.08	16	9	42	118	1.9	13.9	14.0	0.0	0.0
Greece	33	39	–0.88	–0.81	10	11	73	13	2.8	5.7	13.8	0.6	2.5
Guatemala	47	37	1.20	1.39	16	10	20	82	8.0	26.0	30.6	0.3	12.5
Guinea	73	65	0.51	0.53	22	13	63	22	2.3	6.8	6.8	0.0	0.0
Guinea-Bissau	22	20	0.44	0.47	12	3	30	4	0.6	7.6	16.1	2.7	45.8
Haiti	1	1	0.62	0.76	5	13	17	29	5.2	0.3	0.3	0.0	0.0
Honduras	81	52	2.38	2.06	7	9	22	113	7.2	13.6	18.2	0.0	1.9

3.4 Deforestation and biodiversity

	Forest area		Average annual deforestation[a]		Threatened species				GEF benefits index for biodiversity	Terrestrial protected areas		Marine protected areas	
	thousand sq. km		%		Mammals	Birds	Fish	Higher plants[b]	0–100 (no biodiversity to maximum biodiversity)	% of total land area		% of territorial waters	
	1990	2010	1990–2000	2000–10	2010	2010	2010	2010	2008	1990	2009	1990	2009
Hungary	18	20	–0.57	–0.62	2	9	8	1	0.2	4.6	5.1	..	..
India	639	684	–0.22	–0.46	94	78	122	255	39.9	5.0	5.3	1.5	1.7
Indonesia	1,185	944	1.75	0.51	183	119	138	393	81.0	10.0	14.1	0.5	1.9
Iran, Islamic Rep.	111	111	0.00	0.00	16	21	29	1	7.3	5.2	7.1	1.3	1.9
Iraq	8	8	–0.17	–0.09	13	18	11	0	1.6	0.1	0.1	0.0	0.0
Ireland	5	7	–3.16	–1.53	5	1	18	1	0.6	0.6	1.0	0.1	0.1
Israel	1	2	–1.49	–0.07	15	13	35	0	0.8	17.2	18.7	1.0	1.0
Italy	76	91	–0.98	–0.90	7	8	42	27	3.8	5.0	9.9	0.5	16.7
Jamaica	3	3	0.12	0.12	5	10	17	209	4.4	10.2	18.9	0.2	4.2
Japan	250	250	0.03	–0.04	28	40	59	15	36.0	13.2	16.3	2.0	5.6
Jordan	1	1	0.00	0.00	13	10	13	1	0.4	8.4	9.4	0.0	20.8
Kazakhstan	34	33	0.17	0.17	16	21	14	16	5.1	2.4	2.5	..	..
Kenya	37	35	0.35	0.33	28	30	66	129	8.8	11.5	11.6	5.1	10.4
Korea, Dem. Rep.	82	57	1.67	2.00	9	22	12	6	0.7	3.9	4.0	0.1	0.1
Korea, Rep.	64	62	0.13	0.11	9	30	17	3	1.7	2.2	2.4	5.0	5.3
Kosovo	..	5[c]	..	..	..	..	..	..	..	..	..	..	..
Kuwait	0	0	–5.24	–1.84	6	9	11	0	0.1	1.6	1.6	0.0	0.0
Kyrgyz Republic	8	10	–0.26	–1.07	6	12	3	14	1.1	6.4	6.9	..	..
Lao PDR	173	158	0.46	0.48	45	22	23	22	5.0	0.8	16.3	..	..
Latvia	32	34	–0.21	–0.34	1	3	5	0	0.0	6.4	17.8	4.6	6.6
Lebanon	1	1	0.00	–0.45	10	7	21	1	0.2	0.5	0.5	0.0	0.1
Lesotho	0	0	–0.49	–0.47	2	7	1	4	0.3	0.5	0.5	..	..
Liberia	49	43	0.63	0.67	19	11	52	47	2.6	18.1	18.1	0.0	0.0
Libya	2	2	0.00	0.00	12	4	21	2	1.6	0.1	0.1	0.0	0.0
Lithuania	19	22	–0.38	–0.67	3	4	5	0	0.0	1.4	4.5	0.8	2.7
Macedonia, FYR	9	10	–0.49	–0.41	5	10	14	0	0.2	4.2	4.8	..	..
Madagascar	137	126	0.42	0.44	63	35	83	280	29.2	2.1	2.9	0.0	0.1
Malawi	39	32	0.88	0.97	7	14	101	14	3.5	15.0	15.0	..	..
Malaysia	224	205	0.36	0.54	70	45	60	692	13.9	16.9	17.9	1.1	1.6
Mali	141	125	0.58	0.61	12	7	3	6	1.5	2.3	2.4	..	..
Mauritania	4	2	2.66	2.66	15	9	30	0	1.3	0.5	0.5	32.1	32.1
Mauritius	0	0	0.00	1.08	6	11	12	88	3.3	1.7	4.5	0.3	0.3
Mexico	703	648	0.52	0.30	99	55	150	255	68.7	2.4	11.1	1.9	16.7
Moldova	3	4	–0.16	–1.77	4	9	9	0	0.0	0.9	1.4	..	..
Mongolia	125	109	0.67	0.72	11	21	1	0	4.2	4.1	13.4	..	..
Morocco	50	51	0.06	–0.22	18	10	45	31	3.5	1.2	1.5	0.7	1.2
Mozambique	434	390	0.52	0.54	12	23	52	52	7.2	14.8	15.8	1.8	3.3
Myanmar	392	318	1.17	0.93	45	41	33	42	10.0	3.1	6.3	0.3	0.3
Namibia	88	73	0.87	0.96	12	24	25	26	5.2	14.4	14.5	0.5	0.5
Nepal	48	36	2.09	0.70	31	33	8	7	2.1	7.7	17.0	..	..
Netherlands	3	4	–0.43	–0.14	4	2	12	0	0.2	11.0	12.4	13.5	21.2
New Zealand	77	83	–0.69	0.00	9	70	21	21	20.2	25.0	25.8	0.4	7.1
Nicaragua	45	31	1.67	2.01	6	11	26	43	3.3	15.4	36.7	0.7	20.1
Niger	19	12	3.74	0.98	12	6	4	2	0.9	6.8	6.8	..	..
Nigeria	172	90	2.68	3.67	27	13	56	172	6.0	11.6	12.8	0.2	0.2
Norway	91	101	–0.19	–0.79	7	2	18	2	1.3	4.7	14.4	1.0	2.3
Oman	0	0	0.00	0.00	9	10	24	6	3.7	0.0	10.7	0.0	1.3
Pakistan	25	17	1.76	2.24	23	26	33	2	4.9	10.3	10.3	1.8	1.8
Panama	38	33	1.18	0.36	15	17	36	202	10.9	17.2	18.7	3.1	4.0
Papua New Guinea	315	287	0.45	0.48	39	37	41	143	25.4	1.9	3.1	0.3	0.3
Paraguay	212	176	0.88	0.96	8	27	0	10	2.8	2.9	5.4	..	..
Peru	702	680	0.14	0.18	54	96	19	274	33.4	4.7	13.6	2.8	2.8
Philippines	66	77	–0.80	–0.74	39	72	65	222	32.3	8.7	10.9	0.2	1.5
Poland	89	93	–0.20	–0.30	5	6	6	4	0.5	15.3	21.8	3.8	4.5
Portugal	33	35	–0.28	–0.10	11	9	47	21	5.5	5.9	5.9	1.8	1.8
Puerto Rico	3	6	–4.92	–1.75	3	8	15	53	4.0	10.1	10.1	1.5	1.6
Qatar	0	0	0.00	0.00	2	5	11	0	0.1	0.0	0.7	0.0	0.3

3.4 Deforestation and biodiversity

	Forest area		Average annual deforestation[a]		Threatened species				GEF benefits index for biodiversity	Terrestrial protected areas		Marine protected areas	
	thousand sq. km		%		Mammals	Birds	Fish	Higher plants[b]	0–100 (no biodiversity to maximum biodiversity)	% of total land area		% of territorial waters	
	1990	2010	1990–2000	2000–10	2010	2010	2010	2010	2008	1990	2009	1990	2009
Romania	64	66	0.01	–0.32	7	12	18	1	0.7	2.8	7.1	1.5	33.2
Russian Federation	8,090	8,091	0.00	0.00	32	18	35	8	34.1	8.2	9.0	3.1	9.1
Rwanda	3	4	–0.79	–2.37	20	12	9	4	0.9	9.9	10.0	..	..
Saudi Arabia	10	10	0.00	0.00	9	14	22	3	3.2	7.6	31.3	0.6	3.4
Senegal	93	85	0.49	0.49	16	9	41	9	1.0	24.1	24.1	5.8	12.4
Serbia	23	27	–0.62	–0.98	6	11	11	1	0.2	3.0	6.0	..	..
Sierra Leone	31	27	0.65	0.69	17	10	45	48	1.3	5.0	5.0	0.0	0.0
Singapore	0	0	0.00	0.00	11	17	25	57	0.1	5.0	5.4	0.0	1.6
Slovak Republic	19	19	0.01	–0.06	3	7	5	2	0.1	19.5	23.5	..	..
Slovenia	12	13	–0.37	–0.16	4	4	26	0	0.2	7.5	12.1	0.0	0.6
Somalia	83	67	0.97	1.07	15	11	26	21	6.1	0.6	0.6	0.0	0.0
South Africa	82	57	1.67	2.00	24	39	81	97	20.7	6.5	6.9	0.7	6.5
Spain	138	182	–2.09	–0.68	16	15	62	55	6.8	7.7	8.6	0.6	3.4
Sri Lanka	24	19	1.20	1.12	30	14	41	283	7.9	19.6	20.8	0.1	1.1
Sudan	764	699	0.80	0.08	15	14	17	18	5.1	4.7	4.9	0.0	0.0
Swaziland	5	6	–0.93	–0.84	5	9	4	11	0.1	3.0	3.0	..	..
Sweden	273	282	–0.04	–0.29	1	3	11	3	0.3	7.1	11.3	3.7	5.3
Switzerland	12	12	–0.37	–0.38	2	2	9	3	0.2	14.5	22.8	..	..
Syrian Arab Republic	4	5	–1.51	–1.29	16	13	33	3	0.9	0.3	0.6	0.0	0.6
Tajikistan	4	4	–0.05	0.00	8	9	5	14	0.7	1.9	4.1	..	..
Tanzania	415	334	1.02	1.13	35	42	172	298	14.8	26.5	27.7	3.7	10.0
Thailand	195	190	0.28	0.02	57	45	72	91	8.0	14.2	19.6	4.0	4.3
Timor-Leste	10	7	1.22	1.40	4	7	5	0	0.6	0.0	6.0	0.0	6.7
Togo	7	3	3.37	5.13	11	3	24	10	0.3	11.3	11.3	0.0	0.0
Trinidad and Tobago	2	2	0.29	0.35	2	2	19	1	2.2	30.5	31.2	0.2	2.8
Tunisia	6	10	–2.67	–1.86	13	7	31	7	0.5	1.3	1.3	1.1	1.2
Turkey	97	113	–0.47	–1.11	17	15	67	5	6.2	1.7	1.9	2.4	2.4
Turkmenistan	41	41	0.00	0.00	9	15	11	3	1.8	3.0	3.0	..	..
Uganda	48	30	2.03	2.55	22	19	61	41	2.8	7.3	9.7	..	..
Ukraine	93	97	–0.25	–0.20	11	12	21	1	0.5	1.8	3.5	4.1	4.9
United Arab Emirates	2	3	–2.38	–0.22	7	10	13	0	0.2	0.3	5.6	0.3	2.6
United Kingdom	26	29	–0.68	–0.31	5	2	41	14	3.5	21.8	24.4	4.7	5.2
United States	2,963	3,040	–0.13	–0.13	37	74	177	245	94.2	14.8	14.8	18.3	24.7
Uruguay	9	17	–4.38	–2.13	11	23	35	1	1.2	0.3	0.3	0.2	0.2
Uzbekistan	30	33	–0.54	–0.20	10	15	7	15	1.1	2.1	2.3	..	..
Venezuela, RB	520	463	0.57	0.60	32	27	34	70	25.3	39.3	53.7	7.0	15.3
Vietnam	94	138	–2.28	–1.64	54	40	46	146	12.1	4.4	6.2	0.3	2.1
West Bank and Gaza	0	0	0.00	0.00	3	8	0	0	..	..	..	..	..
Yemen, Rep.	5	5	0.00	0.00	9	14	21	159	3.2	0.0	0.5	0.0	1.9
Zambia	528	495	0.32	0.33	9	14	20	9	3.8	36.0	36.0	..	..
Zimbabwe	222	156	1.58	1.88	9	13	3	16	1.9	18.0	28.0	..	..
World	**41,582 s**	**40,204 s**	**0.20 w**	**0.13 w**	**1,131 s**	**1,240 s**	**1,851 s**	**8,724 s**		**9.1 w**	**12.5 w**	**4.8 w**	**9.2 w**
Low income	5,524	4,881	0.63	0.61						10.0	11.2	..	..
Middle income	26,552	25,660	0.24	0.10						8.6	12.4	2.9	6.6
Lower middle income	8,103	7,996	0.26	–0.13						8.8	11.5	0.8	2.0
Upper middle income	18,449	17,664	0.23	0.20						8.4	13.0	4.1	9.4
Low & middle income	32,076	30,541	0.31	0.18						8.9	12.2	3.2	6.6
East Asia & Pacific	4,602	4,698	0.17	–0.38						10.8	14.9	0.5	1.5
Europe & Central Asia	8,703	8,750	–0.02	–0.03						6.6	7.4	3.1	8.8
Latin America & Carib.	10,389	9,460	0.48	0.45						10.5	20.8	6.7	13.1
Middle East & N. Africa	207	211	–0.08	–0.13						3.1	4.0	0.9	2.0
South Asia	795	817	0.01	–0.27						5.5	6.1	1.5	1.7
Sub-Saharan Africa	7,379	6,605	0.58	0.52						11.0	11.7	3.2	4.7
High income	9,506	9,663	–0.13	–0.03						9.9	13.4	8.7	15.1
Euro area	838	930	–0.73	–0.31						11.1	15.4	6.5	10.1

a. Negative values indicate an increase in forest area. b. Flowering plants. c. National sources.

Deforestation and biodiversity 3.4

About the data

As threats to biodiversity mount, the international community is increasingly focusing on conserving diversity. Deforestation is a major cause of loss of biodiversity, and habitat conservation is vital for stemming this loss. Conservation efforts have focused on protecting areas of high biodiversity. The Food and Agriculture Organization of the United Nations (FAO) *Global Forest Resources Assessment 2010* provides detailed information on forest cover in 2010 and adjusted estimates of forest cover in 1990 and 2000. The current survey uses a uniform definition of forest. Because of space limitations, the table does not break down forest cover between natural forest and plantation, a breakdown the FAO provides for developing countries. Thus the deforestation data in the table may underestimate the rate at which natural forest is disappearing in some countries.

The number of threatened species is an important measure of the immediate need for conservation in an area. Global analyses of the status of threatened species have been carried out for few groups of organisms. Only for mammals, birds, and amphibians has the status of virtually all known species been assessed. Threatened species are defined using the International Union for Conservation of Nature's (IUCN) classification: *endangered* (in danger of extinction and unlikely to survive if causal factors continue operating) and *vulnerable* (likely to move into the endangered category in the near future if causal factors continue operating).

The Global Environment Facility's (GEF) benefits index for biodiversity is a comprehensive indicator of national biodiversity status and is used to guide its biodiversity priorities. For each country the biodiversity indicator incorporates the best available and comparable information in four relevant dimensions: represented species, threatened species, represented ecoregions, and threatened ecoregions. To combine these dimensions into one measure, the indicator uses dimensional weights that reflect the consensus of conservation scientists at the GEF, IUCN, WWF International, and other nongovernmental organizations.

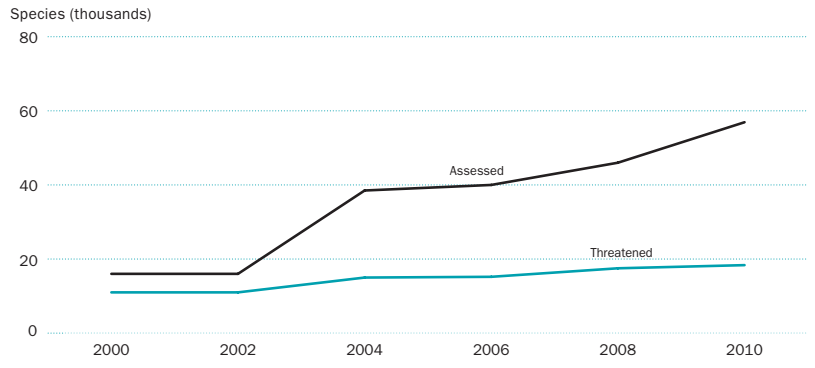
The World Conservation Monitoring Centre (WCMC) compiles data on protected areas, numbers of certain species, and numbers of those species under threat from various sources. Because of differences in definitions, reporting practices, and reporting periods, cross-country comparability is limited. Nationally protected areas are defined using the six IUCN management categories for areas of at least 1,000 hectares: scientific reserves and strict nature reserves with limited public access; national parks of national or international significance and not materially affected by human activity; natural monuments and natural landscapes with unique aspects; managed nature reserves and wildlife sanctuaries; protected landscapes (which may include cultural landscapes); and areas managed mainly for the sustainable use of natural systems to ensure long-term protection and maintenance of biological diversity. The data in the table cover these six categories as well as terrestrial protected areas that are not assigned to a category by the IUCN. Designating an area as protected does not mean that protection is in force. And for small countries that only have protected areas smaller than 1,000 hectares, the size limit in the definition leads to an underestimate of protected areas.

Due to variations in consistency and methods of collection, data quality is highly variable across countries. Some countries update their information more frequently than others, some have more accurate data on extent of coverage, and many underreport the number or extent of protected areas.

Definitions

• **Forest area** is land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent or with trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use. • **Average annual deforestation** is the permanent conversion of natural forest area to other uses, including agriculture, ranching, settlements, and infrastructure. Deforested areas do not include areas logged but intended for regeneration or areas degraded by fuelwood gathering, acid precipitation, or forest fires. • **Threatened species** are the number of species classified by the IUCN as endangered, vulnerable, rare, indeterminate, out of danger, or insufficiently known. Mammals exclude whales and porpoises. Birds are listed for the country where their breeding or wintering ranges are located. Plants are native vascular plant species. • **GEF benefits index for biodiversity** is a composite index of relative biodiversity potential based on the species represented in each country and their threat status and diversity of habitat types. The index has been normalized from 0 (no biodiversity potential) to 100 (maximum biodiversity potential). • **Nationally protected areas** are totally or partially protected areas of at least 1,000 hectares that are designated as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, and protected landscapes. Terrestrial protected areas exclude marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law. Marine protected areas are areas of intertidal or subtidal terrain—and overlying water and associated flora and fauna and historical and cultural features—that have been reserved to protect part or the entire enclosed environment.

At least 33 percent of assessed species are estimated to be threatened 3.4a



Source: International Union for Conservation of Nature.

Data sources

Data on forest area are from the FAO's *Global Forest Resources Assessment 2010* and the FAO's data web site. Data on species are from the electronic files of the United Nations Environment Programme and WCMC, the *2010 IUCN Red List of Threatened Species*, and Froese and Pauly's (2008) FishBase database. The GEF benefits index for biodiversity is from Kiran Dev Pandey, Piet Buys, Ken Chomitz, and David Wheeler's, "Biodiversity Conservation Indicators: New Tools for Priority Setting at the Global Environment Facility" (2006). Data on protected areas are from the United Nations Environment Programme and WCMC, based on data from national authorities and national legislation and international agreements.

3.5 Freshwater

	Internal renewable freshwater resources[a]		Annual freshwater withdrawals					Water productivity	Access to an improved water source	
	Flows billion cu. m 2007	Per capita cu. m 2007	billion cu. m 2007[b]	% of internal resources 2007[b]	% for agriculture 2007[b]	% for industry 2007[b]	% for domestic 2007[b]	GDP/water use 2000 $ per cu. m 2007[b]	% of rural population 2008	% of urban population 2008
Afghanistan	55	1,946	*23.3*	42.3	*98*	*0*	*2*	..	39	78
Albania	27	8,588	*1.7*	6.4	*62*	*11*	*27*	*3*	98	96
Algeria	11	332	*6.1*	54.0	*65*	*13*	*22*	*12*	79	85
Angola	148	8,431	*0.4*	0.2	*60*	*17*	*23*	*61*	38	60
Argentina	276	6,989	*29.2*	10.6	*74*	*9*	*17*	*13*	80	98
Armenia	9	2,952	*3.0*	32.5	*66*	*4*	*30*	*1*	93	98
Australia	492	23,348	*23.9*	4.9	*75*	*10*	*15*	*22*	100	100
Austria	55	6,626	*2.1*	3.8	*1*	*64*	*35*	*105*	100	100
Azerbaijan	8	946	12.2	*150.5*	76	19	4	1	71	88
Bangladesh	105	666	*79.4*	75.6	*96*	*1*	*3*	*1*	78	85
Belarus	37	3,834	*2.8*	7.5	*30*	*47*	*23*	*8*	99	100
Belgium	12	1,129	0.0	..	..	..	..	..	100	100
Benin	10	1,227	*0.1*	1.3	*45*	*23*	*32*	*23*	69	84
Bolivia	304	31,868	*1.4*	0.5	*81*	*7*	*13*	*7*	67	96
Bosnia and Herzegovina	36	9,395	0.0	..	..	..	..	..	98	100
Botswana	2	1,268	*0.2*	8.1	*41*	*18*	*41*	*41*	90	99
Brazil	5,418	28,498	*59.3*	1.1	*62*	*18*	*20*	*14*	84	99
Bulgaria	21	2,742	*10.5*	50.0	*19*	*78*	*3*	*2*	100	100
Burkina Faso	13	849	*0.8*	6.4	*86*	*1*	*13*	*5*	72	95
Burundi	10	1,283	*0.3*	2.9	*77*	*6*	*17*	*3*	71	83
Cambodia	121	8,417	*4.1*	3.4	*98*	*0*	*1*	*2*	56	81
Cameroon	273	14,630	*1.0*	0.4	*74*	*8*	*18*	*13*	51	92
Canada	2,850	86,426	*46.0*	1.6	*12*	*69*	*20*	*19*	99	100
Central African Republic	141	33,119	*0.0*	0.0	*4*	*16*	*80*	*39*	51	92
Chad	15	1,412	*0.2*	1.5	*83*	*0*	*17*	*13*	44	67
Chile	884	53,137	*12.6*	1.4	*64*	*25*	*11*	*8*	75	99
China	2,813	2,134	*554.1*	22.4	*65*	*23*	*12*	*4*	82	98
Hong Kong SAR, China	..	..	..	..	..	..	..	..	..	..
Colombia	2,112	47,611	*10.7*	0.5	*46*	*4*	*50*	*13*	73	99
Congo, Dem. Rep.	900	14,395	*0.4*	0.0	*31*	*17*	*53*	*16*	28	80
Congo, Rep.	222	62,516	*0.0*	*0.0*	*9*	*22*	*70*	*89*	34	95
Costa Rica	112	25,209	*2.7*	2.4	*53*	*17*	*29*	*9*	91	100
Côte d'Ivoire	77	3,819	*0.9*	1.2	*65*	*12*	*24*	*11*	68	93
Croatia	38	8,499	0.0	..	..	..	..	..	97	100
Cuba	38	3,402	*8.2*	21.5	*69*	*12*	*19*	*6*	89	96
Czech Republic	13	1,272	*2.6*	19.6	*2*	*57*	*41*	*30*	100	100
Denmark	6	1,099	*1.3*	21.2	*43*	*25*	*32*	*141*	100	100
Dominican Republic	21	2,139	*3.4*	16.1	*66*	*2*	*32*	*10*	84	87
Ecuador	432	32,379	*17.0*	3.9	*82*	*5*	*12*	*1*	88	97
Egypt, Arab Rep.	2	22	*68.3*	3,794.4	*86*	*6*	*8*	*2*	98	100
El Salvador	18	2,907	*1.3*	7.2	*59*	*16*	*25*	*13*	76	94
Eritrea	3	586	*0.6*	20.8	*95*	*0*	*5*	*1*	57	74
Estonia	13	9,475	*0.2*	1.2	*5*	*38*	*57*	*64*	97	99
Ethiopia	122	1,551	*5.6*	4.6	*94*	*0*	*6*	*2*	26	98
Finland	107	20,232	*2.5*	2.3	*3*	*84*	*14*	*62*	100	100
France	200	3,229	*31.8*	22.4	*12*	*69*	*18*	*38*	100	100
Gabon	164	115,340	*0.1*	0.1	*42*	*8*	*50*	*49*	41	95
Gambia, The	3	1,857	*0.0*	1.0	*65*	*12*	*23*	*19*	86	96
Georgia	58	13,339	1.6	2.8	65	13	22	3	96	100
Germany	107	1,301	*47.1*	44.0	*20*	*68*	*12*	*44*	100	100
Ghana	30	1,325	*1.0*	3.2	*66*	*10*	*24*	*7*	74	90
Greece	58	5,182	*7.8*	13.4	*80*	*3*	*16*	*22*	99	100
Guatemala	109	8,177	*2.0*	1.8	*80*	*13*	*6*	*12*	90	98
Guinea	226	23,505	*1.5*	0.7	*90*	*2*	*8*	*3*	61	89
Guinea-Bissau	16	10,383	*0.2*	1.1	*82*	*5*	*13*	*1*	51	83
Haiti	13	1,338	*1.0*	7.6	*94*	*1*	*5*	*4*	55	71
Honduras	96	13,372	*0.9*	0.9	*80*	*12*	*8*	*12*	77	95

3.5 Freshwater

	Internal renewable freshwater resources[a]		Annual freshwater withdrawals					Water productivity	Access to an improved water source	
	Flows billion cu. m 2007	Per capita cu. m 2007	billion cu. m 2007[b]	% of internal resources 2007[b]	% for agriculture 2007[b]	% for industry 2007[b]	% for domestic 2007[b]	GDP/water use 2000 $ per cu. m 2007[b]	% of rural population 2008	% of urban population 2008
Hungary	6	597	7.6	127.3	32	59	9	8	100	100
India	1,276	1,134	40.4	51.2	91	2	7	1	84	96
Indonesia	2,019	8,987	82.8	2.9	82	7	12	1.2	71	89
Iran, Islamic Rep.	129	1,809	93.3	72.6	92	1	7	2	..	98
Iraq	35	1,175	66.0	187.5	79	15	7	0	55	91
Ireland	49	11,246	..	..	..	..	..	125	100	100
Israel	1	104	2.0	260.5	58	6	36	79	100	100
Italy	183	3,074	44.4	24.3	45	37	18	27	100	100
Jamaica	9	3,514	0.4	4.4	49	17	34	25	89	98
Japan	430	3,365	88.4	20.6	62	18	20	59	100	100
Jordan	1	120	0.9	138.0	65	4	31	14	91	98
Kazakhstan	75	4,871	35.0	46.4	82	17	2	1	90	99
Kenya	21	548	2.7	13.2	79	4	17	6	52	83
Korea, Dem. Rep.	67	2,824	9.0	13.5	55	25	20	..	100	100
Korea, Rep.	65	1,338	18.6	28.7	48	16	36	40	88	100
Kosovo	..	..	..	..	..	..	..	..	..	..
Kuwait	0	0	0.5	..	54	2	44	67	99	99
Kyrgyz Republic	46	8,873	10.1	21.7	94	3	3	0	85	99
Lao PDR	190	31,256	3.0	1.6	90	6	4	1	51	72
Latvia	17	7,355	0.3	1.8	13	33	53	48	96	100
Lebanon	5	1,153	1.3	27.3	60	11	29	17	100	100
Lesotho	5	2,574	0.1	1.0	20	40	40	18	81	97
Liberia	200	55,138	0.1	0.1	55	18	27	5	51	79
Libya	1	97	4.3	721.0	83	3	14	11	..	..
Lithuania	16	4,610	0.3	1.7	7	15	78	73	..	..
Macedonia, FYR	5	2,647	0.0	..	..	..	..	..	99	100
Madagascar	337	18,114	15.0	4.4	96	2	3	0	29	71
Malawi	16	1,118	1.0	6.3	80	5	15	2	77	95
Malaysia	580	21,841	9.0	1.6	62	21	17	15	99	100
Mali	60	4,835	6.5	10.9	90	1	9	1	44	81
Mauritania	0[c]	127	1.7	425.0	88	3	9	1	47	52
Mauritius	3	2,182	0.7	26.4	68	3	30	8	99	100
Mexico	409	3,885	78.2	19.1	77	5	17	9	87	96
Moldova	1	273	2.3	231.0	33	58	10	1	85	96
Mongolia	35	13,326	0.4	1.3	52	27	20	4	49	97
Morocco	29	929	12.6	43.4	87	3	10	4	60	98
Mozambique	100	4,586	0.6	0.6	87	2	11	12	29	77
Myanmar	1003	20,415	33.2	3.8	89	1	10	..	69	75
Namibia	6	2,949	0.3	4.9	71	5	24	19	88	99
Nepal	198	7,007	10.2	5.1	96	1	3	1	87	93
Netherlands	11	671	7.9	72.2	34	60	6	55	100	100
New Zealand	327	77,336	2.1	0.6	42	9	48	31	100	100
Nicaragua	190	33,912	1.3	0.7	83	2	15	4	68	98
Niger	4	248	2.2	62.3	95	0	4	1	39	96
Nigeria	221	1,496	8.0	3.6	69	10	21	9	42	75
Norway	382	81,119	2.2	0.6	11	67	23	90	100	100
Oman	1	514	1.3	94.4	88	1	10	20	77	92
Pakistan	55	338	169.4	308.0	96	2	2	1	87	95
Panama	147	44,094	0.8	0.6	28	5	67	21	83	97
Papua New Guinea	801	124,716	0.1	0.0	1	42	56	59	33	87
Paraguay	94	15,343	0.5	0.5	71	8	20	18	66	99
Peru	1,616	56,685	20.1	1.2	82	10	8	4	61	90
Philippines	479	5,399	28.5	6.0	74	9	17	4	87	93
Poland	54	1,406	16.2	30.2	8	79	13	14	100	100
Portugal	38	3,582	11.3	29.6	78	12	10	11	100	99
Puerto Rico	7	1,801	0.0	..	..	..	..	..	..	..
Qatar	0	45	0.4	870.6	59	2	39	90	100	100

3.5 Freshwater

	Internal renewable freshwater resources[a]		Annual freshwater withdrawals					Water productivity	Access to an improved water source	
	Flows billion cu. m 2007	Per capita cu. m 2007	billion cu. m 2007[b]	% of internal resources 2007[b]	% for agriculture 2007[b]	% for industry 2007[b]	% for domestic 2007[b]	GDP/water use 2000 $ per cu. m 2007[b]	% of rural population 2008	% of urban population 2008
Romania	42	1,963	*23.2*	54.8	*57*	*34*	*9*	*2*	..	..
Russian Federation	4,313	30,350	*76.7*	1.8	*18*	*63*	*19*	*5*	89	98
Rwanda	10	1,005	*0.2*	1.6	*68*	*8*	*24*	*19*	62	77
Saudi Arabia	2	99	*23.7*	986.1	*88*	*3*	*9*	*10*	..	97
Senegal	26	2,169	*2.2*	*8.6*	*93*	*3*	*4*	*3*	52	92
Serbia	44[c]	*5,419*[c]	0.0[c]	..	..	..	..	..	98	99
Sierra Leone	160	29,518	*0.4*	0.2	*92*	*3*	*5*	*4*	26	86
Singapore	1	131	0.0	..	..	..	..	..	..	100
Slovak Republic	13	2,334	0.0	..	..	..	..	..	100	100
Slovenia	19	9,251	0.0	..	..	..	..	..	99	100
Somalia	6	687	*3.3*	55.0	*99*	*0*	*0*	..	9	67
South Africa	45	928	*12.5*	27.9	*63*	*6*	*31*	*14*	78	99
Spain	111	2,478	*35.6*	32.0	*68*	*19*	*13*	*21*	100	100
Sri Lanka	50	2,499	*12.6*	25.2	*95*	*2*	*2*	*2*	88	98
Sudan	30	742	*37.3*	124.4	*97*	*1*	*3*	*1*	52	64
Swaziland	3	2,293	*1.0*	39.5	*97*	*1*	*2*	*2*	61	92
Sweden	171	18,692	*3.0*	1.7	*9*	*54*	*37*	*103*	100	100
Switzerland	40	5,350	*2.6*	6.4	*2*	*74*	*24*	*111*	100	100
Syrian Arab Republic	7	349	*16.7*	*238.4*	*88*	*4*	*9*	*2*	84	94
Tajikistan	66	9,855	*12.0*	18.0	*92*	*5*	*4*	*0*	61	94
Tanzania	84	2,035	*5.2*	*6.2*	*89*	*0*	*10*	*3*	45	80
Thailand	210	3,135	*87.1*	41.5	*95*	*2*	*2*	*2*	98	99
Togo	12	1,825	*0.2*	*1.5*	*45*	*2*	*53*	9	41	87
Trinidad and Tobago	4	2,891	*0.3*	8.1	*6*	*26*	*68*	*46*	93	98
Tunisia	4	410	*2.6*	62.9	*82*	*4*	*14*	*10*	84	99
Turkey	227	3,109	*40.1*	17.7	*74*	*11*	*15*	9	96	100
Turkmenistan	1	273	*24.7*	1,812.5	*98*	*1*	*2*	*0*	72	97
Uganda	39	1,273	0.0	..	40	16	43	..	64	91
Ukraine	53	1,142	*37.5*	70.7	*52*	*35*	*12*	*1*	97	98
United Arab Emirates	0	34	4.0	2,665.3	83	2	15	28	100	100
United Kingdom	145	2,378	*9.5*	6.6	*3*	*75*	*22*	*185*	100	100
United States	2,818	9,344	*477.8*	17.1	*40*	*46*	*14*	*24*	94	100
Uruguay	59	17,750	*3.2*	5.3	*96*	*1*	*3*	*8*	100	100
Uzbekistan	16	608	*58.3*	357.0	*93*	*2*	*5*	*0*	81	98
Venezuela, RB	722	26,287	*8.4*	1.2	*47*	*7*	*46*	*19*	75	94
Vietnam	367	4,304	*71.4*	19.5	*68*	*24*	*8*	*1*	92	99
West Bank and Gaza	1	212	0.4	..	45	7	48	..	91	91
Yemen, Rep.	2	94	*3.4*	161.9	*90*	*2*	*8*	*4*	57	72
Zambia	80	6,513	*1.7*	2.2	*76*	*7*	*17*	*3*	46	87
Zimbabwe	12	985	*4.2*	*34.3*	*79*	*7*	*14*	*1*	72	99
World	**43,464 s**	**6,616 w**	**3,850.0 s**	**9.0 w**	**70 w**	**20 w**	**10 w**	**10 w**	**78 w**	**96 w**
Low income	4,418	5,452	240.9	5.6	93	2	5	1	56	85
Middle income	29,421	6,271	2,672.1	9.1	78	14	9	3	81	95
Lower middle income	11,728	3,155	2,103.9	17.9	81	12	7	2	81	94
Upper middle income	17,694	18,142	568.2	3.2	65	19	15	7	86	98
Low & middle income	33,839	6,150	2,913.0	8.6	79	13	8	3	76	94
East Asia & Pacific	9,454	4,940	959.0	10.2	74	20	7	3	81	96
Europe & Central Asia	5,059	12,911	351.9	7.0	63	27	10	3	89	98
Latin America & Carib.	13,425	24,001	264.9	2.0	71	10	19	10	80	97
Middle East & N. Africa	225	714	275.6	122.3	86	6	8	2	80	95
South Asia	1,819	1,194	941.1	51.7	90	4	6	1	83	95
Sub-Saharan Africa	3,858	4,826	120.5	3.2	87	3	10	4	47	82
High income	9,624	9,017	937.0	10.5	42	43	15	32	98	100
Euro area	955	2,932	200.2	22.0	38	48	15	34	100	100

a. Excludes river flows from other countries because of data unreliability. b. Data are for the most recent year available (see Primary data documentation). c. Includes Kosovo and Montenegro.

About the data

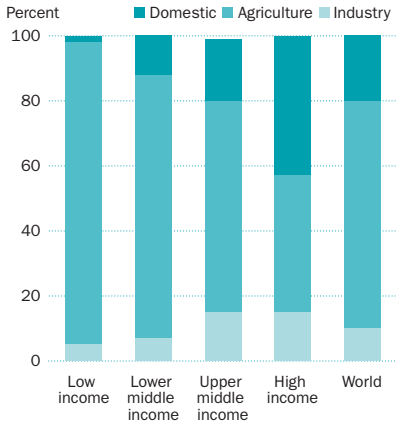
The data on freshwater resources are based on estimates of runoff into rivers and recharge of groundwater. These estimates are based on different sources and refer to different years, so cross-country comparisons should be made with caution. Because the data are collected intermittently, they may hide significant variations in total renewable water resources from year to year. The data also fail to distinguish between seasonal and geographic variations in water availability within countries. Data for small countries and countries in arid and semiarid zones are less reliable than those for larger countries and countries with greater rainfall.

Caution should also be used in comparing data on annual freshwater withdrawals, which are subject to variations in collection and estimation methods. In addition, inflows and outflows are estimated at different times and at different levels of quality and precision, requiring caution in interpreting the data, particularly for water-short countries, notably in the Middle East and North Africa.

Water productivity is an indication only of the efficiency by which each country uses its water resources. Given the different economic structure of each country, these indicators should be used carefully, taking into account the countries' sectoral activities and natural resource endowments.

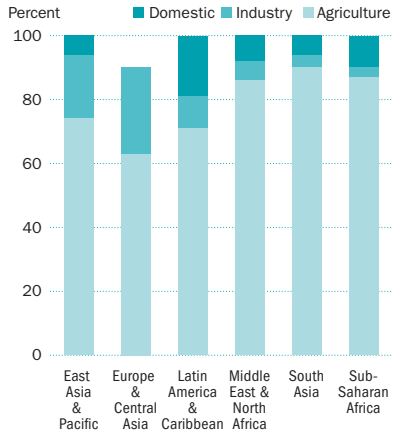
The data on access to an improved water source measure the percentage of the population with ready access to water for domestic purposes. The data are based on surveys and estimates provided by governments to the Joint Monitoring Programme of the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). The coverage rates are based on information from service users on actual household use rather than on information from service providers, which may include nonfunctioning systems. Access to drinking water from an improved source does not ensure that the water is safe or adequate, as these characteristics are not tested at the time of survey. While information on access to an improved water source is widely used, it is extremely subjective, and such terms as *safe, improved, adequate,* and *reasonable* may have different meaning in different countries despite official WHO definitions (see *Definitions*). Even in high-income countries treated water may not always be safe to drink. Access to an improved water source is equated with connection to a supply system; it does not take into account variations in the quality and cost (broadly defined) of the service.

Agriculture is still the largest user of water, accounting for some 70 percent of global withdrawals . . . 3.5a



Source: Table 3.5.

. . . and approaching 90 percent in some developing regions 3.5b



Source: Table 3.5.

Definitions

• **Internal renewable freshwater resources** are the average annual flows of rivers and groundwater from rainfall in the country. Natural incoming flows originating outside a country's borders are excluded. Overlapping water resources between surface runoff and groundwater recharge are also deducted. • **Renewable internal freshwater resources per capita** are calculated using the World Bank's population estimates (see table 2.1). • **Annual freshwater withdrawals** are total water withdrawals, not counting evaporation losses from storage basins. Withdrawals also include water from desalination plants in countries where they are a significant source. Withdrawals can exceed 100 percent of total renewable resources where extraction from nonrenewable aquifers or desalination plants is considerable or where water reuse is significant. Withdrawals for agriculture and industry are total withdrawals for irrigation and livestock production and for direct industrial use (including for cooling thermoelectric plants). Withdrawals for domestic uses include drinking water, municipal use or supply, and use for public services, commercial establishments, and homes. • **Water productivity** is calculated as GDP in constant prices divided by annual total water withdrawal. • **Access to an improved water source** is the percentage of the population with reasonable access to an adequate amount of water from an improved source, such as piped water into a dwelling, plot, or yard; public tap or standpipe; tubewell or borehole; protected dug well or spring; and rainwater collection. Unimproved sources include unprotected dug wells or springs, carts with small tank or drum, bottled water, and tanker trucks. Reasonable access is defined as the availability of at least 20 liters a person a day from a source within 1 kilometer of the dwelling.

Data sources

Data on freshwater resources and withdrawals are from the Food and Agriculture Organization of the United Nations AQUASTAT data. The GDP estimates used to calculate water productivity are from the World Bank national accounts database. Data on access to water are from WHO and UNICEF's *Progress on sanitation and drinking water* (2010).

3.6 Water pollution

	Emissions of organic water pollutants				Industry shares of emissions of organic water pollutants							
	thousand kilograms per day		kilograms per day per worker		% of total							
	1990	2007[a]	1990	2007[a]	Primary metals 2007[a]	Paper and pulp 2007[a]	Chemicals 2007[a]	Food and beverages 2007[a]	Stone, ceramics, and glass 2007[a]	Textiles 2007[a]	Wood 2007[a]	Other 2007[a]
Afghanistan	..	*0.2*	..	*0.21*	..	*19.7*	*27.9*	*14.1*	*11.7*	*23.3*	..	*3.1*
Albania	2.4	3.6	*0.25*	0.25	..	..	..	39.8	..	60.2	..	11.9
Algeria	..	..	..	..	..	..	..	..	..	..	..	..
Angola	..	..	..	..	..	..	..	..	..	..	..	..
Argentina	181.4	*155.5*	0.21	*0.23*	*3.8*	*8.4*	*15.8*	*30.5*	*3.5*	*14.3*	*2.1*	*21.6*
Armenia	..	..	..	..	..	..	..	..	..	..	..	..
Australia	..	..	..	..	..	..	..	..	..	..	..	..
Austria	90.5	*84.4*	*0.15*	*0.14*	*5.7*	*7.1*	*9.3*	*12.2*	*5.8*	*4.3*	*6.0*	*49.5*
Azerbaijan	41.3	20.0	*0.15*	0.18	8.8	3.0	18.5	19.6	8.4	11.7	1.5	28.6
Bangladesh	*250.8*	*303.0*	*0.15*	*0.14*	*0.7*	*2.3*	*3.0*	*7.6*	*2.6*	*79.3*	*0.5*	*4.2*
Belarus	..	..	..	..	..	..	..	..	..	..	..	..
Belgium	*107.8*	95.9	*0.17*	*0.17*	*6.4*	*7.9*	*18.6*	*16.4*	*3.1*	*5.5*	*2.2*	*40.0*
Benin	..	..	..	..	..	..	..	..	..	..	..	..
Bolivia	*11.3*	*11.5*	*0.24*	*0.25*	*0.9*	*9.8*	*13.1*	*35.4*	*7.7*	*18.4*	*5.3*	*9.5*
Bosnia and Herzegovina	..	..	..	..	..	..	..	..	..	..	..	..
Botswana	*2.5*	3.2	*0.30*	0.23	..	2.4	..	43.8	0.6	3.9	..	50.0
Brazil	..	..	..	..	..	..	..	..	..	..	..	..
Bulgaria	*124.3*	102.1	*0.17*	0.17	3.7	4.3	8.0	17.7	4.8	26.8	3.0	31.7
Burkina Faso	..	..	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..	..	..
Cambodia	*3.8*	..	*0.17*	..	..	..	..	..	..	..	..	..
Cameroon	..	..	..	..	..	..	..	..	..	..	..	..
Canada	300.9	*306.6*	0.17	*0.16*	*4.3*	*8.9*	*10.9*	*14.0*	*2.8*	*7.3*	*6.5*	*45.3*
Central African Republic	..	..	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..
Chile	..	92.5	..	0.25	7.6	6.3	13.7	35.1	3.6	9.1	6.9	17.7
China	..	*9,428.9*	..	*0.13*	*7.2*	*3.9*	*13.0*	*7.4*	*6.3*	*20.6*	*1.7*	*39.9*
Hong Kong SAR, China	..	..	..	..	..	..	..	..	..	..	..	..
Colombia	..	*87.0*	..	*0.20*	*2.3*	*8.9*	*17.3*	*21.3*	*5.3*	*24.1*	*0.9*	*19.9*
Congo, Dem. Rep.	..	..	..	..	..	..	..	..	..	..	..	..
Congo, Rep.	..	..	..	..	..	..	..	..	..	..	..	..
Costa Rica	..	..	..	..	..	..	..	..	..	..	..	..
Côte d'Ivoire	..	..	..	..	..	..	..	..	..	..	..	..
Croatia	*48.5*	42.9	*0.17*	0.17	3.1	7.2	9.5	17.6	5.9	14.5	4.9	37.2
Cuba	..	..	..	..	..	..	..	..	..	..	..	..
Czech Republic	*177.1*	146.5	*0.14*	0.13	5.4	4.8	10.9	10.9	6.4	7.4	4.4	49.8
Denmark	*84.5*	61.0	*0.18*	0.16	1.4	11.5	13.1	16.4	4.8	1.5	4.0	47.3
Dominican Republic	*88.6*	..	*0.18*	..	..	..	..	..	..	..	..	..
Ecuador	*28.6*	*44.7*	*0.24*	*0.28*	*1.8*	*7.8*	*12.8*	*46.4*	*4.4*	*12.3*	*2.2*	*12.3*
Egypt, Arab Rep.	*206.5*	..	*0.19*	..	..	..	..	..	..	..	..	..
El Salvador	..	..	..	..	..	..	..	..	..	..	..	..
Eritrea	*2.4*	2.5	*0.19*	0.20	0.2	4.4	9.5	27.3	9.6	29.0	0.1	20.3
Estonia	*21.7*	16.0	*0.15*	0.14	0.4	7.3	7.1	14.6	5.5	8.0	16.4	40.8
Ethiopia	*18.5*	32.2	*0.23*	0.24	1.4	6.0	10.9	34.7	8.3	27.9	1.5	9.3
Finland	72.5	55.3	0.19	0.14	1.0	15.4	8.7	9.0	4.4	2.8	7.3	51.4
France	*326.5*	*569.4*	*0.11*	*0.16*	*3.2*	*7.4*	*15.0*	*16.6*	*3.8*	*4.8*	*2.4*	*46.9*
Gabon	..	..	..	..	..	..	..	..	..	..	..	..
Gambia, The	*0.8*	..	*0.27*	..	..	..	..	..	..	..	..	..
Georgia	..	..	..	..	..	..	..	..	..	..	..	..
Germany	806.6	936.2	0.13	0.14	3.8	7.1	12.4	11.4	3.4	2.4	1.9	57.6
Ghana	..	*16.0*	..	*0.17*	*3.0*	*3.8*	*15.9*	*18.6*	*4.1*	*10.2*	*33.3*	*11.2*
Greece	50.9	*60.8*	0.19	*0.20*	*3.9*	*9.0*	*10.1*	*23.9*	*7.0*	*14.4*	*2.8*	*28.9*
Guatemala	..	..	..	..	..	..	..	..	..	..	..	..
Guinea	..	..	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..
Haiti	5.2	..	0.20	..	..	..	..	..	..	..	..	..
Honduras	..	..	..	..	..	..	..	..	..	..	..	..

3.6 Water pollution

	Emissions of organic water pollutants				Industry shares of emissions of organic water pollutants							
	thousand kilograms per day		kilograms per day per worker		% of total							
	1990	2007[a]	1990	2007[a]	Primary metals 2007[a]	Paper and pulp 2007[a]	Chemicals 2007[a]	Food and beverages 2007[a]	Stone, ceramics, and glass 2007[a]	Textiles 2007[a]	Wood 2007[a]	Other 2007[a]
Hungary	122.1	110.6	0.18	0.15	2.7	6.4	10.6	15.2	3.7	9.1	3.3	49.0
India	..	..	..	..	..	..	..	..	..	..	..	..
Indonesia	721.8	883.0	0.18	0.19	1.4	4.1	12.0	23.1	4.0	29.2	6.3	19.9
Iran, Islamic Rep.	131.6	160.8	0.16	0.15	7.1	2.8	12.8	16.1	13.8	11.2	0.7	35.5
Iraq	7.7	7.7	0.27	0.27	13.1	25.6	29.9	16.9	5.4	9.1	..	..
Ireland	36.1	28.4	0.19	0.16	1.3	10.2	17.6	14.8	5.9	0.8	3.8	45.5
Israel	54.6	52.7	0.16	0.16	1.6	8.9	13.4	16.4	2.9	7.9	1.2	47.6
Italy	378.3	479.2	0.13	0.13	3.5	5.2	10.3	9.3	5.4	13.6	2.9	49.6
Jamaica	..	..	..	..	..	..	..	..	..	..	..	..
Japan	1,455.0	1,126.9	0.14	0.15	3.3	7.0	11.2	15.0	3.6	5.3	2.0	52.5
Jordan	15.0	29.1	0.18	0.18	2.3	6.1	13.7	20.8	11.5	18.6	2.3	24.5
Kazakhstan	123.5	97.4	0.23	0.24	33.3	2.3	8.9	18.7	9.3	3.9	0.6	23.0
Kenya	..	..	..	..	..	..	..	..	..	..	..	..
Korea, Dem. Rep.	..	..	..	..	..	..	..	..	..	..	..	..
Korea, Rep.	366.9	319.6	0.12	0.11	4.2	5.4	12.1	6.3	3.0	9.3	0.9	58.9
Kosovo	..	..	..	..	..	..	..	..	..	..	..	..
Kuwait	..	..	..	..	..	..	..	..	..	..	..	..
Kyrgyz Republic	28.9	12.2	0.14	0.20	9.8	6.3	8.5	24.2	17.5	9.8	1.6	22.4
Lao PDR	4.3	4.3	0.14	0.14	1.8	2.2	3.8	9.2	7.5	49.2	21.4	4.9
Latvia	39.8	28.4	0.12	0.18	2.7	7.7	5.8	21.1	4.4	11.8	19.1	27.3
Lebanon	14.7	14.7	0.19	0.19	0.5	7.5	6.0	25.5	12.9	16.7	4.5	26.3
Lesotho	..	5.3	..	0.13	0.9	0.5	0.3	2.6	0.8	93.5	..	1.4
Liberia	..	..	..	..	..	..	..	..	..	..	..	..
Libya	..	..	..	..	..	..	..	..	..	..	..	..
Lithuania	54.0	42.2	0.15	0.17	0.9	5.7	8.3	20.5	4.7	17.6	11.4	30.8
Macedonia, FYR	27.0	20.3	0.20	0.18	5.8	4.7	6.3	15.1	3.2	44.7	2.9	17.3
Madagascar	..	92.8	..	0.14	0.3	1.6	12.4	7.6	2.8	58.9	6.3	10.0
Malawi	37.2	32.7	0.40	0.39	..	1.4	3.7	82.1	0.6	7.5	1.1	3.6
Malaysia	..	208.3	..	0.12	2.8	4.9	16.5	9.1	3.8	6.6	7.8	48.5
Mali	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	16.8	15.4	0.16	0.17	0.4	3.6	5.9	14.7	..	63.9	0.7	10.9
Mexico	425.0	..	0.18	..	..	..	..	..	..	..	..	..
Moldova	29.2	18.8	0.44	0.45	..	3.8	..	95.2	..	..	..	0.9
Mongolia	..	8.8	..	0.22	3.7	5.1	3.3	27.2	9.5	41.6	5.4	4.1
Morocco	..	74.0	..	0.16	1.0	2.9	7.9	16.3	6.5	43.5	2.0	19.9
Mozambique	..	..	..	..	..	..	..	..	..	..	..	..
Myanmar	..	..	..	..	..	..	..	..	..	..	..	..
Namibia	..	..	..	..	..	..	..	..	..	..	..	..
Nepal	26.4	26.8	0.14	0.16	1.6	3.9	7.2	19.2	29.9	29.4	2.0	6.8
Netherlands	142.3	128.2	0.20	0.19	3.1	13.4	14.1	18.2	4.0	2.1	2.6	42.5
New Zealand	46.7	61.6	0.24	0.23	2.0	12.2	8.6	31.1	3.1	5.8	8.0	29.3
Nicaragua	..	..	..	..	..	..	..	..	..	..	..	..
Niger	..	..	..	..	..	..	..	..	..	..	..	..
Nigeria	..	..	..	..	..	..	..	..	..	..	..	..
Norway	51.8	46.9	0.20	0.18	4.9	12.1	7.5	19.1	4.3	2.0	6.0	44.2
Oman	3.8	7.6	0.15	0.16	4.0	4.6	17.8	20.4	20.5	2.4	4.0	26.3
Pakistan	..	153.7	..	0.17	2.2	1.9	9.1	15.1	4.3	55.6	0.4	11.2
Panama	10.3	13.7	0.30	0.32	0.9	11.6	6.9	55.2	4.0	4.7	1.6	15.0
Papua New Guinea	..	..	..	..	..	..	..	..	..	..	..	..
Paraguay	15.3	10.8	0.20	0.28	3.1	9.3	16.7	42.6	5.9	11.0	4.5	6.9
Peru	..	..	..	..	..	..	..	..	..	..	..	..
Philippines	169.0	144.6	0.17	0.15	2.6	4.2	9.5	14.4	2.7	21.6	2.1	42.9
Poland	446.7	359.7	0.16	0.16	3.3	5.1	11.3	18.1	5.5	10.3	4.9	41.5
Portugal	140.6	87.7	0.14	0.17	0.2	8.1	3.4	19.8	5.2	16.3	8.5	38.5
Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..
Qatar	..	6.4	..	0.12	3.7	6.7	10.5	6.5	18.1	20.7	12.5	21.3

3.6 Water pollution

	Emissions of organic water pollutants				Industry shares of emissions of organic water pollutants							
	thousand kilograms per day		kilograms per day per worker		% of total							
	1990	2007[a]	1990	2007[a]	Primary metals 2007[a]	Paper and pulp 2007[a]	Chemicals 2007[a]	Food and beverages 2007[a]	Stone, ceramics, and glass 2007[a]	Textiles 2007[a]	Wood 2007[a]	Other 2007[a]
Romania	411.2	222.1	0.12	0.15	4.5	3.5	7.1	13.9	4.0	25.0	5.3	36.8
Russian Federation	*1,521.4*	1,381.7	*0.16*	0.17	8.4	4.9	11.6	17.9	8.3	6.3	4.2	38.4
Rwanda	*8.1*	*8.1*	*0.37*	*0.37*	..	..	*9.0*	*77.1*	*4.3*	*1.9*	*2.9*	*4.8*
Saudi Arabia	..	106.6	..	0.18	3.2	6.9	11.6	20.0	10.7	14.4	3.3	30.0
Senegal	*6.1*	*6.6*	*0.30*	*0.29*	*4.9*	*6.3*	*23.8*	*44.6*	*3.9*	*10.5*	*0.8*	*5.3*
Serbia	..	..	..	..	..	..	..	..	..	..	..	..
Sierra Leone	..	..	..	..	..	..	..	..	..	..	..	..
Singapore	*33.1*	38.3	*0.09*	0.09	0.5	5.5	11.9	5.3	1.3	2.3	0.5	72.7
Slovak Republic	*72.8*	*47.9*	*0.13*	*0.14*	*7.9*	*5.4*	*9.1*	*10.7*	*6.0*	*5.0*	*4.2*	*51.7*
Slovenia	*28.1*	28.8	*0.13*	0.13	4.6	6.1	12.2	7.7	4.1	10.8	4.9	49.6
Somalia	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	*260.5*	229.6	*0.17*	0.17	9.9	6.6	10.6	15.7	5.2	10.4	4.2	37.4
Spain	*348.0*	*378.8*	*0.16*	*0.15*	*3.1*	*8.0*	*10.8*	*15.3*	*7.9*	*8.4*	*3.8*	*42.7*
Sri Lanka	..	266.1	..	0.19	2.6	4.3	9.0	22.4	6.3	43.6	2.5	9.3
Sudan	..	*38.6*	..	*0.29*	*0.6*	*1.9*	*7.0*	*57.5*	*14.2*	*8.0*	*1.7*	*9.1*
Swaziland	..	..	..	..	..	..	..	..	..	..	..	..
Sweden	116.8	*96.9*	0.15	*0.14*	*5.3*	*11.9*	9.9	8.6	*2.6*	*1.2*	5.6	*54.9*
Switzerland	..	..	..	..	..	..	..	..	..	..	..	..
Syrian Arab Republic	*59.7*	*80.4*	*0.16*	*0.16*	*1.6*	*1.9*	*7.3*	*19.9*	*11.3*	*32.0*	*5.2*	*20.9*
Tajikistan	29.1	*12.8*	0.17	*0.24*	*28.2*	*2.7*	*2.0*	*18.0*	*8.9*	*38.4*	*0.3*	*1.8*
Tanzania	..	*30.3*	..	*0.34*	*2.6*	*4.8*	*8.6*	*61.2*	*1.9*	*12.7*	*2.9*	*5.3*
Thailand	*369.4*	*581.4*	*0.15*	*0.15*	*1.9*	*4.2*	*12.4*	*16.4*	*4.7*	*20.5*	*2.8*	*37.2*
Timor-Leste	..	..	..	..	..	..	..	..	..	..	..	..
Togo	..	..	..	..	..	..	..	..	..	..	..	..
Trinidad and Tobago	*7.0*	*7.6*	*0.23*	*0.29*	*4.8*	*18.2*	*21.3*	*39.3*	*8.0*	*7.7*	*8.5*	*5.0*
Tunisia	..	..	..	..	..	..	..	..	..	..	..	..
Turkey	*175.8*	*346.4*	*0.18*	*0.15*	*3.8*	*3.8*	*8.6*	*12.4*	*6.6*	*32.2*	*1.7*	*30.9*
Turkmenistan	..	..	..	..	..	..	..	..	..	..	..	..
Uganda	*3.3*	*2.1*	*0.29*	*0.23*	..	*7.8*	*7.3*	*34.8*	*13.3*	*17.2*	*2.3*	*19.6*
Ukraine	..	498.2	..	0.19	13.9	4.3	11.2	19.7	6.8	5.6	2.1	36.5
United Arab Emirates	..	..	..	..	..	..	..	..	..	..	..	..
United Kingdom	*599.9*	*521.7*	*0.16*	*0.17*	*2.7*	*12.5*	*13.5*	*14.9*	*3.6*	*4.3*	*2.5*	*46.1*
United States	*2,307.0*	*1,850.8*	*0.14*	*0.14*	*3.5*	*8.1*	*13.1*	*12.0*	*3.9*	*4.3*	*4.1*	*51.1*
Uruguay	..	..	..	..	..	..	..	..	..	..	..	..
Uzbekistan	..	..	..	..	..	..	..	..	..	..	..	..
Venezuela, RB	..	..	..	..	..	..	..	..	..	..	..	..
Vietnam	*141.0*	544.8	*0.16*	0.14	1.4	3.5	6.8	12.7	6.4	40.2	3.3	25.8
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	*12.6*	46.5	*0.24*	0.21	..	2.1	7.4	35.9	14.6	15.5	5.1	19.4
Zambia	..	..	..	..	..	..	..	..	..	..	..	..
Zimbabwe	*29.3*	..	*0.20*	..	..	..	..	..	..	..	..	..

a. Data are derived using the United Nations Industrial Development Organization's (UNIDO) industry database four-digit International Standard Classification (ISIC). Data in italics are for the most recent year available and are derived using UNIDO's industry database at the three-digit ISIC.

About the data

Emissions of organic pollutants from industrial activities are a major cause of degradation of water quality. Water quality and pollution levels are generally measured as concentration or load—the rate of occurrence of a substance in an aqueous solution. Polluting substances include organic matter, metals, minerals, sediment, bacteria, and toxic chemicals. The table focuses on organic water pollution resulting from industrial activities. Because water pollution tends to be sensitive to local conditions, the national-level data in the table may not reflect the quality of water in specific locations.

The data in the table come from an international study of industrial emissions that may have been the first to include data from developing countries (Hettige, Mani, and Wheeler 1998). These data were updated through 2007 by the World Bank's Development Research Group. Unlike estimates from earlier studies based on engineering or economic models, these estimates are based on actual measurements of plant-level water pollution. The focus is on organic water pollution caused by organic waste, measured in terms of biochemical oxygen demand (BOD), because the data for this indicator are the most plentiful and reliable for cross-country comparisons of emissions. BOD measures the strength of an organic waste by the amount of oxygen consumed in breaking it down. A sewage overload in natural waters exhausts the water's dissolved oxygen content. Wastewater treatment, by contrast, reduces BOD.

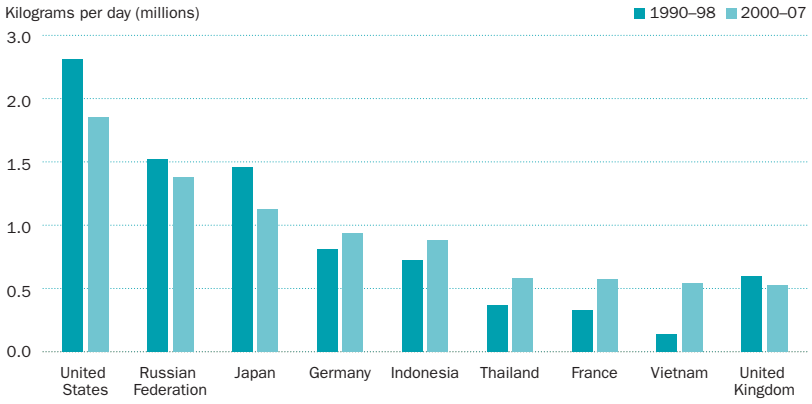
Data on water pollution are more readily available than are other emissions data because most industrial pollution control programs start by regulating emissions of organic water pollutants. Such data are fairly reliable because sampling techniques for measuring water pollution are more widely understood and much less expensive than those for air pollution.

Hettige, Mani, and Wheeler (1998) used plant- and sector-level information on emissions and employment from 13 national environmental protection agencies and sector-level information on output and employment from the United Nations Industrial Development Organization (UNIDO). Their econometric analysis found that the ratio of BOD to employment in each industrial sector is about the same across countries. This finding allowed the authors to estimate BOD loads across countries and over time. The estimated BOD intensities per unit of employment were multiplied by sectoral employment numbers from UNIDO's industry database for 1980–98. These estimates of sectoral emissions were then used to calculate kilograms of emissions of organic water pollutants per day for each country and year. The data in the table were derived by updating these estimates through 2007.

Definitions

• **Emissions of organic water pollutants** are measured as biochemical oxygen demand, or the amount of oxygen that bacteria in water will consume in breaking down waste, a standard water treatment test for the presence of organic pollutants. Emissions per worker are total emissions divided by the number of industrial workers. • **Industry shares of emissions of organic water pollutants** are emissions from manufacturing activities as defined by two-digit divisions of the International Standard Industrial Classification revision 3.

Emissions of organic water pollutants vary among countries from 1990 to 2007 **3.6a**



Note: Data are for the most recent year available during the period specified.

Source: Table 3.6.

Data sources

Data on water pollutants are from Hettige, Mani, and Wheeler, "Industrial Pollution in Economic Development: Kuznets Revisited" (1998). The data were updated through 2007 by the World Bank's Development Research Group using the same methodology as the initial study. Data on industrial sectoral employment are from UNIDO's industry database.

3.7 Energy production and use

	Energy production		Energy use									Alternative and nuclear energy production	
								% of total					
	Total million metric tons of oil equivalent		Total million metric tons of oil equivalent		average annual % growth	Per capita kilograms of oil equivalent		Fossil fuel		Combustible renewables and waste		% of total energy use	
	1990	2008	1990	2008	1990–2008	1990	2008	1990	2008	1990	2008	1990	2008
Afghanistan	..	..	..	..	..	..	..	..	..	..	..	..	..
Albania	2.4	1.2	2.7	2.1	2.0	809	664	76.5	63.7	13.6	10.3	9.2	15.9
Algeria	100.1	162.0	22.2	37.1	2.8	878	1,078	99.9	99.8	0.1	0.1	0.1	0.1
Angola	28.7	105.8	5.9	11.0	3.6	552	609	25.5	33.5	73.5	63.5	1.1	3.0
Argentina	48.4	82.9	46.1	76.4	2.5	1,418	1,915	88.7	89.8	3.7	3.7	7.5	5.9
Armenia	0.1	0.8	7.7	3.0	–2.8	2,171	974	97.2	73.4	0.1	0.0	1.7	26.6
Australia	157.5	302.1	86.2	130.1	2.3	5,053	6,071	93.9	94.6	4.6	4.2	1.5	1.2
Austria	8.1	11.0	24.8	33.2	1.9	3,214	3,988	79.2	71.6	10.0	16.3	11.0	10.8
Azerbaijan	21.3	58.6	25.8	13.4	–2.7	3,609	1,540	100.0	98.9	0.0	0.0	0.2	1.4
Bangladesh	10.8	23.4	12.7	27.9	4.6	110	175	45.5	68.4	53.9	31.1	0.6	0.5
Belarus	3.3	4.0	45.5	28.1	-1.8	4,470	2,907	95.6	92.1	0.4	5.5	0.0	0.0
Belgium	13.1	14.5	48.3	58.6	1.0	4,844	5,471	76.0	73.8	1.6	4.0	23.1	20.4
Benin	1.8	1.8	1.7	3.0	3.2	346	347	4.8	37.1	94.2	61.0	0.0	0.0
Bolivia	4.9	16.8	2.8	5.7	3.2	416	587	69.1	82.1	27.2	14.4	3.6	3.4
Bosnia and Herzegovina	4.6	4.3	7.0	6.0	2.6	1,627	1,588	93.9	92.8	2.3	3.1	3.8	6.5
Botswana	0.9	1.0	1.3	2.1	2.5	933	1,102	66.1	67.2	33.4	22.3	0.1	0.0
Brazil	104.2	228.1	140.2	248.5	3.1	938	1,295	51.2	52.6	34.1	31.6	13.1	14.3
Bulgaria	9.6	10.2	28.6	19.8	–1.2	3,277	2,595	84.3	76.2	0.6	3.8	13.9	22.3
Burkina Faso	..	..	..	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..	..	..	..
Cambodia	..	3.6	..	5.2	*3.5*	..	358	..	29.7	..	69.6	..	0.1
Cameroon	11.0	10.1	5.0	7.1	2.2	407	372	18.7	23.9	76.7	71.0	4.6	5.1
Canada	273.8	407.4	208.7	266.8	1.6	7,509	8,008	74.5	74.9	4.0	4.5	21.5	21.6
Central African Republic	..	..	..	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..	..
Chile	7.4	9.0	13.8	31.4	4.8	1,049	1,871	75.1	77.6	19.3	15.5	5.5	6.6
China	886.3	1,993.3	863.0	2,116.4	4.9	760	1,598	75.5	86.9	23.2	9.6	1.3	3.5
Hong Kong SAR, China	0.0	0.1	8.7	14.1	2.5	1,534	2,026	100.0	94.9	0.6	0.4	0.0	0.0
Colombia	48.2	93.6	24.2	30.8	0.7	730	684	67.4	72.7	22.8	14.7	9.8	13.0
Congo, Dem. Rep.	12.0	22.7	11.8	22.3	3.9	319	346	11.2	4.0	84.7	93.4	4.1	2.9
Congo, Rep.	8.7	13.2	0.8	1.4	3.0	326	378	35.0	43.5	59.5	51.3	5.3	2.3
Costa Rica	1.0	2.7	2.0	4.9	5.0	658	1,084	48.3	45.6	36.6	17.3	14.4	37.3
Côte d'Ivoire	3.4	11.4	4.3	10.3	5.1	343	499	23.3	25.0	73.5	74.0	2.6	1.6
Croatia	5.1	3.9	9.0	9.1	1.4	1,884	2,047	86.5	85.1	3.5	3.6	3.6	5.1
Cuba	6.6	5.1	16.5	12.1	–1.1	1,558	1,076	64.3	89.9	35.6	10.0	0.1	0.1
Czech Republic	40.1	32.8	48.8	44.6	0.2	4,705	4,282	93.2	81.2	0.0	4.9	6.9	16.0
Denmark	10.1	26.6	17.3	19.0	0.2	3,374	3,460	89.6	80.4	6.6	15.6	0.3	3.3
Dominican Republic	1.0	1.7	4.1	8.2	3.8	556	820	74.8	79.2	24.4	18.9	0.7	1.8
Ecuador	16.5	28.5	6.0	10.3	3.9	583	767	79.1	83.9	13.8	6.3	7.2	9.4
Egypt, Arab Rep.	54.9	87.5	31.8	70.7	4.8	551	867	94.0	96.1	3.3	2.1	2.7	1.9
El Salvador	1.7	3.0	2.5	4.9	3.7	463	796	31.4	38.4	48.2	31.2	20.3	30.3
Eritrea	*0.7*	0.5	*0.9*	0.7	*–2.1*	*276*	138	*19.3*	19.8	*80.7*	80.0	*0.0*	0.0
Estonia	5.1	4.2	9.6	5.4	–1.8	6,101	4,026	100.0	88.3	2.0	11.7	0.0	0.2
Ethiopia	14.1	29.6	14.9	31.7	3.5	308	393	5.5	6.7	93.9	92.4	0.6	0.9
Finland	12.1	16.6	28.4	35.3	1.7	5,692	6,635	55.5	48.0	16.1	21.8	20.9	21.2
France	111.9	136.6	223.9	266.5	1.0	3,946	4,279	58.1	51.0	4.9	5.2	38.7	45.3
Gabon	14.6	13.5	1.2	2.1	2.6	1,275	1,431	32.0	43.8	62.9	52.5	5.2	3.7
Gambia, The	..	..	..	..	..	..	..	..	..	..	..	..	..
Georgia	1.8	1.1	12.1	3.0	-6.8	2,217	694	88.6	66.6	3.8	12.7	5.4	21.1
Germany	186.2	134.1	351.4	335.3	-0.1	4,424	4,083	86.8	80.1	1.4	7.0	11.8	13.3
Ghana	4.4	6.9	5.3	9.5	3.4	353	405	18.2	27.8	73.7	66.8	9.3	5.6
Greece	9.2	9.9	21.4	30.4	2.4	2,110	2,707	94.6	92.8	4.2	3.4	1.0	2.2
Guatemala	3.4	5.4	4.4	8.1	3.8	498	590	28.1	42.9	68.5	53.3	3.4	4.0
Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..	..
Haiti	1.3	2.0	1.6	2.8	3.6	219	281	19.7	28.3	77.8	71.2	2.5	0.6
Honduras	1.7	2.1	2.4	4.6	3.7	486	632	30.0	54.1	62.9	41.7	8.2	4.3

3.7 Energy production and use

	Energy production		Energy use									Alternative and nuclear energy production	
	Total million metric tons of oil equivalent		Total million metric tons of oil equivalent		average annual % growth	Per capita kilograms of oil equivalent		% of total				% of total energy use	
								Fossil fuel		Combustible renewables and waste			
	1990	2008	1990	2008	1990–2008	1990	2008	1990	2008	1990	2008	1990	2008
Hungary	14.6	10.5	28.7	26.5	0.0	2,762	2,636	81.5	77.8	2.3	5.8	12.8	15.2
India	291.8	468.3	318.9	621.0	3.6	375	545	55.7	71.1	41.9	26.3	2.4	2.4
Indonesia	172.2	347.0	103.9	198.7	3.5	586	874	54.3	65.6	43.3	26.7	2.4	7.7
Iran, Islamic Rep.	179.8	326.9	68.3	202.1	6.1	1,256	2,808	98.2	99.4	1.0	0.5	0.8	0.2
Iraq	104.9	117.7	18.1	34.0	3.8	957	1,107	98.6	99.4	0.1	0.1	1.2	0.1
Ireland	3.5	1.5	10.0	15.0	2.8	2,849	3,385	84.6	90.2	1.1	1.8	0.6	2.0
Israel	0.4	3.3	11.5	22.0	3.5	2,462	3,011	97.2	96.6	0.0	0.0	3.1	4.8
Italy	25.3	26.9	146.6	176.0	1.4	2,584	2,942	93.4	89.9	0.6	3.0	3.9	5.1
Jamaica	0.5	0.5	2.8	4.4	2.7	1,167	1,633	82.6	88.5	17.1	11.1	0.3	0.4
Japan	75.2	88.7	439.3	495.8	0.8	3,556	3,883	84.5	83.0	1.1	1.4	14.4	15.6
Jordan	0.2	0.3	3.3	7.1	4.3	1,028	1,215	98.2	98.0	0.1	0.1	1.8	1.6
Kazakhstan	90.5	148.2	72.7	70.9	–0.8	4,450	4,525	96.9	98.8	0.2	0.2	0.9	0.9
Kenya	9.0	15.1	10.9	18.0	2.8	467	465	17.5	16.2	77.9	76.9	4.5	7.0
Korea, Dem. Rep.	28.9	20.8	33.2	20.3	–2.1	1,649	851	93.1	88.9	2.9	5.1	4.0	6.0
Korea, Rep.	22.6	44.7	93.1	226.9	4.8	2,171	4,669	83.8	81.2	0.8	1.3	15.4	17.5
Kosovo	..	..	..	..	..	..	..	..	..	..	..	..	..
Kuwait	50.4	152.8	7.8	26.3	7.2	3,681	9,637	99.9	100.0	0.1	0.0	0.0	0.0
Kyrgyz Republic	2.5	1.2	7.5	2.9	-3.8	1,693	542	93.5	69.2	0.1	0.1	11.5	32.3
Lao PDR	..	..	..	..	..	..	..	..	..	..	..	..	..
Latvia	1.1	1.8	7.9	4.5	-2.3	2,941	1,979	81.8	64.3	8.4	24.8	4.9	6.1
Lebanon	0.1	0.2	2.2	5.2	3.5	755	1,250	93.5	95.3	4.6	2.7	1.9	1.0
Lesotho	..	..	..	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	..	..	..	..	..	..	..	..	..
Libya	73.2	103.7	11.3	18.2	2.2	2,596	2,895	98.9	99.1	1.1	0.9	0.0	0.0
Lithuania	4.9	3.9	16.1	9.2	–2.1	4,357	2,733	75.8	60.8	1.8	8.8	28.2	29.1
Macedonia, FYR	1.3	1.7	2.5	3.1	0.9	1,298	1,520	98.0	84.2	0.0	5.6	1.7	2.6
Madagascar	..	..	..	..	..	..	..	..	..	..	..	..	..
Malawi	..	..	..	..	..	..	..	..	..	..	..	..	..
Malaysia	48.8	93.1	22.0	72.7	6.1	1,215	2,693	88.8	95.1	9.7	4.1	1.6	0.9
Mali	..	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	..	..	..	..	..	..	..	..	..	..	..	..	..
Mexico	193.4	233.6	121.3	180.6	2.1	1,457	1,698	88.1	88.8	6.1	4.6	5.9	6.7
Moldova	0.1	0.1	9.9	3.2	–5.2	2,261	867	100.0	89.1	0.4	2.5	0.2	0.2
Mongolia	2.7	3.9	3.4	3.2	–0.9	1,541	1,193	97.0	96.2	2.5	3.3	0.0	0.0
Morocco	0.8	0.6	6.9	15.0	4.0	280	474	93.8	93.7	4.6	3.2	1.5	0.7
Mozambique	5.6	11.5	5.9	9.3	2.8	437	416	5.5	7.3	93.9	81.9	0.4	14.0
Myanmar	10.7	23.1	10.7	15.7	2.4	261	316	14.4	31.0	84.7	66.8	1.0	2.2
Namibia	*0.2*	0.3	*0.7*	1.8	*5.2*	*446*	823	*62.0*	71.6	*16.0*	11.2	*17.5*	7.0
Nepal	5.5	8.7	5.8	9.8	3.1	303	340	5.1	10.9	93.7	86.4	1.3	2.7
Netherlands	60.5	66.5	65.7	79.7	1.0	4,392	4,845	96.0	92.5	1.4	3.9	1.4	1.9
New Zealand	11.4	14.9	12.7	16.9	1.5	3,682	3,967	67.3	66.7	4.3	6.1	28.1	27.0
Nicaragua	1.5	2.2	2.1	3.5	3.1	506	621	28.3	38.5	53.9	52.3	17.5	9.2
Niger	..	..	..	..	..	..	..	..	..	..	..	..	..
Nigeria	150.5	226.8	70.6	111.2	2.5	725	735	19.3	18.3	80.2	81.2	0.5	0.4
Norway	119.1	219.7	21.0	29.7	1.6	4,952	6,222	51.9	58.6	4.9	4.6	49.6	40.7
Oman	38.3	63.5	3.9	16.4	6.6	2,105	5,903	100.0	100.0	0.0	0.0	0.0	0.0
Pakistan	34.3	63.3	43.0	82.8	3.7	398	499	52.8	61.8	43.7	34.8	3.6	3.4
Panama	0.6	0.7	1.5	2.9	3.4	618	853	58.4	75.7	28.3	12.3	12.7	11.8
Papua New Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..
Paraguay	4.6	7.4	3.1	4.4	1.5	723	699	21.3	28.2	72.5	53.7	76.0	109.4
Peru	10.6	12.3	9.7	14.7	2.3	447	510	63.3	76.1	27.5	12.8	9.2	11.2
Philippines	15.7	23.3	27.5	41.1	2.2	440	455	45.8	56.9	35.2	18.6	19.0	24.5
Poland	103.9	71.4	103.1	97.9	-0.5	2,705	2,567	97.8	93.8	2.2	6.0	0.1	0.3
Portugal	3.4	4.4	16.7	24.2	2.6	1,691	2,274	80.4	78.3	14.8	13.0	4.8	5.4
Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..	..
Qatar	26.6	124.8	6.9	24.1	7.1	14,732	18,830	99.9	100.0	0.1	0.0	0.0	0.0

3.7 Energy production and use

	Energy production		Energy use									Alternative and nuclear energy production	
	Total million metric tons of oil equivalent		Total million metric tons of oil equivalent		average annual % growth	Per capita kilograms of oil equivalent		% of total Fossil fuel		% of total Combustible renewables and waste		% of total energy use	
	1990	2008	1990	2008	1990–2008	1990	2008	1990	2008	1990	2008	1990	2008
Romania	40.8	28.8	62.3	39.4	–1.9	2,683	1,830	96.1	79.4	1.0	10.3	1.6	11.2
Russian Federation	1,293.1	1,253.9	879.2	686.8	–1.1	5,929	4,838	93.4	90.9	1.4	0.9	5.2	8.4
Rwanda	..	..	..	..	..	..	..	..	..	..	..	..	..
Saudi Arabia	370.6	579.0	59.0	161.6	4.8	3,631	6,514	100.0	100.0	0.0	0.0	0.0	0.0
Senegal	1.0	1.2	1.7	2.9	3.5	224	234	43.2	57.3	56.8	41.7	0.0	0.7
Serbia	13.4[a]	9.9	19.3[a]	16.0	0.2	2,550[a]	2,181	90.6[a]	89.5	6.0[a]	5.0	4.2[a]	5.4
Sierra Leone	..	..	..	..	..	..	..	..	..	..	..	..	..
Singapore	0.0	0.0	11.5	18.5	1.8	3,760	3,828	100.0	100.0	0.0	0.0	0.0	0.0
Slovak Republic	5.3	6.4	21.3	18.3	–0.1	4,037	3,385	81.6	70.0	0.8	3.7	15.5	26.0
Slovenia	3.1	3.7	5.7	7.7	2.0	2,858	3,827	71.3	69.4	4.7	6.7	25.6	25.6
Somalia	..	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	114.5	163.0	90.9	134.5	2.2	2,581	2,756	86.1	87.2	11.5	10.4	2.5	2.6
Spain	34.6	30.4	90.1	138.8	3.0	2,320	3,047	77.4	81.7	4.5	4.2	18.1	14.6
Sri Lanka	4.2	5.1	5.5	8.9	3.3	322	443	24.1	43.4	71.0	52.6	4.9	4.0
Sudan	8.8	34.9	10.6	15.4	2.6	392	372	17.5	31.2	81.8	68.0	0.8	0.8
Swaziland	..	..	..	..	..	..	..	..	..	..	..	..	..
Sweden	29.7	33.2	47.2	49.6	0.4	5,514	5,379	37.3	33.1	11.7	20.0	50.9	45.9
Switzerland	10.0	12.7	24.0	26.7	0.6	3,581	3,491	59.3	52.7	4.8	8.1	36.7	39.6
Syrian Arab Republic	22.3	23.5	11.4	19.7	2.8	895	957	97.9	98.7	0.0	0.0	2.1	1.3
Tajikistan	2.0	1.5	5.3	2.5	–3.1	1,001	365	71.3	42.3	0.0	0.0	26.7	54.7
Tanzania	9.1	17.5	9.7	19.0	4.1	382	446	6.9	10.6	91.7	88.2	1.4	1.2
Thailand	26.5	63.9	42.0	107.2	5.1	742	1,591	63.9	80.6	34.9	18.7	1.0	0.6
Timor-Leste	..	..	..	..	..	..	..	..	..	..	..	..	..
Togo	1.1	2.1	1.3	2.6	4.3	322	397	15.0	14.3	82.8	83.1	0.6	0.3
Trinidad and Tobago	12.6	40.0	6.0	19.4	7.6	4,899	14,557	99.2	99.9	0.8	0.1	0.0	0.0
Tunisia	5.7	7.5	4.9	9.2	3.7	607	889	87.0	86.3	12.9	13.6	0.1	0.1
Turkey	25.8	29.0	52.8	98.5	3.6	941	1,333	81.8	90.6	13.7	4.9	4.6	4.6
Turkmenistan	74.9	68.6	19.6	18.8	1.5	5,352	3,730	100.0	100.0	0.0	0.0	0.3	0.0
Uganda	..	..	..	..	..	..	..	..	..	..	..	..	..
Ukraine	135.8	81.3	251.8	136.1	–3.0	4,852	2,943	91.8	81.8	0.1	0.7	8.2	17.9
United Arab Emirates	110.2	180.5	19.9	58.4	5.4	10,645	13,030	100.0	100.0	0.0	0.0	0.0	0.0
United Kingdom	208.0	166.7	205.9	208.5	0.1	3,597	3,395	90.7	90.2	0.3	2.2	8.5	7.1
United States	1,652.5	1,706.1	1,915.0	2,283.7	1.1	7,672	7,503	86.4	85.0	3.3	3.7	10.3	11.2
Uruguay	1.1	1.4	2.3	4.2	1.8	725	1,254	58.7	64.9	24.3	23.9	26.8	9.3
Uzbekistan	38.6	62.0	46.4	50.5	0.6	2,261	1,849	99.2	98.1	0.0	0.0	1.2	1.9
Venezuela, RB	148.9	180.7	43.6	64.1	1.6	2,206	2,295	91.5	87.6	1.2	0.8	7.3	11.7
Vietnam	24.7	71.4	24.3	59.4	5.2	367	689	20.4	54.0	77.7	41.8	1.9	3.8
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	9.4	15.3	2.5	7.5	6.2	204	326	97.0	99.0	3.1	1.0	0.0	0.0
Zambia	4.9	6.8	5.4	7.4	1.7	683	583	15.6	7.5	74.3	81.0	12.7	11.3
Zimbabwe	8.6	8.5	9.3	9.5	–0.1	889	763	44.8	26.1	50.9	65.3	4.0	3.9
World	**8,840.1 t**	**12,357.7 t**	**8,569.9 t**	**11,899.4 t**	**1.9 w**	**1,669 w**	**1,835 w**	**81.0 w**	**81.1 w**	**10.1 w**	**9.8 w**	**8.7 w**	**9.1 w**
Low income	172.8	264.0	200.3	279.9	2.1	380	357	39.8	29.2	56.0	66.2	4.4	4.4
Middle income	4,796.0	7,284.5	3,864.0	6,002.2	2.5	1,029	1,261	78.9	81.5	16.9	13.3	4.1	5.2
Lower middle income	2,168.7	4,001.4	1,993.4	3,842.7	3.6	679	1,019	70.1	79.0	27.1	16.9	2.9	4.2
Upper middle income	2,627.2	3,284.5	1,871.1	2,161.8	1.0	2,283	2,177	88.2	86.0	6.1	6.8	5.4	7.0
Low & middle income	4,966.5	7,544.8	4,049.8	6,266.2	2.5	966	1,157	77.4	79.7	18.4	15.2	4.1	5.2
East Asia & Pacific	1,226.1	2,658.9	1,139.4	2,655.4	4.6	716	1,380	71.5	83.7	26.6	12.4	1.9	4.0
Europe & Central Asia	1,769.6	1,772.9	1,577.0	1,215.0	–1.1	4,038	3,030	93.0	89.7	1.5	1.7	5.3	8.7
Latin America & Carib.	609.0	922.0	454.0	729.2	2.5	1,044	1,290	71.2	72.4	19.7	16.8	9.2	10.8
Middle East & N. Africa	558.6	856.3	185.5	431.3	4.7	814	1,329	97.2	98.3	1.7	1.1	1.1	0.6
South Asia	349.5	573.6	389.2	756.8	3.6	348	495	53.8	68.9	43.6	28.5	2.5	2.5
Sub-Saharan Africa	475.6	810.3	310.5	497.4	2.6	676	678	41.2	39.8	56.6	57.7	2.3	2.5
High income	3,892.9	4,843.0	4,544.3	5,672.5	1.4	4,649	5,131	84.2	82.6	2.8	3.9	12.8	13.3
Euro area	476.5	463.1	1,059.7	1,226.5	1.0	3,527	3,763	79.8	75.0	3.2	5.9	16.7	18.6

a. Includes Kosovo and Montenegro.

Energy production and use 3.7

About the data

In developing economies growth in energy use is closely related to growth in the modern sectors—industry, motorized transport, and urban areas—but energy use also reflects climatic, geographic, and economic factors (such as the relative price of energy). Energy use has been growing rapidly in low- and middle-income economies, but high-income economies still use almost five times as much energy on a per capita basis.

Energy data are compiled by the International Energy Agency (IEA). IEA data for economies that are not members of the Organisation for Economic Co-operation and Development (OECD) are based on national energy data adjusted to conform to annual questionnaires completed by OECD member governments.

Total energy use refers to the use of primary energy before transformation to other end-use fuels (such as electricity and refined petroleum products). It includes energy from combustible renewables and waste—solid biomass and animal products, gas and liquid from biomass, and industrial and municipal waste. Biomass is any plant matter used directly as fuel or converted into fuel, heat, or electricity.

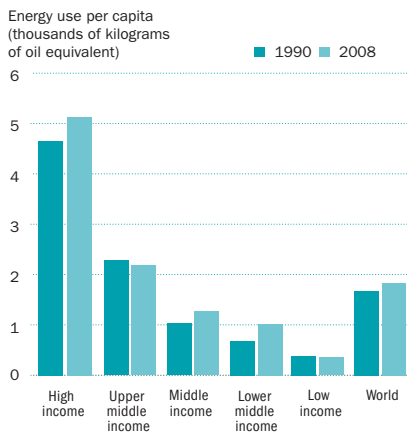
Data for combustible renewables and waste are often based on small surveys or other incomplete information and thus give only a broad impression of developments and are not strictly comparable across countries. The IEA reports include country notes that explain some of these differences (see *Data sources*). All forms of energy—primary energy and primary electricity—are converted into oil equivalents. A notional thermal efficiency of 33 percent is assumed for converting nuclear electricity into oil equivalents and 100 percent efficiency for converting hydroelectric power.

The IEA makes these estimates in consultation with national statistical offices, oil companies, electric utilities, and national energy experts. The IEA occasionally revises its time series to reflect political changes, and energy statistics undergo continual changes in coverage or methodology as more detailed energy accounts become available. Breaks in series are therefore unavoidable.

Definitions

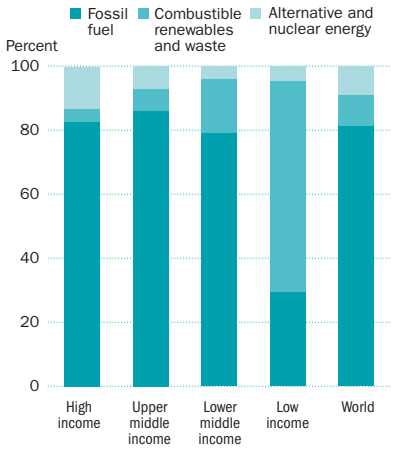
• **Energy production** refers to forms of primary energy—petroleum (crude oil, natural gas liquids, and oil from nonconventional sources), natural gas, solid fuels (coal, lignite, and other derived fuels), and combustible renewables and waste—and primary electricity, all converted into oil equivalents (see *About the data*). • **Energy use** refers to the use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport (see *About the data*). • **Fossil fuel** comprises coal, oil, petroleum, and natural gas products. • **Combustible renewables and waste** comprise solid biomass, liquid biomass, biogas, industrial waste, and municipal waste. • **Alternative and nuclear energy production** is noncarbohydrate energy that does not produce carbon dioxide when generated. It includes hydropower and nuclear, geothermal, and solar power, among others.

A person in a high-income economy uses more than 14 times as much energy on average as a person in a low-income economy in 2008 **3.7a**



Source: Table 3.7.

Fossil fuels are still the primary global energy source in 2008 **3.7b**



Source: Table 3.7.

Data sources

Data on energy production and use are from IEA electronic files and are published in IEA's annual publications, *Energy Statistics and Balances of Non-OECD Countries, Energy Statistics of OECD Countries,* and *Energy Balances of OECD Countries.*

3.8 Energy dependency and efficiency and carbon dioxide emissions

	Net energy imports[a]		GDP per unit of energy use		Carbon dioxide emissions							
	% of energy use		2005 PPP $ per kilogram of oil equivalent		Total million metric tons		Carbon intensity kilograms per kilogram of oil equivalent energy use		Per capita metric tons		kilograms per 2005 PPP $ of GDP	
	1990	2008	1990	2008	1990	2007	1990	2007	1990	2007	1990	2007
Afghanistan	..	..	..	..	2.7	0.7	..	..	0.1	0.0	..	0.0
Albania	8	45	4.8	11.0	7.5	4.2	2.8	2.0	2.3	1.4	0.6	0.2
Algeria	–351	–337	7.1	6.8	78.8	140.0	3.6	3.8	3.1	4.1	0.5	0.6
Angola	–387	–865	5.8	8.8	4.4	24.7	0.8	2.3	0.4	1.4	0.1	0.3
Argentina	–5	–9	5.3	6.9	112.5	183.6	2.4	2.5	3.5	4.6	0.5	0.4
Armenia	98	73	1.4	5.8	*3.7*	5.1	*0.5*	1.8	*1.2*	1.6	*0.4*	0.3
Australia	–83	–132	4.7	5.7	292.9	373.7	3.4	3.0	17.2	17.7	0.7	0.5
Austria	67	67	8.0	9.1	60.9	68.7	2.5	2.1	7.9	8.3	0.3	0.2
Azerbaijan	17	–338	1.3	5.3	*44.1*	31.7	*1.9*	2.7	*7.0*	3.7	*1.5*	0.5
Bangladesh	16	16	6.2	7.1	15.5	43.7	1.2	1.7	0.1	0.3	0.2	0.2
Belarus	93	86	1.5	4.0	*98.5*	66.7	*2.6*	2.4	*10.9*	6.9	*1.7*	0.7
Belgium	73	75	5.2	6.1	107.5	103.0	2.2	1.8	10.8	9.7	0.4	0.3
Benin	–7	39	3.2	3.9	0.7	3.9	0.4	1.3	0.1	0.5	0.1	0.3
Bolivia	–77	–195	7.0	6.7	5.5	13.2	2.0	2.4	0.8	1.4	0.3	0.4
Bosnia and Herzegovina	34	28	..	4.7	*4.7*	29.0	*1.0*	5.2	*1.6*	7.7	..	1.1
Botswana	28	53	7.6	11.6	2.2	5.0	1.7	2.5	1.6	2.6	0.2	0.2
Brazil	26	8	7.7	7.4	208.7	368.0	1.5	1.6	1.4	1.9	0.2	0.2
Bulgaria	66	48	2.3	4.6	76.6	51.7	2.7	2.6	8.8	6.8	1.2	0.6
Burkina Faso	..	..	..	..	0.6	1.7	..	..	0.1	0.1	0.1	0.1
Burundi	..	..	..	..	0.3	0.2	..	..	0.1	0.0	0.1	0.1
Cambodia	..	30	..	5.0	0.5	4.4	..	0.9	0.0	0.3	..	0.2
Cameroon	–120	–42	5.1	5.4	1.7	6.2	0.3	0.8	0.1	0.3	0.1	0.2
Canada	–31	-53	3.6	4.5	449.7	556.9	2.2	2.1	16.2	16.9	0.6	0.5
Central African Republic	..	..	..	..	0.2	0.3	..	..	0.1	0.1	0.1	0.1
Chad	..	..	..	..	0.1	0.4	..	..	0.0	0.0	0.0	0.0
Chile	46	71	6.3	7.2	34.9	71.6	2.5	2.3	2.6	4.3	0.4	0.3
China	–3	6	1.4	3.6	2,458.7	6,533.0	2.8	3.3	2.2	5.0	2.0	0.9
Hong Kong SAR, China	100	100	15.5	20.0	27.6	39.9	3.1	2.9	4.8	5.8	0.2	0.1
Colombia	–99	–204	8.4	12.0	57.3	63.4	2.4	2.2	1.7	1.4	0.3	0.2
Congo, Dem. Rep.	–2	–2	1.9	0.8	4.1	2.4	0.3	0.1	0.1	0.0	0.2	0.1
Congo, Rep.	–997	-868	10.7	9.6	1.2	1.6	1.5	1.3	0.5	0.4	0.1	0.1
Costa Rica	49	45	9.5	9.6	3.0	8.1	1.5	1.7	1.0	1.8	0.2	0.2
Côte d'Ivoire	22	–11	5.5	3.1	5.8	6.4	1.3	0.6	0.5	0.3	0.2	0.2
Croatia	43	57	7.1	8.5	*25.0*	24.8	*2.8*	2.7	*5.2*	5.6	*0.4*	0.3
Cuba	60	58	..	..	33.3	27.0	2.0	2.7	3.1	2.4	..	..
Czech Republic	18	26	3.5	5.4	*162.6*	124.9	*3.3*	2.7	*15.7*	12.1	*1.0*	0.5
Denmark	42	–40	7.5	9.9	50.4	50.0	2.9	2.5	9.8	9.1	0.4	0.3
Dominican Republic	75	79	6.7	9.2	9.6	20.7	2.3	2.6	1.3	2.1	0.3	0.3
Ecuador	–175	–176	9.4	9.9	16.8	30.0	2.8	2.5	1.6	2.2	0.3	0.3
Egypt, Arab Rep.	–72	–24	5.8	5.8	75.9	184.5	2.4	2.7	1.3	2.3	0.4	0.5
El Salvador	31	38	8.0	7.9	2.6	6.7	1.1	1.4	0.5	1.1	0.1	0.2
Eritrea	*19*	20	*1.9*	3.8	..	0.6	..	0.8	..	0.1	..	0.2
Estonia	47	22	1.7	4.7	*28.2*	20.5	*2.9*	3.6	*18.0*	15.2	*1.8*	0.8
Ethiopia	5	7	1.8	2.0	3.0	6.5	0.2	0.3	0.1	0.1	0.1	0.1
Finland	57	53	4.1	5.1	50.9	64.1	1.8	1.8	10.2	12.1	0.4	0.4
France	50	49	6.3	7.4	398.7	371.5	1.8	1.4	7.0	6.0	0.3	0.2
Gabon	–1,139	–552	11.8	9.4	6.1	2.0	5.2	1.1	6.6	1.4	0.4	0.1
Gambia, The	..	..	..	..	0.2	0.4	..	..	0.2	0.2	0.2	0.2
Georgia	85	64	2.4	6.6	*15.3*	6.0	*1.4*	1.8	*3.2*	1.4	*0.6*	0.3
Germany	47	60	5.8	8.3	*960.2*	787.3	*2.8*	2.4	*12.0*	9.6	*0.4*	0.3
Ghana	17	27	2.5	3.4	3.9	9.8	0.7	1.0	0.3	0.4	0.3	0.3
Greece	57	68	8.3	10.0	72.7	98.0	3.4	3.0	7.2	8.8	0.4	0.3
Guatemala	24	33	6.7	7.4	5.1	12.9	1.1	1.6	0.6	1.0	0.2	0.2
Guinea	..	..	..	..	1.1	1.4	..	..	0.2	0.1	0.2	0.2
Guinea-Bissau	..	..	..	..	0.3	0.3	..	..	0.2	0.2	0.2	0.2
Haiti	20	28	*6.4*	3.7	1.0	2.4	0.6	0.9	0.1	0.2	*0.1*	0.2
Honduras	29	55	5.5	5.7	2.6	8.8	1.1	1.9	0.5	1.2	0.2	0.3

Energy dependency and efficiency and carbon dioxide emissions

	Net energy imports[a]		GDP per unit of energy use		Carbon dioxide emissions							
	% of energy use		2005 PPP $ per kilogram of oil equivalent		Total million metric tons		Carbon intensity kilograms per kilogram of oil equivalent energy use		Per capita metric tons		kilograms per 2005 PPP $ of GDP	
	1990	2008	1990	2008	1990	2007	1990	2007	1990	2007	1990	2007
Hungary	49	60	4.4	6.8	63.4	56.4	2.2	2.1	6.1	5.6	0.5	0.3
India	8	25	3.3	5.1	690.0	1,611.0	2.2	2.7	0.8	1.4	0.7	0.5
Indonesia	–66	–75	3.6	4.2	149.4	396.8	1.5	2.1	0.8	1.8	0.4	0.5
Iran, Islamic Rep.	–163	–62	5.0	3.7	227.0	495.6	3.3	2.7	4.2	7.0	0.7	0.7
Iraq	–480	–246	..	2.9	52.5	100.0	2.9	3.0	2.8	3.3	..	1.1
Ireland	65	90	6.2	11.6	30.3	44.3	3.0	2.9	8.6	10.2	0.5	0.2
Israel	96	85	7.3	8.5	33.5	66.7	2.9	3.0	7.2	9.3	0.4	0.4
Italy	83	85	9.2	9.6	424.7	456.1	2.9	2.6	7.5	7.7	0.3	0.3
Jamaica	83	88	5.1	4.4	8.0	14.0	2.9	2.8	3.3	5.2	0.6	0.7
Japan	83	82	7.3	8.1	1,152.3	1,253.5	2.6	2.4	9.3	9.8	0.4	0.3
Jordan	95	96	3.2	4.2	10.4	21.4	3.2	3.0	3.3	3.8	1.0	0.8
Kazakhstan	–24	–109	1.6	2.3	*261.1*	227.2	*4.0*	3.4	*18.0*	14.7	*2.5*	1.4
Kenya	18	16	3.0	3.1	5.8	11.2	0.5	0.6	0.2	0.3	0.2	0.2
Korea, Dem. Rep.	13	-3	..	..	244.6	70.7	7.4	3.8	12.1	3.0	..	..
Korea, Rep.	76	80	5.2	5.5	241.5	502.9	2.6	2.3	5.6	10.4	0.5	0.4
Kosovo	..	..	..	..	..	..	..	..	..	..	..	..
Kuwait	–544	–481	*2.8*	4.8	40.7	86.1	5.2	3.4	19.2	32.3	*0.6*	0.7
Kyrgyz Republic	67	58	1.5	3.8	*11.0*	6.1	*1.6*	2.1	*2.8*	1.2	*1.1*	0.6
Lao PDR	..	..	..	..	0.2	1.5	..	..	0.1	0.3	0.1	0.1
Latvia	86	60	3.4	7.9	*13.3*	7.8	*1.9*	1.7	*5.6*	3.4	*0.6*	0.2
Lebanon	94	96	7.5	8.8	9.1	13.3	4.0	3.3	3.1	3.2	0.5	0.3
Lesotho	..	..	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	0.5	0.7	..	..	0.2	0.2	0.5	0.5
Libya	–546	–469	..	5.2	40.3	57.3	3.6	3.2	9.2	9.3	..	0.6
Lithuania	69	58	2.9	6.4	*22.1*	15.3	*1.5*	1.7	*6.8*	4.5	*0.5*	0.3
Macedonia, FYR	49	45	6.4	5.8	*10.8*	11.3	*6.4*	3.7	*8.3*	5.5	*1.0*	0.7
Madagascar	..	..	..	..	1.0	2.2	..	..	0.1	0.1	0.1	0.1
Malawi	..	..	..	..	0.6	1.1	..	..	0.1	0.1	0.1	0.1
Malaysia	–122	–28	5.5	4.9	56.5	194.3	2.5	2.7	3.1	7.3	0.5	0.6
Mali	..	..	..	..	0.4	0.6	..	..	0.0	0.0	0.1	0.0
Mauritania	..	..	..	..	2.7	1.9	..	..	1.3	0.6	0.9	0.3
Mauritius	..	..	..	..	1.5	3.9	..	..	1.4	3.1	0.2	0.3
Mexico	–60	-29	6.9	7.9	357.2	471.1	2.9	2.6	4.3	4.5	0.4	0.3
Moldova	99	97	1.7	3.1	*21.0*	4.7	*2.4*	1.4	*5.4*	1.3	*1.4*	0.5
Mongolia	20	–23	1.4	2.8	10.0	10.6	2.9	3.4	4.5	4.0	2.0	1.3
Morocco	89	96	9.7	8.4	23.5	46.4	3.4	3.2	0.9	1.5	0.4	0.4
Mozambique	5	–23	0.9	1.9	1.0	2.6	0.2	0.3	0.1	0.1	0.2	0.2
Myanmar	0	–47	..	..	4.3	13.2	0.4	0.8	0.1	0.3	..	..
Namibia	67	82	*9.4*	7.3	0.0	3.0	*0.0*	1.9	0.0	1.5	0.0	0.2
Nepal	5	11	2.3	3.0	0.6	3.4	0.1	0.4	0.0	0.1	0.0	0.1
Netherlands	8	16	6.0	7.9	164.0	173.1	2.5	2.2	11.0	10.6	0.4	0.3
New Zealand	10	12	5.1	6.3	23.9	32.6	1.8	1.9	6.9	7.7	0.4	0.3
Nicaragua	29	39	3.7	4.1	2.6	4.6	1.3	1.3	0.6	0.8	0.3	0.3
Niger	..	..	..	..	1.0	0.9	..	..	0.1	0.1	0.2	0.1
Nigeria	–113	–104	2.0	2.6	45.3	95.2	0.6	0.9	0.5	0.6	0.3	0.3
Norway	–467	–640	6.5	7.9	31.3	42.7	1.5	1.6	7.4	9.1	0.2	0.2
Oman	–888	–286	7.1	4.0	10.3	37.3	2.4	2.4	5.6	13.7	0.4	0.6
Pakistan	20	24	4.2	4.7	68.5	156.3	1.6	1.9	0.6	1.0	0.4	0.4
Panama	59	76	9.8	13.8	3.1	7.2	2.1	2.6	1.3	2.2	0.2	0.2
Papua New Guinea	..	..	..	..	2.1	3.4	..	..	0.5	0.5	0.3	0.3
Paraguay	–49	–69	5.5	6.2	2.3	4.1	0.7	1.0	0.5	0.7	0.1	0.2
Peru	–9	16	10.0	15.4	21.1	43.0	2.2	3.1	1.0	1.5	0.2	0.2
Philippines	43	43	5.4	7.1	44.5	70.9	1.6	1.8	0.7	0.8	0.3	0.3
Poland	–1	27	3.0	6.4	347.6	317.1	3.4	3.3	9.1	8.3	1.1	0.5
Portugal	80	82	9.6	9.7	44.3	58.1	2.6	2.3	4.5	5.5	0.3	0.2
Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..
Qatar	–286	–418	..	4.5	11.8	63.0	1.7	2.8	25.2	55.4	..	0.7

3.8 Energy dependency and efficiency and carbon dioxide emissions

	Net energy imports[a]		GDP per unit of energy use		Carbon dioxide emissions							
	% of energy use		2005 PPP $ per kilogram of oil equivalent		Total million metric tons		Carbon intensity kilograms per kilogram of oil equivalent energy use		Per capita metric tons		kilograms per 2005 PPP $ of GDP	
	1990	2008	1990	2008	1990	2007	1990	2007	1990	2007	1990	2007
Romania	34	27	2.9	6.4	158.7	94.1	2.5	2.4	6.8	4.4	0.9	0.4
Russian Federation	–47	–83	2.1	3.1	*2,073.5*	1,536.1	*2.7*	2.3	*15.8*	10.8	*1.2*	0.8
Rwanda	..	..	..	..	0.7	0.7	..	..	0.1	0.1	0.1	0.1
Saudi Arabia	–528	–258	5.3	3.3	214.9	402.1	3.6	2.7	13.2	16.6	0.7	0.8
Senegal	43	57	6.3	7.1	3.2	5.5	1.9	2.0	0.4	0.5	0.3	0.3
Serbia	31	38	4.6	4.7	45.3[b]	53.5[b]	1.5[b]	..	6.4[b]	6.3[b]	..	..
Sierra Leone	..	..	..	..	0.4	1.3	..	..	0.1	0.2	0.1	0.3
Singapore	100	100	6.2	12.5	46.9	54.1	4.1	2.0	15.4	11.8	0.7	0.2
Slovak Republic	75	65	3.1	6.1	*44.3*	37.0	*2.6*	2.1	*10.4*	6.8	*0.8*	0.4
Slovenia	46	53	5.7	7.1	*12.3*	15.1	*3.2*	2.1	*9.1*	7.5	*0.6*	0.3
Somalia	..	..	..	..	0.0	0.6	..	..	0.0	0.1	..	..
South Africa	–26	–21	3.1	3.5	333.2	433.2	3.7	3.2	9.5	9.0	1.2	1.0
Spain	62	78	8.5	9.3	227.4	359.0	2.5	2.5	5.9	8.0	0.3	0.3
Sri Lanka	24	43	6.3	9.5	3.8	12.3	0.7	1.3	0.2	0.6	0.1	0.2
Sudan	17	–127	2.5	5.3	5.6	11.5	0.5	0.8	0.2	0.3	0.2	0.2
Swaziland	..	..	..	..	0.4	1.1	..	..	0.5	0.9	0.1	0.2
Sweden	37	33	4.5	6.4	51.7	49.2	1.1	1.0	6.0	5.4	0.2	0.2
Switzerland	59	52	9.3	10.9	42.9	38.0	1.8	1.5	6.4	5.0	0.2	0.1
Syrian Arab Republic	–96	–19	3.3	4.4	37.4	69.8	3.3	3.6	2.9	3.5	1.0	0.8
Tajikistan	62	40	3.1	4.8	*21.3*	7.2	*4.3*	1.9	*4.5*	1.1	*1.5*	0.6
Tanzania	7	8	2.2	2.6	2.4	6.0	0.2	0.3	0.1	0.1	0.1	0.1
Thailand	37	40	5.3	4.7	95.8	277.3	2.3	2.7	1.7	4.1	0.4	0.6
Timor-Leste	..	..	..	..	..	0.2	..	..	..	0.2	..	0.3
Togo	17	17	2.7	1.9	0.8	1.3	0.6	0.5	0.2	0.2	0.2	0.3
Trinidad and Tobago	–111	–106	2.2	1.7	16.9	37.0	2.8	2.4	13.9	27.9	1.3	1.2
Tunisia	–16	18	6.6	8.3	13.3	23.8	2.7	2.7	1.6	2.3	0.4	0.3
Turkey	51	71	8.3	8.9	150.7	288.4	2.9	2.9	2.7	4.0	0.3	0.3
Turkmenistan	–281	–265	0.7	1.7	*28.0*	45.8	*1.6*	2.5	*8.6*	9.2	*2.3*	1.6
Uganda	..	..	..	..	0.8	3.2	..	..	0.0	0.1	0.1	0.1
Ukraine	46	40	1.7	2.3	*611.0*	317.3	*2.7*	2.3	*13.3*	6.8	*1.6*	1.0
United Arab Emirates	–454	–209	4.8	4.2	54.8	135.4	2.8	2.6	29.3	31.0	0.6	0.6
United Kingdom	–1	20	6.6	10.0	569.8	539.2	2.8	2.6	10.0	8.8	0.4	0.3
United States	14	25	4.2	5.8	4,861.0	5,832.2	2.5	2.5	19.5	19.3	0.6	0.4
Uruguay	49	67	10.1	9.3	4.0	6.2	1.8	2.0	1.3	1.9	0.2	0.2
Uzbekistan	17	–23	0.9	1.3	*113.9*	116.0	*2.8*	2.4	*6.3*	4.3	*3.1*	1.9
Venezuela, RB	–242	–182	4.3	5.1	122.1	165.4	2.8	2.6	6.2	6.0	0.6	0.5
Vietnam	-2	–20	2.5	3.7	21.4	111.3	0.9	2.0	0.3	1.3	0.4	0.5
West Bank and Gaza	..	..	..	..	..	2.3	..	..	..	0.6	..	..
Yemen, Rep.	–273	–104	8.7	6.8	10.1	22.0	3.3	3.0	0.8	1.0	0.5	0.4
Zambia	9	8	1.8	2.1	2.4	2.7	0.5	0.4	0.3	0.2	0.2	0.2
Zimbabwe	8	10	..	..	15.5	9.6	1.7	1.0	1.5	0.8	..	..
World	**–3[c] w**	**–4[c] w**	**4.2 w**	**5.5 w**	**22,529.9[d] t**	**30,649.4[d] t**	**2.6[d] w**	**2.5[d] w**	**4.3[d] w**	**4.6[d] w**	**0.6[d] w**	**0.5[d] w**
Low income	14	6	2.6	3.2	357.6	228.2	2.2	1.0	0.7	0.3	0.8	0.3
Middle income	–24	–21	3.0	4.4	9,758.0	15,574.9	*2.6*	2.7	2.6	3.3	0.8	0.6
Lower middle income	–9	–4	2.4	4.0	4,772.5	10,391.5	2.4	2.9	1.6	2.8	1.0	0.7
Upper middle income	–40	–52	3.7	5.2	4,984.4	5,175.3	*2.7*	2.5	6.1	5.3	*0.7*	0.5
Low & middle income	–23	–20	3.0	4.4	10,115.2	15,802.5	*2.5*	2.7	2.4	2.9	0.8	0.6
East Asia & Pacific	–8	0	2.0	3.8	3,091.2	7,693.8	2.7	3.1	1.9	4.0	1.4	0.8
Europe & Central Asia	–12	–46	2.2	3.6	4,214.9	2,897.1	*2.7*	2.4	*10.7*	7.2	*1.2*	0.7
Latin America & Carib.	–34	–26	6.9	7.7	1,017.3	1,538.1	2.2	2.2	2.3	2.7	0.3	0.3
Middle East & N. Africa	–201	–99	5.7	4.7	578.7	1,177.0	3.1	2.9	2.5	3.7	0.6	0.6
South Asia	10	24	3.5	5.2	781.4	1,828.9	2.0	2.5	0.7	1.2	0.6	0.5
Sub-Saharan Africa	–54	–63	2.8	3.2	465.1	679.5	1.7	1.6	0.9	0.8	0.6	0.4
High income	15	15	5.3	6.6	11,669.7	13,761.0	2.6	2.4	11.9	12.5	0.5	0.4
Euro area	55	62	6.6	8.2	2,595.7	2,656.8	*2.4*	2.2	8.6	8.2	0.4	0.3

a. Negative values indicate that a country is a net exporter. b. Includes Kosovo and Montenegro. c. Deviation from zero is due to statistical errors and changes in stock. d. Includes emissions not allocated to specific countries.

Energy dependency and efficiency and carbon dioxide emissions 3.8

About the data

Because commercial energy is widely traded, its production and use need to be distinguished. Net energy imports show the extent to which an economy's use exceeds its production. High-income economies are net energy importers; middle-income economies are their main suppliers.

The ratio of gross domestic product (GDP) to energy use indicates energy efficiency. To produce comparable and consistent estimates of real GDP across economies relative to physical inputs to GDP—that is, units of energy use—GDP is converted to 2005 international dollars using purchasing power parity (PPP) rates. Differences in this ratio over time and across economies reflect structural changes in an economy, changes in sectoral energy efficiency, and differences in fuel mixes.

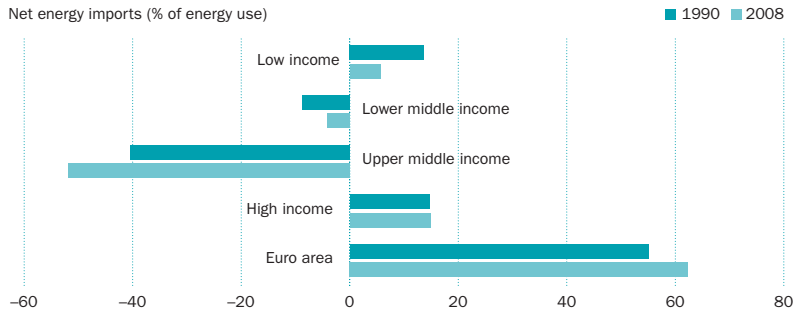
Carbon dioxide emissions, largely by-products of energy production and use (see table 3.7), account for the largest share of greenhouse gases, which are associated with global warming. Anthropogenic carbon dioxide emissions result primarily from fossil fuel combustion and cement manufacturing. In combustion different fossil fuels release different amounts of carbon dioxide for the same level of energy use: oil releases about 50 percent more carbon dioxide than natural gas, and 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 U.S. Department of Energy's Carbon Dioxide Information Analysis Center (CDIAC) calculates annual anthropogenic emissions from data on fossil fuel consumption (from the United Nations Statistics Division's World Energy Data Set) and world cement manufacturing (from the U.S. Bureau of Mines's Cement Manufacturing Data Set). Carbon dioxide emissions, often calculated and reported as elemental carbon, were converted to actual carbon dioxide mass by multiplying them by 3.664 (the ratio of the mass of carbon to that of carbon dioxide). Although estimates of global carbon dioxide emissions are probably accurate within 10 percent (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 since 1949, incorporating recent findings and corrections. Estimates exclude fuels supplied to ships and aircraft in international transport because of the difficulty of apportioning the fuels among benefiting countries. The ratio of carbon dioxide per unit of energy shows carbon intensity, which is the amount of carbon dioxide emitted as a result of using one unit of energy in the process of production. The proportion of carbon dioxide per unit of GDP indicates how clean production processes are.

Definitions

• **Net energy imports** are estimated as energy use less production, both measured in oil equivalents. • **GDP per unit of energy use** is the ratio of gross domestic product (GDP) per kilogram of oil equivalent of energy use, with GDP converted to 2005 international dollars using purchasing power parity (PPP) rates. An international dollar has the same purchasing power over GDP that a U.S. dollar has in the United States. Energy use refers to the use of primary energy before transformation to other end-use fuel, which is equal to indigenous production plus imports and stock changes minus exports and fuel supplied to ships and aircraft engaged in international transport (see *About the data* for table 3.7). • **Carbon dioxide emissions** are emissions from the burning of fossil fuels and the manufacture of cement and include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring.

High-income economies depend on imported energy 3.8a



Note: Negative values indicate that the income group is a net energy exporter.
Source: Table 3.8.

Data sources

Data on energy use are from the electronic files of the International Energy Agency. Data on carbon dioxide emissions are from the CDIAC, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States.

3.9 Trends in greenhouse gas emissions

	Carbon dioxide emissions		Methane emissions				Nitrous oxide emissions				Other greenhouse gas emissions	
	average annual % growth[a]	% change[b]	Total thousand metric tons of carbon dioxide equivalent	% change[b]	% of total		Total thousand metric tons of carbon dioxide equivalent	% change[b]	% of total		Total thousand metric tons of carbon dioxide equivalent	% change[b]
	1990–2007	1990–2007	2005	1990–2005	From energy processes 2005	Agricultural 2005	2005	1990–2005	Energy and industry 2005	Agricultural 2005	2005	1990–2005
Afghanistan	–7.8	–73.3	..	..	..	..	..	..	..	..	..	..
Albania	2.5	–43.3	2,407	–5.1	20.0	70.8	1,036	–18.7	7.1	78.4	62	..
Algeria	3.7	77.6	54,219	33.1	83.2	8.2	4,898	27.5	22.6	58.6	489	50.0
Angola	10.1	459.0	45,409	–8.3	15.6	27.9	38,881	–6.7	0.4	38.4	20	..
Argentina	2.4	63.1	101,821	–8.3	18.9	70.6	49,821	29.6	3.9	89.2	785	–65.8
Armenia	1.2	21.8	2,962	2.5	50.8	36.7	580	–27.6	1.2	81.6	335	..
Australia	1.4	27.6	126,488	9.7	29.7	55.1	62,966	–0.1	10.3	78.2	6,505	33.5
Austria	1.1	12.7	8,515	–15.0	21.7	48.6	4,448	–13.5	31.0	52.5	2,329	46.2
Azerbaijan	–2.2	–36.2	36,607	110.7	82.0	13.6	2,633	0.4	8.3	77.5	89	–49.5
Bangladesh	6.5	181.7	92,414	6.5	10.0	70.5	21,386	42.1	7.5	83.1	0	..
Belarus	–2.6	–39.9	11,498	–32.8	7.6	70.9	11,680	–28.3	23.1	72.9	467	..
Belgium	–0.3	–4.2	10,063	–21.8	11.6	56.7	6,571	–27.6	38.1	44.3	2,106	583.8
Benin	9.1	442.1	4,080	–15.8	15.6	47.8	2,902	–21.5	4.0	61.5	0	..
Bolivia	4.0	139.6	30,350	30.9	25.6	34.1	15,092	3.2	0.7	36.5	0	..
Bosnia and Herzegovina	14.1	315.2	2,741	–53.5	46.7	42.4	1,196	–40.8	24.7	57.8	571	–7.4
Botswana	4.1	130.2	4,501	–22.6	8.6	84.1	3,081	–44.1	1.4	92.0	0	..
Brazil	3.3	76.3	492,160	56.4	7.6	61.1	235,987	52.6	3.4	67.0	11,816	40.5
Bulgaria	–2.1	–32.5	10,867	–24.8	13.0	18.9	4,227	–55.2	36.0	48.1	383	..
Burkina Faso	5.9	188.8	..	..	..	..	..	..	..	..	..	..
Burundi	–4.7	–41.0	..	..	..	..	..	..	..	..	..	..
Cambodia	16.0	884.6	20,215	35.0	4.9	76.1	5,794	46.9	3.5	66.1	0	..
Cameroon	4.2	254.9	18,518	37.1	39.1	42.4	9,127	–13.3	2.6	75.9	419	–55.0
Canada	1.5	23.8	89,338	30.8	32.2	29.3	40,171	–5.5	23.7	58.9	21,943	69.7
Central African Republic	1.0	27.8	..	..	..	..	..	..	..	..	..	..
Chad	10.5	162.5	..	..	..	..	..	..	..	..	..	..
Chile	4.6	105.4	18,149	49.8	24.4	39.4	8,135	57.5	16.6	73.4	13	–29.5
China	5.2	165.7	1,333,098	28.5	45.8	38.8	467,213	48.5	12.9	74.3	141,394	1,073.0
Hong Kong SAR, China	2.0	44.5	2,820	84.0	26.7	0.0	422	–1.0	38.5	0.0	119	–68.6
Colombia	–0.3	10.6	58,108	13.5	19.9	68.0	21,288	5.2	4.4	86.1	83	98.3
Congo, Dem. Rep.	–3.7	–40.2	56,445	–41.6	10.2	23.1	54,643	–37.3	2.2	31.3	0	..
Congo, Rep.	–0.8	33.6	5,584	–10.4	32.2	31.9	3,566	–17.2	1.0	51.8	5	..
Costa Rica	5.1	174.7	2,580	–31.3	9.5	67.2	1,334	–26.2	4.5	85.4	62	..
Côte d'Ivoire	1.5	10.1	10,997	–2.2	16.9	17.4	7,364	–1.6	2.7	29.3	0	..
Croatia	1.8	–0.8	3,864	–60.5	57.0	33.3	2,851	–24.5	36.6	52.4	59	–93.4
Cuba	–1.3	–18.9	9,455	–21.0	11.2	62.4	6,356	–31.8	15.1	78.7	129	..
Czech Republic	–1.1	–23.2	11,497	–40.3	49.4	33.6	8,878	–10.2	53.0	36.9	1,121	..
Denmark	–1.0	–0.8	7,935	–0.5	16.4	65.2	6,290	–21.5	18.0	73.4	1,422	458.3
Dominican Republic	4.7	116.9	6,081	3.8	7.8	63.7	2,255	11.0	7.8	76.8	0	..
Ecuador	2.9	78.1	17,125	31.2	31.2	57.8	4,571	42.3	3.8	84.9	63	..
Egypt, Arab Rep.	5.2	143.2	46,996	68.8	50.7	31.7	18,996	60.7	8.3	80.0	3,181	54.5
El Salvador	4.7	155.9	3,131	18.0	12.4	53.1	1,377	7.7	8.2	76.2	77	..
Eritrea	7.4	..	2,467	30.9	11.2	73.2	1,189	15.6	3.8	90.9	0	..
Estonia	–2.1	–27.5	2,108	–36.8	42.3	30.5	932	–50.7	21.5	60.5	40	1,790.5
Ethiopia	4.6	115.7	52,243	32.8	14.3	72.5	30,510	19.4	5.2	88.8	10	..
Finland	1.3	26.0	9,742	–2.8	7.4	20.7	7,124	–4.1	42.8	41.7	826	724.4
France	–0.3	–6.8	77,252	–0.3	44.3	47.7	49,058	–30.6	24.2	66.8	15,539	57.1
Gabon	–6.2	–66.6	8,218	1.4	90.4	1.1	482	57.9	10.0	23.3	9	..
Gambia, The	4.2	107.7	..	..	..	..	..	..	..	..	..	..
Georgia	–6.2	–65.1	4,410	–12.4	36.1	50.8	2,019	–26.9	35.5	56.9	12	..
Germany	–1.1	–18.0	67,582	–44.8	32.1	43.8	56,560	–23.9	38.2	52.2	31,543	8.1
Ghana	4.9	149.5	8,990	24.2	23.3	39.5	4,899	–5.5	9.3	70.5	15	–97.5
Greece	2.2	34.9	7,289	2.1	26.3	50.0	5,977	–17.1	22.1	58.2	1,842	–20.9
Guatemala	6.0	154.2	8,306	74.7	12.4	48.8	5,376	121.2	5.5	56.8	481	..
Guinea	1.5	31.6	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	–0.4	13.0	..	..	..	..	..	..	..	..	..	..
Haiti	7.6	141.3	4,006	34.9	12.1	56.2	1,438	59.6	6.2	84.2	0	..
Honduras	7.4	240.7	5,191	31.5	7.2	78.4	2,865	26.1	3.8	85.9	0	..

Trends in greenhouse gas emissions

3.9

	Carbon dioxide emissions		Methane emissions				Nitrous oxide emissions				Other greenhouse gas emissions	
	average annual % growth[a] 1990–2007	% change[b] 1990–2007	Total thousand metric tons of carbon dioxide equivalent 2005	% change[b] 1990–2005	% of total From energy processes 2005	% of total Agricultural 2005	Total thousand metric tons of carbon dioxide equivalent 2005	% change[b] 1990–2005	% of total Energy and industry 2005	% of total Agricultural 2005	Total thousand metric tons of carbon dioxide equivalent 2005	% change[b] 1990–2005
Hungary	–0.6	–11.0	7,767	–22.9	29.1	33.6	6,961	–31.2	30.9	60.1	1,552	121.1
India	4.8	133.5	583,978	10.5	15.9	64.4	212,927	33.3	12.8	73.4	8,433	–11.9
Indonesia	4.6	165.5	208,944	18.4	25.5	46.4	123,275	43.5	3.7	71.5	1,027	–40.6
Iran, Islamic Rep.	4.7	118.3	114,585	32.5	70.6	18.2	26,644	41.1	11.4	75.3	2,569	–2.9
Iraq	3.7	90.5	15,937	–45.8	58.4	18.6	3,440	–9.9	9.7	63.3	86	–66.0
Ireland	2.5	46.1	15,331	14.3	11.9	76.7	7,486	–8.3	4.5	90.5	1,151	3,062.9
Israel	3.6	99.0	3,517	83.8	18.4	31.2	1,793	41.6	15.3	53.0	1,981	88.7
Italy	0.6	7.4	40,790	–13.4	14.7	39.8	28,620	–5.4	39.1	43.7	13,968	211.1
Jamaica	2.4	75.3	1,302	14.4	11.4	50.3	599	29.5	12.1	59.0	51	..
Japan	0.4	8.8	42,771	–36.5	8.1	71.2	29,785	–17.0	41.6	27.9	53,786	81.1
Jordan	4.3	106.2	1,796	111.5	25.0	21.8	667	39.6	8.2	55.4	112	..
Kazakhstan	–2.1	–22.9	47,119	–27.3	66.2	25.3	17,594	–46.2	12.8	62.5	339	..
Kenya	4.6	92.9	22,130	23.3	16.9	65.5	10,542	14.3	5.0	88.8	0	..
Korea, Dem. Rep.	–9.2	–71.1	18,195	–15.0	58.6	23.5	3,422	–60.6	13.2	62.3	2,794	..
Korea, Rep.	4.0	108.2	32,069	2.4	19.9	38.6	13,548	34.7	41.3	35.9	10,221	66.0
Kosovo	..	..	..	..	..	..	..	..	..	..	..	..
Kuwait	9.0	111.4	14,380	119.4	93.4	1.1	650	157.1	27.7	16.9	931	253.9
Kyrgyz Republic	–4.1	–51.2	3,591	–38.1	6.8	72.3	1,510	–57.7	11.2	72.6	24	..
Lao PDR	14.0	554.7	..	..	..	..	..	..	..	..	..	..
Latvia	–4.4	–47.9	3,108	–42.1	53.6	27.7	1,253	–58.7	11.6	77.4	890	..
Lebanon	3.0	46.8	1,003	46.6	9.7	25.5	672	79.1	12.6	58.8	0	..
Lesotho	..	..	..	..	..	..	..	..	..	..	..	..
Liberia	5.3	39.4	..	..	..	..	..	..	..	..	..	..
Libya	2.2	42.2	14,682	–34.7	86.3	5.7	1,285	9.2	11.2	51.9	280	–0.7
Lithuania	–3.1	–38.9	5,516	–34.1	32.0	33.8	2,451	–45.7	5.0	86.0	656	..
Macedonia, FYR	–0.4	–29.3	1,403	–36.5	32.1	46.6	599	–33.9	15.9	63.9	120	..
Madagascar	5.1	128.3	..	..	..	..	..	..	..	..	..	..
Malawi	3.8	72.5	..	..	..	..	..	..	..	..	..	..
Malaysia	6.4	243.6	46,501	64.7	69.3	12.4	15,087	13.5	6.7	64.9	994	66.3
Mali	1.9	37.4	..	..	..	..	..	..	..	..	..	..
Mauritania	–4.6	–26.8	..	..	..	..	..	..	..	..	..	..
Mauritius	6.2	165.7	..	..	..	..	..	..	..	..	..	..
Mexico	1.6	31.9	128,209	26.3	40.2	42.3	42,514	8.9	10.6	75.2	4,555	53.1
Moldova	–10.5	–80.1	3,372	–17.5	45.2	29.4	849	–51.0	5.5	73.5	8	..
Mongolia	–0.7	5.4	6,067	–25.9	2.5	92.1	3,489	–30.0	2.2	93.2	0	..
Morocco	3.8	97.1	10,573	15.8	8.0	51.7	5,814	12.2	3.0	82.6	0	..
Mozambique	5.4	159.7	12,843	18.2	22.7	44.2	9,501	–12.7	3.4	71.4	282	..
Myanmar	6.9	208.5	77,211	–7.4	12.6	69.0	30,932	–23.9	2.6	42.9	0	..
Namibia	42.7	..	5,057	47.2	0.3	94.9	3,797	47.1	1.1	94.3	0	..
Nepal	8.1	439.9	22,142	9.7	5.9	82.9	4,516	26.0	13.0	76.8	0	..
Netherlands	0.0	5.6	21,259	–30.4	23.4	43.4	14,596	–10.7	52.5	39.5	3,750	–40.9
New Zealand	2.2	36.5	27,635	3.6	3.6	90.2	12,930	23.5	3.5	94.2	973	3.4
Nicaragua	4.4	73.6	6,018	26.3	6.6	74.8	3,340	10.1	3.3	91.7	0	..
Niger	–1.2	–4.6	..	..	..	..	..	..	..	..	..	..
Nigeria	5.9	110.0	130,317	10.9	68.9	19.8	21,565	12.6	9.1	77.3	669	176.6
Norway	2.9	36.5	16,870	47.2	74.6	12.6	4,737	–3.1	46.5	39.0	5,202	–39.4
Oman	8.2	260.5	17,849	194.9	94.1	3.0	561	82.6	16.0	68.0	175	..
Pakistan	4.8	128.1	137,401	50.7	23.7	63.5	26,838	46.0	14.5	74.2	819	–18.8
Panama	4.4	131.2	3,219	16.5	4.0	79.2	1,204	18.1	4.9	83.7	0	..
Papua New Guinea	5.3	57.2	..	..	..	..	..	..	..	..	..	..
Paraguay	3.0	82.7	15,388	2.0	3.9	84.1	9,067	0.6	1.7	82.6	0	..
Peru	3.6	103.1	17,187	22.7	13.5	61.3	7,560	35.4	2.9	81.9	330	..
Philippines	3.1	59.2	51,889	28.6	9.3	63.7	12,950	34.0	9.1	73.1	365	125.6
Poland	–1.0	–8.8	70,023	–36.6	62.0	21.9	30,198	4.7	33.5	57.7	2,451	360.6
Portugal	2.0	31.2	12,173	22.4	13.8	35.4	5,958	24.3	22.0	43.8	783	606.6
Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..
Qatar	5.9	435.5	15,706	387.2	96.5	0.4	200	105.1	33.9	25.0	0	..

3.9 Trends in greenhouse gas emissions

	Carbon dioxide emissions		Methane emissions				Nitrous oxide emissions				Other greenhouse gas emissions	
	average annual % growth[a]	% change[b]	Total thousand metric tons of carbon dioxide equivalent	% change[b]	% of total		Total thousand metric tons of carbon dioxide equivalent	% change[b]	% of total		Total thousand metric tons of carbon dioxide equivalent	% change[b]
	1990–2007	1990–2007	2005	1990–2005	From energy processes 2005	Agricultural 2005	2005	1990–2005	Energy and industry 2005	Agricultural 2005	2005	1990–2005
Romania	–2.9	–40.7	24,331	–35.1	42.7	36.0	11,537	–44.0	32.4	56.2	746	–62.8
Russian Federation	–2.2	–34.3	562,801	–18.3	79.3	9.1	76,121	–48.7	27.8	44.3	59,673	130.6
Rwanda	0.6	4.8	..	..	..	..	..	..	..	..	..	..
Saudi Arabia	2.6	87.1	48,152	67.4	83.6	4.0	6,501	17.5	14.0	46.1	2,193	–10.6
Senegal	3.0	72.1	7,129	35.1	9.9	68.3	4,083	37.2	2.7	88.5	0	..
Serbia	0.6[c]	–20.1[c]	7,782	–58.7	41.5	43.7	4,581	–8.8	24.2	63.6	4,493	353.7
Sierra Leone	7.4	237.7	..	..	..	..	..	..	..	..	..	..
Singapore	0.3	15.4	2,237	136.6	60.1	1.3	1,068	162.8	77.6	2.8	2,532	396.0
Slovak Republic	–1.6	–32.8	3,911	–39.7	18.2	39.0	3,354	–37.1	52.0	37.7	395	478.0
Slovenia	0.6	–17.3	3,498	0.6	30.7	32.1	1,156	–12.2	13.2	70.4	473	–38.5
Somalia	*38.1*	..	..	..	..	..	..	..	..	..	..	..
South Africa	1.3	30.0	63,785	24.6	45.4	31.4	24,048	12.9	12.6	59.8	2,552	71.1
Spain	2.9	57.9	36,338	11.9	10.4	56.8	26,529	6.5	18.7	62.6	9,080	47.7
Sri Lanka	7.5	226.3	10,210	–11.2	5.3	65.2	2,056	18.0	12.1	65.1	0	..
Sudan	6.4	107.3	67,441	55.5	7.1	85.2	49,472	34.9	1.3	92.6	0	..
Swaziland	10.0	150.0	..	..	..	..	..	..	..	..	..	..
Sweden	–0.5	–4.8	11,311	1.3	9.9	28.1	5,865	–13.1	26.8	60.2	2,078	133.8
Switzerland	–0.3	–11.6	4,748	–17.1	19.8	67.6	2,415	–15.5	20.8	59.3	2,109	97.4
Syrian Arab Republic	3.6	86.6	12,458	–10.8	53.8	28.1	5,509	33.4	9.0	78.1	0	..
Tajikistan	–6.9	–69.9	3,898	–9.3	12.8	68.6	1,378	0.2	1.4	86.9	383	–86.3
Tanzania	4.9	154.7	32,024	24.0	12.6	63.2	21,647	0.8	2.5	78.8	0	..
Thailand	5.7	189.6	83,257	5.7	16.9	66.0	22,304	15.1	21.7	65.5	1,104	–22.8
Timor-Leste	..	..	..	..	..	..	..	..	..	..	..	..
Togo	3.6	70.1	2,889	5.0	23.5	39.8	1,738	–21.3	5.6	67.5	0	..
Trinidad and Tobago	4.1	118.4	10,070	32.0	83.9	0.7	230	12.4	11.5	60.3	0	..
Tunisia	3.3	79.9	8,160	106.2	55.6	25.5	2,366	18.0	21.4	66.4	0	..
Turkey	3.4	91.4	64,251	46.4	16.0	33.6	32,781	12.8	22.7	66.4	5,066	96.9
Turkmenistan	2.8	44.7	27,984	–5.0	75.2	21.6	4,276	93.8	16.4	78.1	73	..
Uganda	8.3	291.9	..	..	..	..	..	..	..	..	..	..
Ukraine	–4.4	–54.0	70,360	–42.2	62.1	23.3	26,097	–51.4	42.8	45.6	693	209.3
United Arab Emirates	5.5	147.3	23,283	58.0	93.1	2.6	1,169	78.7	18.3	43.6	1,075	27.4
United Kingdom	–0.5	–5.4	65,788	–44.1	24.8	38.2	30,565	–44.7	24.8	60.0	10,403	96.7
United States	1.2	20.0	548,074	–14.4	41.0	34.8	317,153	1.8	30.6	56.4	239,517	158.7
Uruguay	2.0	55.7	19,589	24.1	1.5	94.3	7,017	16.1	1.4	96.9	59	..
Uzbekistan	0.1	–9.7	39,602	24.0	57.3	33.7	10,003	9.4	6.2	84.2	608	..
Venezuela, RB	2.9	35.5	61,183	5.9	47.4	40.0	14,935	23.4	5.0	75.2	2,468	–24.0
Vietnam	11.7	420.3	82,978	40.1	22.7	63.9	23,030	98.3	6.1	83.0	0	..
West Bank and Gaza	*19.7*	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	4.5	117.4	6,677	73.5	17.0	54.9	3,250	57.4	11.2	72.5	0	..
Zambia	–0.2	10.0	19,294	–28.4	6.7	59.3	25,068	–29.7	2.6	71.7	0	..
Zimbabwe	–3.3	–37.9	9,539	–5.7	11.4	73.3	6,114	–16.1	3.7	85.2	0	..
World	**1.8 w**	**36.0 w**	**7,135,973 s**	**6.2 w**	**37.3 w**	**42.6 w**	**2,852,592 s**	**5.8 w**	**15.4 w**	**66.2 w**	**724,183 s**	**122.4 w**
Low income	–4.1	–36.2	464,616	–4.0	13.6	60.7	239,126	–16.7	4.1	63.6	..	..
Middle income	2.6	59.6	5,128,922	13.9	39.0	42.6	1,799,128	18.3	10.7	70.8	259,893	208.5
Lower middle income	4.3	117.7	3,120,011	18.6	35.1	46.9	1,153,692	30.5	10.8	72.3	159,984	439.4
Upper middle income	0.3	3.8	2,008,911	7.3	45.0	35.8	645,436	1.5	10.6	68.1	99,909	83.1
Low & middle income	2.4	56.2	5,593,538	12.2	36.9	44.1	2,038,253	12.8	10.0	70.0	263,401	200.5
East Asia & Pacific	4.7	148.9	1,928,355	24.5	39.2	43.6	707,496	38.0	10.5	72.2	..	..
Europe & Central Asia	–2.0	–31.3	933,500	–17.2	67.5	17.4	213,150	–38.8	25.4	56.6	74,802	112.0
Latin America & Carib.	2.4	51.2	1,008,557	30.3	17.3	58.6	442,132	32.9	4.6	72.4	20,972	23.5
Middle East & N. Africa	4.2	103.4	287,084	20.0	64.7	20.7	73,539	36.8	10.7	74.5	6,717	20.7
South Asia	4.8	134.1	846,145	14.6	16.1	65.4	267,722	34.9	12.6	74.3	9,253	–12.5
Sub-Saharan Africa	2.2	46.1	589,897	5.4	30.5	44.0	334,216	–7.6	3.7	66.1	..	..
High income	1.0	17.9	1,542,435	–10.8	38.9	37.0	814,339	–8.4	29.1	56.9	460,781	93.7
Euro area	0.2	2.4	315,597	–18.0	25.9	46.9	218,258	–17.8	31.7	55.4	84,190	37.2

a. Calculated using the least squares method, which accounts for ups and downs of all data points in the period (see Statistical methods). b. Calculated as the change in emission since 1990, which is the baseline for Kyoto Protocal requirements. c. Includes Kosovo and Montenegro.

Trends in greenhouse gas emissions 3.9

About the data

Greenhouse gases—which include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—contribute to climate change.

Carbon dioxide emissions, largely a byproduct of energy production and use (see table 3.7), account for the largest share of greenhouse gases. Anthropogenic carbon dioxide emissions result primarily from fossil fuel combustion and cement manufacturing. Burning oil releases more carbon dioxide than burning natural gas, and burning coal releases even more for the same level of energy use. Cement manufacturing releases about half a metric ton of carbon dioxide for each metric ton of cement produced.

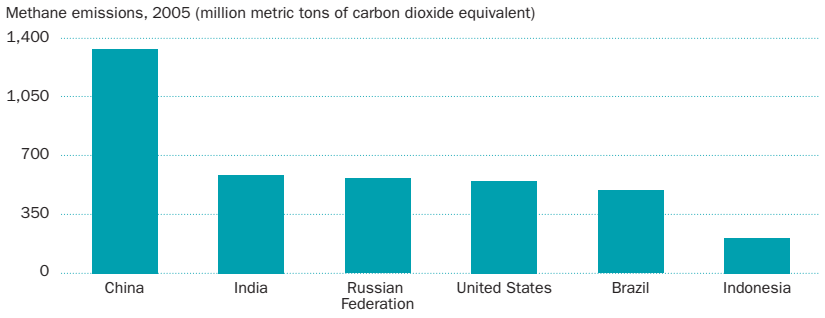
Methane emissions result largely from agricultural activities, industrial production landfills and wastewater treatment, and other sources such as tropical forest and other vegetation fires. The emissions are usually expressed in carbon dioxide equivalents using the global warming potential, which allows the effective contributions of different gases to be compared. A kilogram of methane is 21 times as effective at trapping heat in the earth's atmosphere as a kilogram of carbon dioxide within 100 years.

Nitrous oxide emissions are mainly from fossil fuel combustion, fertilizers, rainforest fires, and animal waste. Nitrous oxide is a powerful greenhouse gas, with an estimated atmospheric lifetime of 114 years, compared with 12 years for methane. The per kilogram global warming potential of nitrous oxide is nearly 310 times that of carbon dioxide within 100 years.

Other greenhouse gases covered under the Kyoto Protocol are hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Although emissions of these artificial gases are small, they are more powerful greenhouse gases than carbon dioxide, with much higher atmospheric lifetimes and high global warming potential.

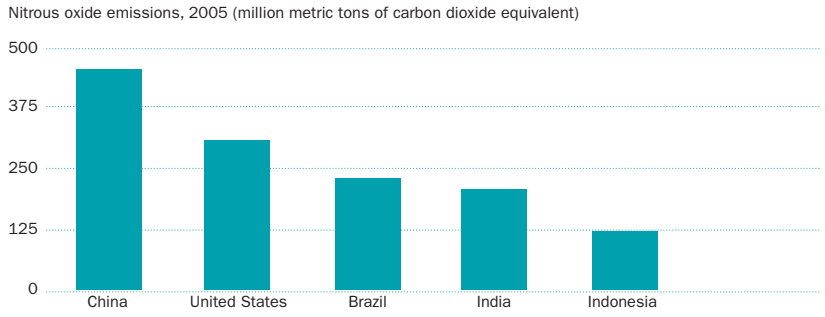
For a discussion of carbon dioxide sources and the methodology behind emissions calculation, see *About the data* for table 3.8.

The six largest contributors to methane emissions account for about 50 percent of emissions **3.9a**



Source: Table 3.9.

The five largest contributors to nitrous oxide emissions account for about 50 percent of emissions **3.9b**



Source: Table 3.9.

Definitions

• **Carbon dioxide emissions** are emissions from the burning of fossil fuels and the manufacture of cement and include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring. • **Methane emissions** are emissions from human activities such as agriculture and from industrial methane production. • **Methane emissions from energy processes** are emissions from the production, handling, transmission, and combustion of fossil fuels and biofuels. • **Agricultural methane emissions** are emissions from animals, animal waste, rice production, agricultural waste burning (nonenergy, on-site), and savannah burning. • **Nitrous oxide emissions** are emissions from agricultural biomass burning, industrial activities, and livestock management. • **Nitrous oxide emissions from energy processes** are emissions produced by the combustion of fossil fuels and biofuels. • **Agricultural nitrous oxide emissions** are emissions produced through fertilizer use (synthetic and animal manure), animal waste management, agricultural waste burning (nonenergy, on-site), and savannah burning. • **Other greenhouse gas emissions** include hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, which are to be curbed under the Kyoto Protocol. Hydrofluorocarbons, used as a replacement for chlorofluorocarbons, are used mainly in refrigeration and semiconductor manufacturing. Perfluorocarbons, also used as a replacement for chlorofluorocarbons in manufacturing semiconductors, are a byproduct of aluminum smelting and uranium enrichment. Sulfur hexafluoride is used largely to insulate high-voltage electric power equipment.

Data sources

Data on carbon dioxide emissions are from the Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States. Data on methane, nitrous oxide, and other greenhouse gases emissions are compiled by the International Energy Agency.

3.10 Sources of electricity

	Electricity production		Sources of electricity[a]									
	billion kilowatt hours		% of total									
	Coal		Natural Gas		Oil		Hydropower		Nuclear power			
	1990	2008	1990	2008	1990	2008	1990	2008	1990	2008	1990	2008
Afghanistan	..	..	..	..	..	..	..	..	..	..	..	..
Albania	3.2	3.8	0.0	0.0	0.0	0.0	10.9	0.0	89.1	100.0	0.0	0.0
Algeria	16.1	40.2	0.0	0.0	93.7	97.3	5.4	2.0	0.8	0.7	0.0	0.0
Angola	0.8	4.0	0.0	0.0	0.0	0.0	13.8	3.7	86.2	96.3	0.0	0.0
Argentina	50.7	121.4	1.3	2.3	39.2	53.6	9.8	11.7	35.2	24.9	14.3	6.0
Armenia	10.4	5.8	0.0	0.0	16.4	26.2	68.6	0.0	15.0	31.1	0.0	42.6
Australia	154.3	257.1	78.7	76.9	9.3	15.0	2.3	1.1	9.2	4.6	0.0	0.0
Austria	49.3	64.4	14.2	10.7	15.7	17.4	3.8	1.9	63.9	59.0	0.0	0.0
Azerbaijan	23.2	23.9	0.0	0.0	0.0	84.1	97.0	6.6	3.0	9.3	0.0	0.0
Bangladesh	7.7	35.0	0.0	1.8	84.3	89.0	4.3	5.0	11.4	4.2	0.0	0.0
Belarus	39.5	35.0	0.0	0.0	58.1	96.9	41.8	2.7	0.1	0.1	0.0	0.0
Belgium	70.3	83.6	28.2	8.7	7.7	29.5	1.9	0.5	0.4	0.5	60.8	54.5
Benin	0.0	0.1	0.0	0.0	0.0	0.0	100.0	99.3	0.0	0.7	0.0	0.0
Bolivia	2.1	6.2	0.0	0.0	37.6	46.5	5.3	14.0	55.3	36.6	0.0	0.0
Bosnia and Herzegovina	14.6	13.3	71.8	64.4	0.0	0.0	7.3	1.3	20.9	34.3	0.0	0.0
Botswana	0.9	0.6	88.1	100.0	0.0	0.0	11.9	0.0	0.0	0.0	0.0	0.0
Brazil	222.8	463.4	2.1	2.7	0.3	6.3	2.2	3.8	92.8	79.8	1.0	3.0
Bulgaria	42.1	44.6	50.3	52.1	7.6	5.3	2.9	0.6	4.5	6.3	34.8	35.4
Burkina Faso	..	..	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..	..	..
Cambodia	..	1.5	..	0.0	..	0.0	..	96.5	..	3.1	..	0.0
Cameroon	2.7	5.6	0.0	0.0	0.0	7.7	1.5	15.9	98.5	76.2	0.0	0.0
Canada	482.0	651.2	17.1	17.2	2.0	6.2	3.4	1.5	61.6	58.7	15.1	14.4
Central African Republic	..	..	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..
Chile	18.4	59.7	38.3	23.6	2.1	3.7	9.2	26.9	48.5	40.5	0.0	0.0
China	621.2	3,456.9	71.3	79.1	0.4	0.9	7.9	0.7	20.4	16.9	0.0	2.0
Hong Kong SAR, China	28.9	38.0	98.3	68.2	0.0	31.5	1.7	0.3	0.0	0.0	0.0	0.0
Colombia	36.4	56.0	10.1	5.4	12.4	10.3	1.0	0.3	75.6	82.8	0.0	0.0
Congo, Dem. Rep.	5.7	7.5	0.0	0.0	0.0	0.4	0.4	0.2	99.6	99.4	0.0	0.0
Congo, Rep.	0.5	0.5	0.0	0.0	0.0	18.7	0.6	0.0	99.4	81.3	0.0	0.0
Costa Rica	3.5	9.5	0.0	0.0	0.0	0.0	2.5	7.1	97.5	78.0	0.0	0.0
Côte d'Ivoire	2.0	5.8	0.0	0.0	0.0	65.1	33.3	0.2	66.7	32.7	0.0	0.0
Croatia	9.2	12.2	6.8	20.4	20.2	20.1	31.6	16.2	41.3	42.7	0.0	0.0
Cuba	15.0	17.7	0.0	0.0	0.2	0.0	91.4	97.0	0.8	0.8	0.0	0.0
Czech Republic	62.3	83.2	76.4	59.9	0.6	1.2	0.9	0.2	1.9	2.4	20.2	31.9
Denmark	26.0	36.4	90.7	48.0	2.7	19.0	3.4	3.1	0.1	0.1	0.0	0.0
Dominican Republic	3.7	15.4	1.2	13.8	0.0	12.9	88.6	61.8	9.4	11.2	0.0	0.0
Ecuador	6.3	18.6	0.0	0.0	0.0	7.3	21.5	29.8	78.5	60.7	0.0	0.0
Egypt, Arab Rep.	42.3	131.0	0.0	0.0	39.6	68.4	36.9	19.7	23.5	11.2	0.0	0.0
El Salvador	2.2	6.0	0.0	0.0	0.0	0.0	6.9	38.6	73.5	34.2	0.0	0.0
Eritrea	*0.1*	0.3	*0.0*	0.0	*0.0*	0.0	*100.0*	99.3	*0.0*	0.0	*0.0*	0.0
Estonia	17.4	10.6	85.8	91.0	5.5	4.0	8.3	0.3	0.0	0.3	0.0	0.0
Ethiopia	1.2	3.8	0.0	0.0	0.0	0.0	11.6	12.4	88.4	87.3	0.0	0.0
Finland	54.4	77.4	18.5	11.8	8.6	14.5	3.1	0.5	20.0	22.1	35.3	29.6
France	417.2	570.3	8.5	4.8	0.7	3.8	2.1	1.0	12.9	11.2	75.3	77.1
Gabon	1.0	2.0	0.0	0.0	16.4	24.7	11.2	31.2	72.1	43.8	0.0	0.0
Gambia, The	..	..	..	..	..	..	..	..	..	..	..	..
Georgia	13.7	8.4	0.0	0.0	15.6	15.2	29.2	0.0	55.2	84.8	0.0	0.0
Germany	547.7	631.2	58.7	46.0	7.4	13.9	1.9	1.5	3.2	3.3	27.8	23.5
Ghana	5.7	8.4	0.0	0.0	0.0	0.0	0.0	25.9	100.0	74.1	0.0	0.0
Greece	34.8	62.9	72.4	53.0	0.3	21.9	22.3	15.9	5.1	5.3	0.0	0.0
Guatemala	2.3	8.7	0.0	13.0	0.0	0.0	9.0	26.6	76.0	42.6	0.0	0.0
Guinea	..	..	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..
Haiti	0.6	0.5	0.0	0.0	0.0	0.0	20.6	62.8	76.5	37.2	0.0	0.0
Honduras	2.3	6.5	0.0	0.0	0.0	0.0	1.7	61.9	98.3	35.0	0.0	0.0

Sources of electricity 3.10

	Electricity production		Sources of electricity[a]									
			% of total									
	billion kilowatt hours		Coal		Natural Gas		Oil		Hydropower		Nuclear power	
	1990	2008	1990	2008	1990	2008	1990	2008	1990	2008	1990	2008
Hungary	28.4	40.0	30.5	18.0	15.7	37.9	4.8	0.9	0.6	0.5	48.3	37.0
India	289.4	830.1	66.2	68.6	3.4	9.9	3.5	4.1	24.8	13.8	2.1	1.8
Indonesia	33.3	149.4	31.5	41.1	2.3	16.9	42.7	28.8	20.2	7.7	0.0	0.0
Iran, Islamic Rep.	59.1	214.5	0.0	0.2	52.5	80.8	37.3	16.6	10.3	2.3	0.0	0.0
Iraq	24.0	36.8	0.0	0.0	0.0	0.0	89.2	98.5	10.8	1.5	0.0	0.0
Ireland	14.2	29.4	41.6	17.8	27.7	54.7	10.0	5.9	4.9	3.3	0.0	0.0
Israel	20.9	56.4	50.1	62.7	0.0	26.2	49.9	10.6	0.0	0.0	0.0	0.0
Italy	213.1	313.5	16.8	15.5	18.6	55.1	48.2	10.0	14.8	13.3	0.0	0.0
Jamaica	2.5	7.8	0.0	0.0	0.0	0.0	92.4	96.0	3.6	2.0	0.0	0.0
Japan	835.5	1,075.0	14.0	26.8	20.0	26.3	18.5	9.7	10.7	7.1	24.2	24.0
Jordan	3.6	13.8	0.0	0.0	11.9	80.6	87.8	18.9	0.3	0.4	0.0	0.0
Kazakhstan	87.4	80.3	71.1	70.3	10.5	10.7	10.0	9.7	8.4	9.3	0.0	0.0
Kenya	3.2	7.1	0.0	0.0	0.0	0.0	7.1	38.4	76.6	40.4	0.0	0.0
Korea, Dem. Rep.	27.7	23.2	40.1	36.0	0.0	0.0	3.6	3.4	56.3	60.6	0.0	0.0
Korea, Rep.	105.4	443.9	16.8	43.2	9.1	18.3	17.9	3.5	6.0	0.7	50.2	34.0
Kosovo	..	..	..	..	..	..	..	..	..	..	..	..
Kuwait	18.5	51.7	0.0	0.0	45.7	30.4	54.3	69.6	0.0	0.0	0.0	0.0
Kyrgyz Republic	15.7	11.9	13.1	3.5	23.5	6.1	0.0	0.0	63.5	90.4	0.0	0.0
Lao PDR	..	..	..	..	..	..	..	..	..	..	..	..
Latvia	6.6	5.3	0.0	0.0	26.1	39.0	5.4	0.0	67.6	58.9	0.0	0.0
Lebanon	1.5	10.6	0.0	0.0	0.0	0.0	66.7	96.5	33.3	3.5	0.0	0.0
Lesotho	..	..	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	..	..	..	..	..	..	..	..
Libya	10.2	28.7	0.0	0.0	0.0	41.0	100.0	59.0	0.0	0.0	0.0	0.0
Lithuania	28.4	13.3	0.0	0.0	23.8	15.2	14.6	4.2	1.5	3.0	60.0	74.2
Macedonia, FYR	5.8	6.3	89.7	83.8	0.0	0.0	1.8	2.9	8.5	13.3	0.0	0.0
Madagascar	..	..	..	..	..	..	..	..	..	..	..	..
Malawi	..	..	..	..	..	..	..	..	..	..	..	..
Malaysia	23.0	97.4	12.3	26.9	20.4	63.6	50.0	1.9	17.3	7.7	0.0	0.0
Mali	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	..	..	..	..	..	..	..	..	..	..	..	..
Mexico	115.8	258.9	6.7	8.3	12.5	50.6	53.6	19.0	20.3	15.1	2.5	3.8
Moldova	16.2	3.6	30.8	0.0	42.3	95.6	25.4	0.4	1.6	2.3	0.0	0.0
Mongolia	3.5	4.1	92.4	96.1	0.0	0.0	7.6	3.9	0.0	0.0	0.0	0.0
Morocco	9.6	20.8	23.0	56.2	0.0	13.8	64.4	24.2	12.7	4.5	0.0	0.0
Mozambique	0.5	15.1	13.9	0.0	0.0	0.1	23.6	0.0	62.6	99.9	0.0	0.0
Myanmar	2.5	6.6	1.6	0.0	39.3	35.7	10.9	3.5	48.1	60.8	0.0	0.0
Namibia	*1.4*	2.1	*1.5*	31.1	*0.0*	0.0	*3.3*	1.4	95.2	67.5	*0.0*	0.0
Nepal	0.9	3.1	0.0	0.0	0.0	0.0	0.1	0.4	99.9	99.6	0.0	0.0
Netherlands	71.9	107.6	38.3	24.9	50.9	58.9	4.3	1.9	0.1	0.1	4.9	3.9
New Zealand	32.3	43.8	2.1	11.0	17.7	24.3	0.0	0.3	71.9	51.0	0.0	0.0
Nicaragua	1.4	3.4	0.0	0.0	0.0	0.0	39.8	64.5	28.8	15.9	0.0	0.0
Niger	..	..	..	..	..	..	..	..	..	..	..	..
Nigeria	13.5	21.1	0.1	0.0	53.7	58.2	13.7	14.7	32.6	27.1	0.0	0.0
Norway	121.6	141.7	0.1	0.1	0.0	0.3	0.0	0.0	99.6	98.5	0.0	0.0
Oman	4.5	15.7	0.0	0.0	81.6	82.0	18.4	18.0	0.0	0.0	0.0	0.0
Pakistan	37.7	91.6	0.1	0.1	33.6	32.4	20.6	35.4	44.9	30.3	0.8	1.8
Panama	2.7	6.4	0.0	0.0	0.0	0.0	14.7	37.9	83.2	61.8	0.0	0.0
Papua New Guinea	..	..	..	..	..	..	..	..	..	..	..	..
Paraguay	27.2	55.5	0.0	0.0	0.0	0.0	0.0	0.0	99.9	100.0	0.0	0.0
Peru	13.8	32.4	0.0	2.7	1.7	28.0	21.5	9.0	75.8	58.7	0.0	0.0
Philippines	27.4	60.8	7.0	25.9	0.0	32.2	45.3	8.0	22.1	16.2	0.0	0.0
Poland	134.4	155.6	97.5	92.2	0.1	2.0	1.2	1.5	1.1	1.4	0.0	0.0
Portugal	28.4	45.5	32.1	24.6	0.0	33.4	33.1	9.1	32.3	15.0	0.0	0.0
Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..
Qatar	4.8	21.6	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0

3.10 Sources of electricity

	Electricity production		Sources of electricity[a]									
			% of total									
	billion kilowatt hours		Coal		Natural Gas		Oil		Hydropower		Nuclear power	
	1990	2008	1990	2008	1990	2008	1990	2008	1990	2008	1990	2008
Romania	64.3	65.0	28.8	39.8	35.1	15.3	18.4	1.1	17.7	26.5	0.0	17.3
Russian Federation	1,082.2	1,038.4	14.3	18.9	47.3	47.6	11.5	1.5	15.3	15.9	10.9	15.7
Rwanda	..	..	..	..	..	..	..	..	..	..	..	..
Saudi Arabia	69.2	204.2	0.0	0.0	48.1	43.1	51.9	56.9	0.0	0.0	0.0	0.0
Senegal	0.9	2.4	0.0	0.0	2.3	1.7	93.0	85.8	0.0	9.5	0.0	0.0
Serbia	40.9	36.8	69.1	72.4	3.2	1.1	4.6	0.5	23.1	26.0	0.0	0.0
Sierra Leone	..	..	..	..	..	..	..	..	..	..	..	..
Singapore	15.7	41.7	0.0	0.0	0.0	80.3	100.0	19.7	0.0	0.0	0.0	0.0
Slovak Republic	25.5	28.8	31.9	17.9	7.1	5.6	6.4	2.4	7.4	14.0	47.2	58.1
Slovenia	12.4	16.4	31.3	32.5	0.0	2.9	7.9	0.1	23.7	24.5	37.1	38.3
Somalia	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	165.4	255.5	94.3	94.2	0.0	0.0	0.0	0.1	0.6	0.5	5.1	5.1
Spain	151.2	311.1	40.1	16.1	1.0	39.1	5.7	5.8	16.8	7.6	35.9	19.0
Sri Lanka	3.2	9.2	0.0	0.0	0.0	0.0	0.2	55.1	99.8	44.7	0.0	0.0
Sudan	1.5	4.5	0.0	0.0	0.0	0.0	36.8	67.6	63.2	32.4	0.0	0.0
Swaziland	..	..	..	..	..	..	..	..	..	..	..	..
Sweden	146.0	149.9	1.1	1.1	0.3	0.4	0.9	0.6	49.7	46.1	46.7	42.6
Switzerland	55.0	67.1	0.1	0.0	0.6	1.1	0.7	0.2	54.2	53.7	43.0	41.3
Syrian Arab Republic	11.6	41.0	0.0	0.0	20.5	31.3	56.0	61.7	23.5	7.0	0.0	0.0
Tajikistan	18.1	16.1	0.0	0.0	9.1	1.9	0.0	0.0	90.9	98.1	0.0	0.0
Tanzania	1.6	4.4	0.0	2.7	0.0	36.2	4.9	0.9	95.1	60.1	0.0	0.0
Thailand	44.2	147.4	25.0	21.4	40.2	69.4	23.5	1.1	11.3	4.8	0.0	0.0
Timor-Leste	..	..	..	..	..	..	..	..	..	..	..	..
Togo	0.2	0.1	0.0	0.0	0.0	0.0	39.9	24.4	60.1	74.0	0.0	0.0
Trinidad and Tobago	3.6	7.9	0.0	0.0	99.0	99.6	0.1	0.2	0.0	0.0	0.0	0.0
Tunisia	5.8	15.3	0.0	0.0	63.7	88.7	35.5	10.8	0.8	0.2	0.0	0.0
Turkey	57.5	198.4	35.1	29.1	17.7	49.7	6.9	3.8	40.2	16.8	0.0	0.0
Turkmenistan	14.6	15.0	0.0	0.0	95.2	100.0	0.0	0.0	4.8	0.0	0.0	0.0
Uganda	..	..	..	..	..	..	..	..	..	..	..	..
Ukraine	298.6	192.5	38.2	35.6	16.7	11.4	16.1	0.4	3.5	5.9	25.5	46.7
United Arab Emirates	17.1	86.3	0.0	0.0	96.3	98.3	3.7	1.7	0.0	0.0	0.0	0.0
United Kingdom	317.8	385.3	65.0	32.9	1.6	45.9	10.9	1.6	1.6	1.3	20.7	13.6
United States	3,202.8	4,343.8	53.1	49.1	11.9	21.0	4.1	1.3	8.5	5.9	19.1	19.3
Uruguay	7.4	8.8	0.0	0.0	0.0	0.0	5.1	39.1	94.2	51.4	0.0	0.0
Uzbekistan	56.3	49.4	7.4	4.1	76.4	70.0	4.4	2.9	11.8	23.0	0.0	0.0
Venezuela, RB	59.3	119.3	0.0	0.0	26.2	14.7	11.5	12.5	62.3	72.8	0.0	0.0
Vietnam	8.7	73.0	23.1	20.8	0.1	41.5	15.0	2.1	61.8	35.6	0.0	0.0
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	1.7	6.5	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0
Zambia	8.0	9.7	0.5	0.0	0.0	0.0	0.3	0.3	99.2	99.7	0.0	0.0
Zimbabwe	9.4	8.0	53.3	46.3	0.0	0.0	0.0	0.3	46.7	53.4	0.0	0.0
World	**11,839.5 t**	**20,201.4 t**	**37.3 w**	**40.8 w**	**14.6 w**	**21.3 w**	**10.2 w**	**5.1 w**	**18.0 w**	**15.8 w**	**17.0 w**	**13.5 w**
Low income	138.9	206.7	13.2	6.4	9.2	17.5	1.7	5.0	53.7	48.9	0.0	0.0
Middle income	3,984.6	8,948.5	32.4	47.4	22.3	19.8	14.6	6.0	23.1	20.4	6.4	4.7
Lower middle income	1,654.0	5,548.8	47.7	63.3	11.7	9.9	14.2	5.0	20.3	16.8	5.0	3.2
Upper middle income	2,330.2	3,402.8	21.6	21.3	29.8	35.8	14.9	7.6	25.1	26.4	7.3	7.2
Low & middle income	4,122.5	9,174.7	31.8	46.4	21.8	19.7	14.1	6.0	24.1	21.0	6.1	4.6
East Asia & Pacific	796.3	4,044.1	61.0	71.6	3.4	6.7	12.6	2.0	21.4	16.4	0.0	1.7
Europe & Central Asia	1,935.8	1,864.6	23.1	25.3	36.7	40.2	13.6	2.0	14.5	16.4	11.7	15.7
Latin America & Carib.	598.1	1,285.3	4.0	4.5	9.4	20.7	17.8	13.5	64.4	55.3	2.1	2.4
Middle East & N. Africa	187.9	566.8	1.2	2.1	36.9	62.5	48.3	29.4	12.4	4.4	0.0	0.0
South Asia	341.7	977.2	56.1	58.3	8.5	14.6	5.3	7.5	27.4	15.4	1.9	1.7
Sub-Saharan Africa	260.2	424.1	62.2	58.0	2.8	4.4	1.9	3.8	15.9	17.2	3.2	3.1
High income	7,736.5	11,079.9	40.2	36.1	10.7	22.5	8.1	4.4	14.7	11.3	22.7	20.8
Euro area	1,694.1	2,352.2	33.7	22.4	8.6	24.0	9.6	3.9	11.1	9.5	35.6	31.6

a. Shares may not sum to 100 percent because some sources of generated electricity (such as wind, solar, and geothermal) are not shown.

Sources of electricity 3.10

About the data

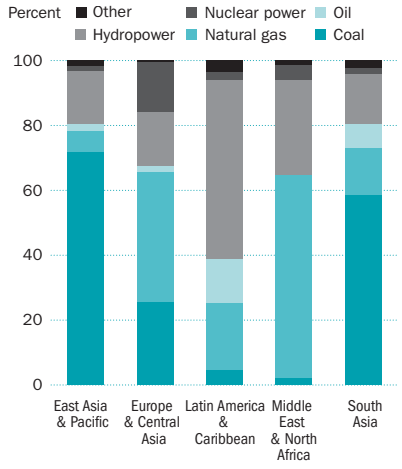
Use of energy is important in improving people's standard of living. But electricity generation also can damage the environment. Whether such damage occurs depends largely on how electricity is generated. For example, burning coal releases twice as much carbon dioxide—a major contributor to global warming—as does burning an equivalent amount of natural gas (see *About the data* for table 3.8). Nuclear energy does not generate carbon dioxide emissions, but it produces other dangerous waste products. The table provides information on electricity production by source.

The International Energy Agency (IEA) compiles data on energy inputs used to generate electricity. IEA data for countries that are not members of the Organisation for Economic Co-operation and Development (OECD) are based on national energy data adjusted to conform to annual questionnaires completed by OECD member governments. In addition, estimates are sometimes made to complete major aggregates from which key data are missing, and adjustments are made to compensate for differences in definitions. The IEA makes these estimates in consultation with national statistical offices, oil companies, electric utilities, and national energy experts. It occasionally revises its time series to reflect political changes. For example, the IEA has constructed historical energy statistics for countries of the former Soviet Union. In addition, energy statistics for other countries have undergone continuous changes in coverage or methodology in recent years as more detailed energy accounts have become available. Breaks in series are therefore unavoidable.

Definitions

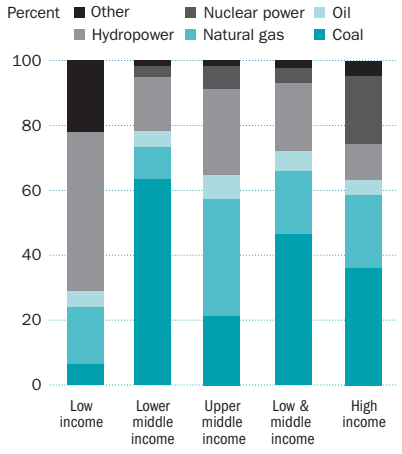
• **Electricity production** is measured at the terminals of all alternator sets in a station. In addition to hydropower, coal, oil, gas, and nuclear power generation, it covers generation by geothermal, solar, wind, and tide and wave energy as well as that from combustible renewables and waste. Production includes the output of electric plants designed to produce electricity only, as well as that of combined heat and power plants. • **Sources of electricity** are the inputs used to generate electricity: coal, gas, oil, hydropower, and nuclear power. • **Coal** is all coal and brown coal, both primary (including hard coal and lignite-brown coal) and derived fuels (including patent fuel, coke oven coke, gas coke, coke oven gas, and blast furnace gas). Peat is also included in this category. • **Gas** is natural gas but not natural gas liquids. • **Oil** is crude oil and petroleum products. • **Hydropower** is electricity produced by hydroelectric power plants. • **Nuclear power** is electricity produced by nuclear power plants.

More than 50 percent of electricity in Latin America is produced by hydropower **3.10a**



Source: Table 3.10.

Lower middle-income countries produce the majority of their power from coal **3.10b**



Source: Table 3.10.

Data sources

Data on electricity production are from the IEA's electronic files and its annual publications *Energy Statistics and Balances of Non-OECD Countries, Energy Statistics of OECD Countries,* and *Energy Balances of OECD Countries.*

3.11 Urbanization

	Urban population					Population in urban agglomerations of more than 1 million		Population in largest city		Access to improved sanitation facilities			
	millions		% of total population		average annual % growth	% of total population		% of urban population		% of urban population		% of rural population	
	1990	2009	1990	2009	1990–2009	1990	2009	1990	2009	1990	2008	1990	2008
Afghanistan	3	7	18	24	4.0	7	12	38	49	..	60	..	30
Albania	1	1	36	47	1.2	..	..	21	29	..	98	..	98
Algeria	13	23	52	66	2.9	7	8	14	12	99	98	77	88
Angola	4	11	37	58	5.2	15	24	40	42	58	86	6	18
Argentina	28	37	87	92	1.4	39	39	37	35	93	91	73	77
Armenia	2	2	68	64	-1.0	33	36	49	56	95	95	..	80
Australia	15	19	85	89	1.5	60	59	25	23	100	100	100	100
Austria	5	6	66	67	0.6	20	20	30	30	100	100	100	100
Azerbaijan	4	5	54	52	0.9	24	22	45	43	..	51	..	39
Bangladesh	23	45	20	28	3.5	8	13	29	32	59	56	34	52
Belarus	7	7	66	74	0.3	16	19	24	26	..	91	..	97
Belgium	10	11	96	97	0.5	17	18	17	18	100	100	100	100
Benin	2	4	35	42	4.3	..	..	30	22	14	24	1	4
Bolivia	4	7	56	66	3.0	25	33	29	25	29	34	6	9
Bosnia and Herzegovina	2	2	39	48	0.4	..	..	24	22	..	99	..	92
Botswana	1	1	42	60	3.8	..	..	22	17	58	74	20	39
Brazil	112	167	75	86	2.1	35	40	13	12	81	87	35	37
Bulgaria	6	5	66	71	-0.3	14	16	21	22	100	100	98	100
Burkina Faso	1	3	14	20	5.0	6	11	44	56	28	33	2	6
Burundi	0	1	6	11	4.8	..	..	66	51	41	49	44	46
Cambodia	1	3	13	22	5.2	6	10	50	46	38	67	5	18
Cameroon	5	11	41	58	4.3	14	19	19	18	65	56	35	35
Canada	21	27	77	81	1.3	40	44	18	20	100	100	99	99
Central African Republic	1	2	37	39	2.4	..	..	43	41	21	43	5	28
Chad	1	3	21	27	4.6	..	..	38	27	20	23	2	4
Chile	11	15	83	89	1.7	35	35	42	39	91	98	48	83
China	311	586	27	44	3.3	9	17	3	3	48	58	38	52
Hong Kong SAR, China	6	7	100	100	1.1	100	100	100	99	..	..	..	..
Colombia	23	34	68	75	2.2	31	37	21	24	80	81	43	55
Congo, Dem. Rep.	10	23	28	35	4.2	13	17	35	37	23	23	4	23
Congo, Rep.	1	2	54	62	2.8	29	35	53	57	..	31	..	29
Costa Rica	2	3	51	64	3.3	24	31	47	48	94	95	91	96
Côte d'Ivoire	5	10	40	49	3.9	17	19	42	38	38	36	8	11
Croatia	3	3	54	58	-0.1	..	..	27	27	..	99	..	98
Cuba	8	8	73	76	0.5	20	19	27	25	86	94	64	81
Czech Republic	8	8	75	74	0.0	12	11	16	15	100	99	98	97
Denmark	4	5	85	87	0.5	20	21	24	24	100	100	100	100
Dominican Republic	4	7	55	70	2.9	21	21	37	30	83	87	61	74
Ecuador	6	9	55	66	2.5	26	33	28	29	86	96	48	84
Egypt, Arab Rep.	25	35	44	43	1.8	21	18	36	31	91	97	57	92
El Salvador	3	4	49	61	1.9	18	25	37	41	88	89	62	83
Eritrea	0	1	16	21	4.0	..	..	72	60	58	52	0	4
Estonia	1	1	71	69	-1.0	..	..	43	43	..	96	..	94
Ethiopia	6	14	13	17	4.5	4	3	29	20	21	29	1	8
Finland	3	3	61	64	0.5	17	21	28	33	100	100	100	100
France	42	49	74	78	0.8	23	23	22	21	100	100	100	100
Gabon	1	1	69	86	3.6	..	..	62	49	..	33	..	30
Gambia, The	0	1	38	57	5.5	..	..	66	45	..	68	..	65
Georgia	3	2	55	53	-1.5	22	26	41	50	97	96	95	93
Germany	58	60	73	74	0.2	8	8	6	6	100	100	100	100
Ghana	5	12	36	51	4.2	13	17	22	19	11	18	4	7
Greece	6	7	59	61	0.8	30	29	51	47	100	99	92	97
Guatemala	4	7	41	49	3.3	9	8	22	16	84	89	51	73
Guinea	2	4	28	35	3.8	15	16	52	45	18	34	6	11
Guinea-Bissau	0	0	28	30	2.7	..	..	53	63	..	49	..	9
Haiti	2	5	29	48	4.6	16	26	56	55	44	24	19	10
Honduras	2	4	40	48	3.2	12	13	29	28	68	80	28	62

3.11 Urbanization

	Urban population					Population in urban agglomerations of more than 1 million		Population in largest city		Access to improved sanitation facilities			
	millions		% of total population		average annual % growth	% of total population		% of urban population		% of urban population		% of rural population	
	1990	2009	1990	2009	1990–2009	1990	2009	1990	2009	1990	2008	1990	2008
Hungary	7	7	66	68	0.0	19	17	29	25	100	100	100	100
India	217	345	26	30	2.4	10	13	4	6	49	54	7	21
Indonesia	54	121	31	53	4.2	10	9	15	8	58	67	22	36
Iran, Islamic Rep.	31	50	56	69	2.6	24	24	21	14	86	..	78	..
Iraq	13	21	70	67	2.4	26	23	31	27	..	76	..	66
Ireland	2	3	57	62	1.7	26	24	46	39	100	100	98	98
Israel	4	7	90	92	2.5	56	57	48	47	100	100	100	100
Italy	38	41	67	68	0.4	19	17	9	8	..	..	..	..
Jamaica	1	1	49	54	1.1	..	..	49	40	82	82	83	84
Japan	78	85	63	67	0.5	46	49	42	43	100	100	100	100
Jordan	2	5	72	78	3.9	27	18	37	23	98	98	..	97
Kazakhstan	9	9	56	58	0.0	7	9	12	15	96	97	97	98
Kenya	4	9	18	22	3.8	6	8	32	39	24	27	27	32
Korea, Dem. Rep.	12	15	58	63	1.3	13	12	21	19	..	..	..	..
Korea, Rep.	32	40	74	82	1.2	51	48	33	25	100	100	100	100
Kosovo	..	..	..	..	..	..	..	..	..	..	..	..	..
Kuwait	2	3	98	98	1.5	65	80	67	81	100	100	100	100
Kyrgyz Republic	2	2	38	36	0.8	..	..	38	44	94	94	..	93
Lao PDR	1	2	15	32	6.0	..	..	70	39	..	86	..	38
Latvia	2	2	69	68	-1.0	..	..	49	46	..	82	..	71
Lebanon	2	4	83	87	2.1	43	45	52	52	100	100	..	..
Lesotho	0	1	14	26	4.6	..	..	50	41	29	40	32	25
Liberia	1	2	45	61	4.7	..	29	106	37	21	25	3	4
Libya	3	5	76	78	2.2	20	17	26	22	97	97	96	96
Lithuania	2	2	68	67	-0.6	..	..	23	24	..	..	..	..
Macedonia, FYR	1	1	58	67	1.2	..	..	40	35	..	92	..	82
Madagascar	3	6	24	30	4.2	8	9	36	31	14	15	6	10
Malawi	1	3	12	19	5.2	..	..	24	28	50	51	41	57
Malaysia	9	20	50	71	4.1	8	9	12	8	88	96	81	95
Mali	2	4	23	33	3.9	9	13	37	38	36	45	23	32
Mauritania	1	1	40	41	2.8	..	..	53	52	29	50	8	9
Mauritius	0	1	44	43	0.8	..	..	30	28	93	93	90	90
Mexico	59	83	71	78	1.8	34	36	26	23	80	90	30	68
Moldova	2	1	47	41	-1.6	..	..	32	43	..	85	..	74
Mongolia	1	2	57	57	1.0	..	..	45	62	..	64	..	32
Morocco	12	18	48	56	2.1	18	19	22	18	81	83	27	52
Mozambique	3	9	21	38	5.8	6	7	27	18	36	38	4	4
Myanmar	10	17	25	33	2.6	9	11	29	26	..	86	..	79
Namibia	0	1	28	37	3.8	..	..	35	42	66	60	9	17
Nepal	2	5	9	18	5.9	..	..	23	19	41	51	8	27
Netherlands	10	14	69	82	1.5	13	12	9	8	100	100	100	100
New Zealand	3	4	85	87	1.3	25	32	30	36	..	..	88	..
Nicaragua	2	3	52	57	2.2	18	23	34	29	59	63	26	37
Niger	1	3	15	17	3.9	5	7	35	40	19	34	2	4
Nigeria	34	76	35	49	4.2	12	15	14	13	39	36	36	28
Norway	3	4	72	78	1.1	..	..	22	23	100	100	100	100
Oman	1	2	66	72	2.7	..	..	27	31	97	97	61	..
Pakistan	33	62	31	37	3.3	16	18	22	21	73	72	8	29
Panama	1	3	54	74	3.6	35	39	65	53	73	75	40	51
Papua New Guinea	1	1	15	13	1.6	..	..	32	37	78	71	42	41
Paraguay	2	4	49	61	3.3	26	31	53	51	61	90	15	40
Peru	15	21	69	72	1.7	27	30	39	42	71	81	16	36
Philippines	30	60	49	66	3.6	14	14	26	19	70	80	46	69
Poland	23	23	61	61	0.0	4	4	7	7	96	96	..	80
Portugal	5	6	48	60	1.6	37	39	54	44	97	100	87	100
Puerto Rico	3	4	72	99	2.3	44	69	60	70	..	..	..	..
Qatar	0	1	92	96	6.0	..	..	54	32	100	100	100	100

3.11 Urbanization

	Urban population					Population in urban agglomerations of more than 1 million		Population in largest city		Access to improved sanitation facilities			
	millions		% of total population		average annual % growth	% of total population		% of urban population		% of urban population		% of rural population	
	1990	2009	1990	2009	1990–2009	1990	2009	1990	2009	1990	2008	1990	2008
Romania	12	12	53	54	-0.3	9	9	17	17	88	88	52	54
Russian Federation	109	103	73	73	-0.3	17	18	8	10	93	93	70	70
Rwanda	0	2	5	19	8.3	..	..	57	49	35	50	22	55
Saudi Arabia	12	21	77	82	2.7	34	41	19	23	100	100	..	..
Senegal	3	5	39	43	3.1	19	22	48	52	62	69	22	38
Serbia	4	4	50	52	0.0	15	15	30	29	..	96	..	88
Sierra Leone	1	2	33	38	2.5	..	..	39	40	..	24	..	6
Singapore	3	5	100	100	2.6	99	95	99	95	99	100	..	..
Slovak Republic	3	3	57	57	0.1	..	..	..	..	100	100	100	99
Slovenia	1	1	50	48	-0.1	..	..	27	26	100	100	100	100
Somalia	2	3	30	37	2.9	16	15	53	40	..	52	..	6
South Africa	18	30	52	61	2.6	28	34	10	12	80	84	58	65
Spain	29	36	75	77	1.0	22	23	15	16	100	100	100	100
Sri Lanka	3	3	17	15	0.2	..	..	21	22	85	88	67	92
Sudan	7	19	27	44	5.0	9	12	33	27	63	55	23	18
Swaziland	0	0	23	25	2.2	..	..	22	25	..	61	..	53
Sweden	7	8	83	85	0.5	12	14	15	16	100	100	100	100
Switzerland	5	6	73	74	0.8	15	15	20	20	100	100	100	100
Syrian Arab Republic	6	12	49	55	3.2	30	32	25	26	94	96	72	95
Tajikistan	2	2	32	26	0.5	..	..	35	38	93	95	..	94
Tanzania	5	11	19	26	4.5	5	7	27	28	27	32	23	21
Thailand	17	23	29	34	1.7	10	10	35	30	93	95	74	96
Timor-Leste	0	0	21	28	3.8	..	..	79	53	..	76	..	40
Togo	1	3	30	43	4.6	16	24	52	56	25	24	8	3
Trinidad and Tobago	0	0	9	14	3.0	..	..	44	32	93	92	93	92
Tunisia	5	7	58	67	2.1	..	..	14	11	95	96	44	64
Turkey	33	52	59	69	2.3	23	28	20	20	96	97	66	75
Turkmenistan	2	3	45	49	2.2	..	..	25	25	99	99	97	97
Uganda	2	4	11	13	4.1	4	5	38	36	35	38	40	49
Ukraine	35	31	67	68	-0.5	12	14	7	9	97	97	91	90
United Arab Emirates	1	4	79	78	4.7	25	33	32	42	98	98	95	95
United Kingdom	51	56	89	90	0.5	26	26	15	15	100	100	100	100
United States	188	252	75	82	1.5	42	45	9	8	100	100	99	99
Uruguay	3	3	89	92	0.6	50	49	56	53	95	100	83	99
Uzbekistan	8	10	40	37	1.1	10	8	26	22	95	100	76	100
Venezuela, RB	17	27	84	94	2.5	34	32	17	11	89	..	45	..
Vietnam	13	25	20	28	3.2	9	12	25	24	61	94	29	67
West Bank and Gaza	1	3	68	72	4.1	..	..	..	..	..	91	..	84
Yemen, Rep.	3	7	21	31	5.5	5	9	25	30	64	94	6	33
Zambia	3	5	39	36	2.0	10	11	24	31	62	59	36	43
Zimbabwe	3	5	29	38	2.3	10	13	35	34	58	56	37	37
World	**2,257 s**	**3,398 s**	**43 w**	**50 w**	**2.2 w**	**17 w**	**20 w**	**17 w**	**16 w**	**77 w**	**76 w**	**35 w**	**45 w**
Low income	121	243	22	29	3.7	8	11	33	32	39	44	19	32
Middle income	1,437	2,309	38	48	2.5	14	18	14	13	69	71	31	43
Lower middle income	883	1,559	30	41	3.0	11	15	11	11	58	63	28	41
Upper middle income	554	750	68	75	1.6	25	29	19	19	87	90	58	67
Low & middle income	1,558	2,552	36	45	2.6	13	17	16	15	67	69	29	41
East Asia & Pacific	461	875	29	45	3.4	..	..	9	7	54	64	37	54
Europe & Central Asia	246	258	63	64	0.2	16	18	14	16	94	94	75	80
Latin America & Carib.	308	452	71	79	2.0	32	35	24	22	81	86	38	54
Middle East & N. Africa	117	191	52	58	2.6	20	20	26	22	90	92	57	76
South Asia	281	467	25	30	2.7	10	13	9	12	53	57	11	27
Sub-Saharan Africa	145	310	28	37	4.0	11	14	27	26	43	43	21	24
High income	699	845	73	77	1.0	..	..	20	19	100	100	99	98
Euro area	213	241	71	73	0.6	18	18	16	16	100	100	99	100

About the data

There is no consistent and universally accepted standard for distinguishing urban from rural areas, in part because of the wide variety of situations across countries (see *About the data* for table 3.1). Most countries use an urban classification related to the size or characteristics of settlements. Some define urban areas based on the presence of certain infrastructure and services. And other countries designate urban areas based on administrative arrangements.

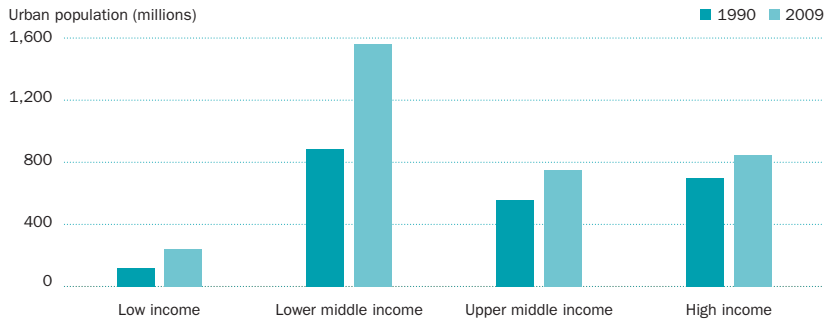
The population of a city or metropolitan area depends on the boundaries chosen. For example, in 1990 Beijing, China, contained 2.3 million people in 87 square kilometers of "inner city" and 5.4 million in 158 square kilometers of "core city." The population of "inner city and inner suburban districts" was 6.3 million and that of "inner city, inner and outer suburban districts, and inner and outer counties" was 10.8 million. (Most countries use the last definition.) For further discussion of urban-rural issues see box 3.1a in *About the data* for table 3.1.

Estimates of the world's urban population would change significantly if China, India, and a few other populous nations were to change their definition of urban centers. According to China's State Statistical Bureau, by the end of 1996 urban residents accounted for about 43 percent of China's population, more than double the 20 percent considered urban in 1994. In addition to the continuous migration of people from rural to urban areas, one of the main reasons for this shift was the rapid growth in the hundreds of towns reclassified as cities in recent years.

Because the estimates in the table are based on national definitions of what constitutes a city or metropolitan area, cross-country comparisons should be made with caution. To estimate urban populations, UN ratios of urban to total population were applied to the World Bank's estimates of total population (see table 2.1).

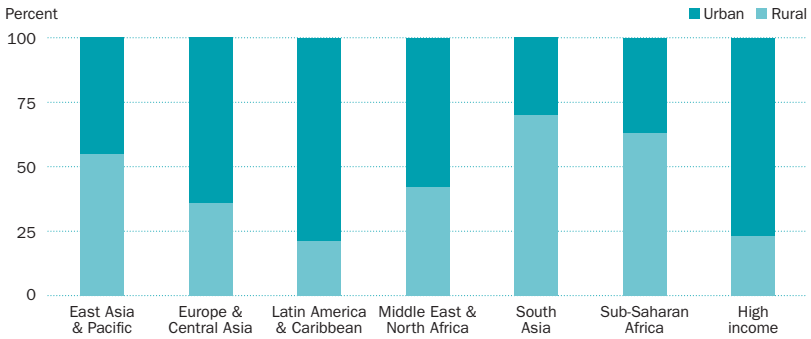
The table shows access to improved sanitation facilities for both urban and rural populations to allow comparison of access. Definitions of access and urban areas vary, however, so comparisons between countries can be misleading.

Urban population is increasing in developing economies, especially in low and lower middle-income economies 3.11a



Source: Table 3.11.

Latin America and Caribbean has the greatest share of urban population, even greater than the high-income economies in 2009 3.11b



Source: Tables 3.1 and 3.11.

Definitions

• **Urban population** is the midyear population of areas defined as urban in each country and reported to the United Nations (see *About the data*). • **Population in urban agglomerations of more than 1 million** is the percentage of a country's population living in metropolitan areas that in 2005 had a population of more than 1 million. • **Population in largest city** is the percentage of a country's urban population living in that country's largest metropolitan area. • **Access to improved sanitation facilities** is the percentage of the urban or rural population with access to at least adequate excreta disposal facilities (private or shared but not public) that can effectively prevent human, animal, and insect contact with excreta. Improved facilities range from simple but protected pit latrines to flush toilets with a sewerage connection. To be effective, facilities must be correctly constructed and properly maintained.

Data sources

Data on urban population and the population in urban agglomerations and in the largest city are from the United Nations Population Division's *World Urbanization Prospects: The 2009 Revision.* Data on total population are World Bank estimates. Data on access to sanitation are from the World Health Organization and United Nations Children's Fund's *Progress on sanitation and drinking water* (2010).

3.12 Urban housing conditions

	Census year	Household size		Overcrowding		Durable dwelling units		Home ownership		Multiunit dwellings		Vacancy rate	
		number of people		Households living in overcrowded dwellings[a] % of total		Buildings with durable structure % of total		Privately owned dwellings % of total		% of total		Unoccupied dwellings % of total	
		National	Urban	National	Urban	National	Urban	National	Urban	National	Urban	National	Urban
Afghanistan		..	..	..	..	..	..	..	..	..	..	..	..
Albania	2001	4.2	3.9	..	..	..	..	65[b]	30[b]	..	..	12	13
Algeria	1998	4.9	..	..	..	..	..	67	..	..	..	19	..
Angola		..	..	..	..	..	..	..	..	..	..	..	..
Argentina	2001	3.6	..	19	..	97	..	..	..	4	..	16[b]	..
Armenia	2001	4.1	4.0	4	6	93	93	95	90	1	1	..	..
Australia	2001	3.8	..	1	..	..	..	..	..	..	..	..	..
Austria	2001	2.4	..	2	..	..	..	48	..	..	..	..	..
Azerbaijan	1999	4.7	4.4	..	..	..	..	74	62	4	5	..	..
Bangladesh	2001	4.8	4.8	..	..	21[b]	42[b]	88[b]	61[b]	..	..	..	..
Belarus	1999	..	..	..	..	..	..	..	..	..	..	..	..
Belgium	2001	2.6	..	0[b]	..	..	..	67	..	32[b]	..	..	..
Benin	1992	5.9	..	..	..	26	..	59	..	..	..	..	..
Bolivia	2001	4.2	4.3	40	..	43	58	70	59	3[b]	5[b]	6	4
Bosnia and Herzegovina		..	..	..	..	..	..	..	..	..	..	..	..
Botswana	2001	4.2	3.9	27	47	88	90[b]	61	47	1	..	..	..
Brazil	2000	3.8	3.7	..	..	..	..	74	75	..	..	..	..
Bulgaria	2001	2.7	2.7	..	..	79	89	98	98	..	..	23	17
Burkina Faso	1996	6.2	5.8	30	53	..	..	..	..	..	..	..	..
Burundi	1990	4.7	..	..	..	..	..	..	..	..	..	..	..
Cambodia	2005	5.0	4.9	35	32	79	88	58	57	27	32	..	..
Cameroon	1987	5.2	5.1	67	77	77	..	73	48	27	42	..	..
Canada	2001	2.6	..	..	..	..	..	64	..	32	..	8	..
Central African Republic	2003	5.2	5.8	32	36[b]	78	92	85	74	..	..	..	..
Chad	1993	5.1	5.1	..	..	..	..	..	..	..	..	..	..
Chile	2002	3.4	3.5	..	..	91	92	66	65	13	15	11	10
China	2000	3.4	3.2	..	..	82	..	88	74	..	..	1	..
Hong Kong SAR, China		..	..	..	..	..	..	..	..	..	..	..	..
Colombia	1993	4.8	..	27[b]	..	83[b]	..	68[b]	..	13	..	10[b]	..
Congo, Dem. Rep.	1984	5.4	..	55	..	..	..	..	..	..	..	..	..
Congo, Rep.	1984	10.5	..	..	..	..	..	76	..	..	..	..	..
Costa Rica	2000	4.0	..	22	..	88	..	72	..	2	3	9	6
Côte d'Ivoire	1998	5.4	..	..	..	..	..	..	..	..	..	..	..
Croatia	2001	3.0	..	..	..	..	..	..	..	..	..	12	..
Cuba	2002	3.1	..	5	..	..	..	..	..	..	..	..	..
Czech Republic	2001	2.4	..	..	..	..	..	52	..	49	..	12	..
Denmark	2001	2.2	..	..	..	..	..	..	..	..	..	..	..
Dominican Republic	2002	3.9	..	..	..	97	..	..	..	8	..	11	..
Ecuador	2001	3.5	3.7	30	..	81	88	68[b]	58[b]	9	14	12	7
Egypt, Arab Rep.	1996	4.7	..	..	..	..	..	..	..	75	..	..	..
El Salvador	1992	..	..	63	..	67	83	70	68	3	6	11	11
Eritrea		..	..	..	..	..	..	..	..	..	..	..	..
Estonia	2000	2.4	2.3	3	..	..	..	..	..	72	..	13	..
Ethiopia	1994	4.8	4.7	..	..	..	23	..	54	..	..	..	..
Finland	2000	2.2	..	..	..	..	..	64	..	44	..	..	..
France	1999	2.5	..	..	..	..	..	55	..	..	..	7	..
Gabon	2003	5.2	..	..	..	..	..	..	..	..	..	..	..
Gambia	1993	8.9	..	..	..	18	..	68	..	..	..	..	..
Georgia	2002	3.5	3.5	..	..	..	..	..	..	..	..	..	..
Germany	2001	2.3	..	..	..	..	..	43	..	..	..	7	..
Ghana	2000	5.1	5.1	..	..	45	..	57	..	53	..	5	..
Greece	2001	3.0	..	1	..	..	..	..	..	..	..	..	..
Guatemala	2002	4.4	4.7	..	..	67	80	81	74	2	4	13	11
Guinea	1996	6.7	..	63	..	..	..	76	..	..	..	..	..
Guinea-Bissau		..	..	..	..	..	..	..	..	..	..	..	..
Haiti	1982	4.2	..	26	..	..	..	92	68	..	..	9	19
Honduras	2001	4.4	..	..	..	69	85	..	..	..	..	14	..

3.12 Urban housing conditions

	Census year	Household size		Overcrowding		Durable dwelling units		Home ownership		Multiunit dwellings		Vacancy rate	
		number of people		Households living in overcrowded dwellings[a] % of total		Buildings with durable structure % of total		Privately owned dwellings % of total		% of total		Unoccupied dwellings % of total	
		National	Urban	National	Urban	National	Urban	National	Urban	National	Urban	National	Urban
Hungary	2001	2.6	..	2	..	..	..	..	..	..	..	4	..
India	2001	5.3	5.3	77	71	83	81	87	67	..	..	6	9
Indonesia	2000	4.0	..	..	..	..	..	..	..	..	..	..	..
Iran, Islamic Rep.	1996	4.8	4.6	33[b]	26[b]	72	76	73	67	..	..	..	..
Iraq	1997	7.7	7.2	..	..	88	96	70	66	4	5	13	15
Ireland	2002	3.0	..	..	..	..	..	..	..	8[b]	..	..	..
Israel	1995	3.5	..	..	..	..	..	..	..	..	..	..	..
Italy	2001	2.8	..	..	..	..	..	..	..	..	..	21	..
Jamaica	2001	3.5	..	..	..	98[b]	..	58[b]	..	2[b]	..	..	..
Japan	2000	2.7	..	..	..	..	..	61	..	37	..	..	..
Jordan	2004	5.3	5.1	35	34	..	..	64	60	72	80	..	..
Kazakhstan		..	..	..	..	..	..	..	..	..	..	..	..
Kenya	1999	4.6	3.4	..	..	35	72	72	25	..	..	39	17
Korea, Dem. Rep.	2000	3.8	..	23	..	..	..	50	..	15	..	..	..
Korea, Rep.	1993	4.4	..	..	..	..	..	..	..	..	..	..	..
Kosovo		..	..	..	..	..	..	..	..	..	..	..	..
Kuwait	1995	6.4	..	..	..	..	..	..	..	9[b]	..	11	..
Kyrgyz Republic	1999	4.4	3.6	..	..	..	..	..	..	..	..	..	..
Laos	1995	6.1	6.1	..	..	49	77	96	86	..	..	..	..
Latvia	2000	3.0	2.6	4	..	88	..	58	..	74	..	0	..
Lebanon		..	..	..	..	..	..	..	..	..	..	..	..
Lesotho	2001	5.0	..	10[b]	..	..	..	84	..	0	..	..	..
Liberia	1974	4.8	..	31	..	20	..	1	..	..	..	..	..
Libya		6.4	..	..	..	..	..	..	..	..	..	7	..
Lithuania	2001	2.6	..	7	..	..	..	..	..	..	..	..	..
Macedonia, FYR	2002	3.6	3.6	8[b]	..	95[b]	95[b]	48[b]	..	..	..	7[b]	3[b]
Madagascar	1993	4.9	4.8	64	57	..	..	81	59	..	..	..	..
Malawi	1998	4.4	4.4	30	..	48	84	86	47	..	..	..	..
Malaysia	2000	4.5	4.4	..	..	..	..	..	..	10[b]	16[b]	..	..
Mali	1998	5.6	..	..	..	..	..	..	..	..	..	..	..
Mauritania	1988	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	2000	3.9	3.8	6	7	91	94	87	81	..	..	7	6
Mexico	2005	4.0	3.9	24	20	..	..	..	..	..	..	3	2
Moldova	2003	..	..	..	..	..	..	..	..	..	..	..	..
Mongolia	2000	4.4	4.5	..	..	..	..	..	..	48	56	..	..
Morocco	1982	5.9	5.3	..	..	..	..	..	..	..	..	..	..
Mozambique	1997	4.4	4.9	37	28	7	20	92	83	1	1	0	..
Myanmar		..	..	..	..	..	..	..	..	..	..	..	..
Namibia	2001	5.3	..	..	..	..	..	..	..	..	..	..	..
Nepal	2001	5.4	4.9	..	..	..	..	88	..	..	..	0	..
Netherlands		..	..	..	..	..	..	..	..	..	..	..	..
New Zealand	2001	2.8	..	1[b]	..	..	..	65	..	17	..	10	..
Nicaragua	1995	5.3	..	..	..	79	87	84	86	0	0	8	..
Niger	2001	6.4	6.0	..	..	..	..	77	40	..	..	..	..
Nigeria	1991	5.0	4.7	..	..	..	..	..	..	..	..	..	..
Norway	1980	2.7	..	1	..	..	..	67	..	38	..	..	..
Oman	2003	7.1	..	..	..	..	..	..	..	..	..	..	..
Pakistan	1998	6.8	6.8	..	..	58	86	81	..	..	..	..	..
Panama	2000	4.1	..	28[b]	..	88	98[b]	80	66[b]	10[b]	10[b]	14	..
Papua New Guinea	1990	4.5[b]	6.5	..	..	..	..	..	44	..	8	..	..
Paraguay	2002	4.6	4.5	38[b]	..[b]	95[b]	98[b]	79	75	1[b]	2[b]	6[b]	6[b]
Peru	2007	3.9	3.9	35	31	..	..	..	..	..	..	..	..
Philippines	2000	4.9	..	..	..	..	..	71	..	12			
Poland	1988	3.2	..	..	..	..	..	..	..	..	..	1	..
Portugal	2001	2.8	..	..	..	..	..	76	..	86	..	..	..
Puerto Rico	2005	2.8	.	1	..	..	..	75	..	..	..	..	..
Qatar		..	..	..	..	..	..	..	..	..	..	..	..

3.12 Urban housing conditions

	Census year	Household size		Overcrowding		Durable dwelling units		Home ownership		Multiunit dwellings		Vacancy rate	
		number of people		Households living in overcrowded dwellings[a] % of total		Buildings with durable structure % of total		Privately owned dwellings % of total		% of total		Unoccupied dwellings % of total	
		National	Urban	National	Urban	National	Urban	National	Urban	National	Urban	National	Urban
Romania	2002	2.9	2.8	20	20	..	..	84	72	..	..	..	..
Russian Federation	2002	2.8	2.7	7	5	..	..	..	..	73	86	..	..
Rwanda	2002	4.4	3.7	43	36	13	31	79	41	36	60	..	..
Saudi Arabia	2004	5.5	..	..	..	92[b]	..	43	..	..	..	..	..
Senegal	2002	9.2	8.0	72	68	..	..	74	54	..	..	..	..
Serbia	2001	2.9	2.2	..	..	..	..	..	..	..	..	..	..
Sierra Leone	1985	6.8	..	..	..	34	..	68	..	..	..	..	..
Singapore	2000	4.4	..	..	..	..	..	..	..	..	..	..	..
Slovak Republic		..	..	..	..	..	..	..	..	..	..	..	..
Slovenia	2002	2.8	2.7	14	17	..	..	91	87	33	56	..	..
Somalia	1975	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	2007	3.0	2.8	16	15	..	..	43	40	..	..	..	..
Spain	2001	2.9	..	1	..	..	..	82	..	..	..	..	..
Sri Lanka	2001	3.8	..	..	..	93[b]	92[b]	70[b]	58[b]	1	14[b]	13	1[b]
Sudan	1993	5.8	6.0	..	..	..	..	86[b]	58[b]	0[b]	1[b]	..	..
Swaziland	1997	5.4	3.7	..	..	..	..	..	..	..	..	..	..
Sweden	1990	2.0	..	..	..	..	..	..	..	54	..	1	..
Switzerland	2000	2.2	..	1	..	..	..	34	..	77	..	..	..
Syrian Arab Republic	1981	6.3	6.0	..	..	..	..	..	..	..	..	..	..
Tajikistan	2000	..	..	..	..	..	..	..	..	..	..	..	..
Tanzania	2002	4.9	4.5	33[b]	7[b]	..	..	82[b]	43[b]	..	..	..	..
Thailand	2000	3.8	..	..	..	93	93	81	62	3	..	3	..
Timor-Leste		..	..	..	..	..	..	..	..	..	..	..	..
Togo		..	..	..	..	..	..	..	..	..	..	..	..
Trinidad and Tobago	2000	3.7	..	9[b]	..	98[b]	..	74[b]	..	17[b]	..	..	..
Tunisia	1994	8.0	..	..	..	99	..	71	89[b]	6	10[b]	15	12[b]
Turkey	1990	5.0	..	..	..	..	..	70	..	..	..	..	..
Turkmenistan		..	..	..	..	..	..	..	..	..	..	..	..
Uganda	2002	4.7	3.9	..	..	19	61	76	28	37	71	..	..
Ukraine	2003	..	..	..	..	..	..	..	..	..	..	..	..
United Arab Emirates		..	..	..	..	..	..	..	..	..	..	..	..
United Kingdom	2001	..	2.4	..	..	..	..	..	69	..	19	..	..
United States	2005	2.5	..	0	..	..	..	74	..	26	..	..	..
Uruguay	1996	3.3	3.4	22[b]	..	..	..	57[b]	57[b]	..	..	13[b]	13[b]
Uzbekistan		..	..	..	..	..	..	..	..	..	..	..	..
Venezuela. RB	2001	4.4	..	..	..	..	..	78	..	14	..	16	..
Vietnam	1999	4.6	4.5	..	..	77	89	95	86	..	..	..	..
West Bank and Gaza	1997	7.1	..	..	..	..	..	78	..	45	..	..	..
Yemen	1994	6.7	6.8	54[b]	6[b]	..	..	88[b]	68[b]	3[b]	11[b]	..	..
Zambia	2000	5.3	5.9	..	..	..	..	94	30	..	..	..	..
Zimbabwe	1992	4.8	4.2	..	..	..	..	94	30	6	..	..	..

a. More than two people per room. b. Data are from a previous census.

Urban housing conditions

About the data

Urbanization can yield important social benefits, improving access to public services and the job market. It also leads to significant demands for services. Inadequate living quarters and demand for housing and shelter are major concerns for policymakers.

The unmet demand for affordable housing, along with urban poverty, has led to the emergence of slums in many poor countries. Improving the shelter situation requires a better understanding of the mechanisms governing housing markets and the processes governing housing availability. That requires good data and adequate policy-oriented analysis so that housing policy can be formulated in a global comparative perspective and drawn from lessons learned in other countries. Housing policies and outcomes affect such broad socioeconomic conditions as the infant mortality rate, performance in school, household saving, productivity levels, capital formation, and government budget deficits. A good understanding of housing conditions thus requires an extensive set of indicators within a reasonable framework.

There is a strong demand for quantitative indicators that can measure housing conditions on a regular basis to monitor progress. However, data deficiencies and lack of rigorous quantitative analysis hamper informed decisionmaking on desirable policies to improve housing conditions. The data in the table are from housing and population censuses, collected using similar definitions. The table will incorporate household survey data in future editions. The table focuses attention on urban areas, where housing conditions are typically most severe. Not all the compiled indicators are presented in the table because of space limitations.

Selected housing indicators for smaller economies **3.12a**

	Census year	Household size	Overcrowding	Durable dwelling units	Home ownership	Multiunit dwellings	Vacancy rate
		number of people	Households living in overcrowded dwellings[a] % of total	Buildings with durable structure % of total	Privately owned dwellings % of total	% of total	Unoccupied dwellings % of total
Antigua and Barbuda	2001	3.0	..	99[b]	65[b]	3[b]	22
Bahamas	1990	3.8	12	99	55	13	14
Bahrain	2001	5.9	..	94[b]	51	28	6
Barbados	1990	3.5	3	100	76	9	9
Belize	2000	4.6	..	93	63	4	..
Cape Verde	1990	5.1	28	78	72	2	..
Cayman Islands	1999	3.1	..	100	53	38	19
Equatorial Guinea	1993	7.5	14	56[b]	75	14	..
Fiji	1996	5.4	..	60	65	7	..
Guam	2000	4.0	2[b]	93	48	29	19
Isle of Man	2001	2.4	0	..	68	16	..
Maldives	2000	6.6	..	93	..	1	15
Marshall Islands	1999	7.8	..	95	72	12	8
Netherlands Antilles	2001	2.9	24[b]	99	60	16	12
New Caledonia	1989	4.1	..	77	53	9	13
Northern Mariana Islands	1995	4.9	9[b]	99	33	27	17
Palau	2000	5.7	8	76	79	11	3
Seychelles	1997	4.2	15[b]	97	78	..	0
Solomon Islands	1999	6.3	51	23	85	1	..
St. Vincent & Grenadines	1991	3.9	..	98	71	7	..
Turks and Caicos	1990	3.3	4	96	66	11	..
Virgin Islands (UK)	1991	3.0	2	99	40	46	..
Western Samoa	1991	7.3	..	42	90	47	30

a. More than two people per room. b. Data are from a previous census.
Source: National population and housing censuses.

Definitions

• **Census year** is the year in which the underlying data were collected. • **Household size** is the average number of people within a household, calculated by dividing total population by the number of households in the country and in urban areas. • **Overcrowding** refers to the number of households living in dwellings with two or more people per room as a percentage of total households in the country and in urban areas. • **Durable dwelling units** are the number of housing units in structures made of durable building materials (concrete, stone, cement, brick, asbestos, zinc, and stucco) expected to maintain their stability for 20 years or longer under local conditions with normal maintenance and repair, taking into account location and environmental hazards such as floods, mudslides, and earthquakes, as a percentage of total dwellings. • **Home ownership** refers to the number of privately owned dwellings as a percentage of total dwellings. When the number of private dwellings is not available from the census data, the share of households that own their housing unit is used. Privately owned and owner-occupied units are included, depending on the definition used in the census data. State- and community-owned units and rented, squatted, and rent-free units are excluded. • **Multiunit dwellings** are the number of multiunit dwellings, such as apartments, flats, condominiums, barracks, boardinghouses, orphanages, retirement houses, hostels, hotels, and collective dwellings, as a percentage of total dwellings. • **Vacancy rate** is the percentage of completed dwelling units that are currently unoccupied. It includes all vacant units, whether on the market or not (such as second homes).

Data sources

Data on urban housing conditions are from national population and housing censuses.

3.13 Traffic and congestion

	Motor vehicles		Passenger cars	Road density	Road sector energy consumption				Fuel price		Particulate matter concentration	
	per 1,000 people	per kilometer of road	per 1,000 people	km. of road per 100 sq. km. of land area	% of total consumption	kilograms of oil equivalent per capita			$ per liter		Urban-population-weighted PM10 micrograms per cubic meter	
						Total	Diesel fuel	Gasoline fuel	Super grade gasoline	Diesel		
	2008	2008	2008	2008	2008	2008	2008	2008	2010	2010	1990	2008
Afghanistan	27	19	19	*6*	..	..	..	..	1.15	1.00	68	37
Albania	114	20	84	*63*	32	213	184	*24*	1.46	1.40	92	46
Algeria	112	35	72	5	16	173	92	*63*	0.32	0.19	113	69
Angola	*40*	..	*8*	..	11	65	31	*30*	0.65	0.43	111	55
Argentina	*314*	..	..	*8*	18	346	179	*102*	0.96	1.05	104	68
Armenia	*105*	*42*	*96*	26	10	100	0	*64*	1.08	0.99	*481*	69
Australia	687	18	551	11	18	1,091	327	*645*	1.27	1.23	22	14
Austria	562	42	514	132	22	877	605	*199*	1.63	1.55	39	29
Azerbaijan	*89*	*13*	*72*	*61*	12	188	72	*108*	0.75	0.56	*132*	33
Bangladesh	2	2	1	*166*	6	11	5	*2*	1.09	0.63	237	134
Belarus	*282*	..	*240*	*46*	6	161	89	*51*	1.08	0.86	23	7
Belgium	543	38	479	503	15	827	659	*134*	1.87	1.62	30	21
Benin	*21*	..	*17*	*17*	23	79	27	*47*	1.04	1.21	78	45
Bolivia	*68*	*7*	*18*	*6*	25	149	72	*48*	0.70	0.54	113	74
Bosnia and Herzegovina	135	23	119	*43*	15	242	151	*84*	1.42	1.42	36	19
Botswana	*113*	*7*	*56*	*4*	31	340	136	*186*	0.93	0.97	93	69
Brazil	*198*	*18*	*158*	*21*	23	298	148	*73*	1.58	1.14	39	21
Bulgaria	353	67	310	*36*	13	335	196	*78*	1.51	1.58	108	51
Burkina Faso	11	2	7	*34*	..	..	..	..	1.44	1.28	144	64
Burundi	*6*	..	*2*	*44*	..	..	..	..	1.43	1.42	68	31
Cambodia	*20*	*6*	*18*	*21*	7	26	14	*11*	1.15	0.98	88	41
Cameroon	..	..	*11*	*11*	10	36	17	*18*	1.20	1.10	122	47
Canada	605	14	399	14	17	1,324	336	*889*	1.21	1.08	25	15
Central African Republic	*0*	*0*	*0*	..	..	..	..	..	1.71	1.69	60	34
Chad	*6*	*2*	..	*3*	..	..	..	..	1.32	1.31	209	81
Chile	172	36	109	..	18	345	191	*137*	1.38	1.02	92	62
China	37	13	27	39	5	85	36	*45*	1.11	1.04	115	66
Hong Kong SAR, China	73	248	55	187	10	204	149	*47*	1.92	1.32	..	..
Colombia	58	16	41	14	25	171	81	*70*	1.41	0.95	38	20
Congo, Dem. Rep.	*5*	..	..	*7*	1	3	0	*3*	1.28	1.27	71	40
Congo, Rep.	*26*	..	*15*	*5*	26	98	67	*27*	1.27	0.84	129	68
Costa Rica	163	19	126	74	30	320	159	*144*	1.14	0.97	43	32
Côte d'Ivoire	*20*	*5*	*16*	*25*	4	21	14	*6*	1.68	1.30	87	32
Croatia	388	59	346	52	21	432	249	*153*	1.59	1.49	45	27
Cuba	38	7	21	..	3	29	21	*5*	1.72	1.24	42	23
Czech Republic	513	41	424	166	13	553	330	*189*	1.75	1.69	67	18
Denmark	477	36	377	170	23	779	442	*312*	2.00	1.79	29	16
Dominican Republic	*123*	..	*62*	..	18	144	48	*89*	1.23	1.03	43	16
Ecuador	*63*	*19*	*38*	*15*	38	289	123	*151*	0.53	0.28	36	20
Egypt, Arab Rep.	43	33	31	10	17	145	79	*54*	0.48	0.32	212	97
El Salvador	*84*	..	*41*	..	16	131	58	*67*	0.92	0.89	44	28
Eritrea	*11*	..	*6*	..	5	7	6	*1*	2.54	1.07	141	71
Estonia	477	11	412	128	13	542	286	*239*	1.54	1.57	44	13
Ethiopia	*3*	*4*	*1*	*4*	4	16	13	*2*	0.91	0.78	108	59
Finland	534	36	461	23	11	740	419	*284*	1.94	1.60	22	15
France	598	39	495	173	16	666	483	*129*	1.98	1.72	18	13
Gabon	..	..	..	*3*	10	143	106	*31*	*1.14*	*0.90*	9	7
Gambia, The	*7*	*3*	*5*	*33*	..	..	..	..	*0.79*	*0.75*	136	62
Georgia	*116*	*16*	*95*	*29*	19	135	45	*81*	1.13	1.13	204	49
Germany	554	71	502	180	15	609	309	*243*	1.90	1.68	27	16
Ghana	*33*	*13*	*21*	*24*	12	49	23	*23*	0.82	0.83	38	24
Greece	*560*	*54*	*443*	88	21	581	192	*359*	2.05	1.78	64	32
Guatemala	*117*	..	..	..	23	134	64	*63*	0.95	0.85	69	60
Guinea	..	..	..	*18*	..	..	..	..	0.95	0.95	103	53
Guinea-Bissau	33	15	27	*12*	..	..	..	..	..	..	114	47
Haiti	..	..	..	..	9	25	0	*23*	*1.16*	*0.89*	68	35
Honduras	97	..	69	..	21	135	73	*55*	1.04	0.92	44	42

3.13 Traffic and congestion

	Motor vehicles		Passenger cars	Road density	Road sector energy consumption				Fuel price		Particulate matter concentration	
	per 1,000 people	per kilometer of road	per 1,000 people	km. of road per 100 sq. km. of land area	% of total consumption	kilograms of oil equivalent per capita			$ per liter		Urban-population-weighted PM10 micrograms per cubic meter	
						Total	Diesel fuel	Gasoline fuel	Super grade gasoline	Diesel		
	2008	2008	2008	2008	2008	2008	2008	2008	2010	2010	1990	2008
Hungary	*384*	*20*	304	212	16	435	254	*149*	1.67	1.61	33	16
India	*15*	*4*	*10*	129	7	36	22	*10*	1.15	0.82	111	59
Indonesia	77	40	43	23	12	103	31	*67*	0.79	0.51	133	72
Iran, Islamic Rep.	128	53	113	*10*	19	522	223	*249*	0.10	0.02	86	55
Iraq	..	..	..	..	30	330	185	*129*	0.78	0.56	164	138
Ireland	534	24	451	137	29	996	570	*385*	1.78	1.69	23	13
Israel	313	126	260	82	16	481	155	*300*	1.85	1.87	66	28
Italy	673	83	596	*162*	21	626	389	*181*	1.87	1.69	41	23
Jamaica	*188*	*24*	*138*	202	12	204	0	*190*	0.98	0.98	55	37
Japan	593	63	319	*318*	14	541	175	*331*	1.60	1.37	42	27
Jordan	146	110	102	9	22	264	105	*150*	1.04	0.73	107	33
Kazakhstan	197	33	164	3	6	277	25	*238*	0.71	0.51	42	15
Kenya	*21*	*10*	*15*	*11*	6	26	16	9	1.33	1.27	64	30
Korea, Dem. Rep.	..	..	..	*21*	2	17	9	*7*	*1.51*	*1.40*	180	59
Korea, Rep.	346	161	257	105	12	559	278	*152*	1.52	1.35	51	31
Kosovo	..	..	..	..	..	..	..	..	1.63	1.60	..	..
Kuwait	*507*	*233*	*282*	*32*	14	1,343	401	*868*	0.23	0.21	77	95
Kyrgyz Republic	*59*	*9*	*44*	*17*	17	94	0	*89*	0.85	0.79	*76*	26
Lao PDR	*21*	*10*	*2*	15	..	..	..	..	1.26	0.97	87	39
Latvia	474	15	412	108	24	481	293	*163*	1.48	1.49	38	13
Lebanon	..	..	..	67	29	360	3	*334*	1.13	0.77	64	36
Lesotho	..	..	..	..	..	..	..	..	0.97	1.07	123	46
Liberia	*3*	..	*2*	..	..	..	..	..	0.98	0.96	68	31
Libya	*291*	..	*225*	..	19	542	325	*192*	0.17	0.13	101	76
Lithuania	546	23	498	124	18	486	275	*122*	1.59	1.42	52	17
Macedonia, FYR	144	21	129	54	13	194	106	*58*	1.52	1.27	45	20
Madagascar	27	10	8	..	..	..	..	..	1.52	1.26	91	33
Malawi	*9*	..	*4*	*13*	..	..	..	..	1.71	1.54	93	35
Malaysia	334	83	298	*30*	19	523	193	*310*	0.59	0.56	35	20
Mali	*9*	..	*7*	*2*	..	..	..	..	1.42	1.25	259	112
Mauritania	..	..	..	*1*	..	..	..	..	1.16	0.99	145	69
Mauritius	159	99	123	99	..	..	..	..	1.55	1.23	21	18
Mexico	264	77	181	19	28	472	128	*312*	0.81	0.72	67	33
Moldova	139	39	101	38	10	85	53	*26*	1.21	1.08	*109*	36
Mongolia	72	4	48	*3*	13	157	8	*139*	1.11	1.04	190	111
Morocco	*71*	*38*	*53*	13	24	112	93	*15*	1.23	0.88	38	27
Mozambique	13	10	9	4	4	18	13	*4*	1.11	0.86	112	26
Myanmar	7	13	5	*4*	7	22	11	*8*	0.80	0.80	113	46
Namibia	*109*	*4*	*52*	..	33	274	77	*170*	1.06	1.09	73	48
Nepal	*5*	..	*3*	*12*	3	11	7	*2*	1.18	0.91	67	32
Netherlands	515	62	449	328	15	708	396	*252*	2.13	1.71	45	31
New Zealand	733	33	616	35	25	1,004	423	*529*	1.47	0.97	14	12
Nicaragua	*57*	*16*	*17*	*16*	13	79	44	*32*	1.09	0.99	44	23
Niger	*5*	*4*	*4*	1	..	..	..	..	1.07	1.16	199	96
Nigeria	*31*	..	*31*	*21*	8	58	8	*46*	0.44	0.77	195	46
Norway	575	29	461	29	12	733	437	*271*	2.12	2.01	21	16
Oman	*225*	*12*	*174*	17	11	665	56	*567*	0.31	0.38	136	94
Pakistan	*11*	*8*	*9*	*33*	13	63	40	*9*	0.86	0.92	220	109
Panama	120	30	*131*	18	17	148	0	*138*	0.85	0.77	58	34
Papua New Guinea	*9*	..	*6*	..	..	..	..	..	*0.94*	*0.90*	35	18
Paraguay	*82*	..	*39*	..	26	181	140	*31*	1.28	1.01	106	67
Peru	55	15	35	*8*	29	148	106	*29*	1.41	1.10	96	51
Philippines	*33*	*14*	*11*	*67*	17	76	43	*28*	1.05	0.84	56	19
Poland	495	49	422	123	15	391	216	*105*	1.57	1.50	60	35
Portugal	*509*	*70*	*495*	*90*	25	579	409	*140*	1.85	1.58	49	21
Puerto Rico	*642*	..	*614*	*287*	..	..	..	..	*0.65*	*0.78*	23	21
Qatar	*724*	..	*335*	*67*	12	2,245	1,388	*756*	0.19	0.19	71	35

3.13 Traffic and congestion

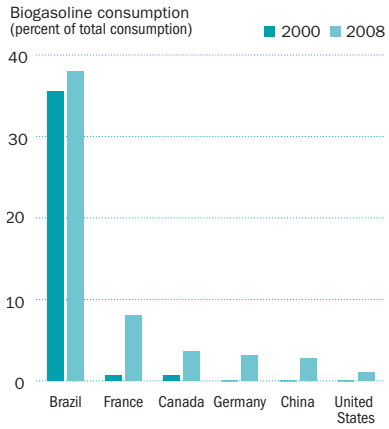
	Motor vehicles		Passenger cars	Road density	Road sector energy consumption				Fuel price		Particulate matter concentration	
	per 1,000 people	per kilometer of road	per 1,000 people	km. of road per 100 sq. km. of land area	% of total consumption	kilograms of oil equivalent per capita			$ per liter		Urban-population-weighted PM10 micrograms per cubic meter	
						Total	Diesel fuel	Gasoline fuel	Super grade gasoline	Diesel		
	2008	2008	2008	2008	2008	2008	2008	2008	2010	2010	1990	2008
Romania	219	24	187	*83*	12	216	136	*67*	1.46	1.46	36	12
Russian Federation	*245*	*35*	*206*	*6*	7	318	80	*222*	0.84	0.72	41	16
Rwanda	4	3	2	*53*	..	..	..	..	1.63	1.62	60	27
Saudi Arabia	..	*20*	*415*	*11*	20	1,279	568	*646*	0.16	0.07	157	104
Senegal	23	19	17	*8*	24	57	45	*10*	1.57	1.34	92	81
Serbia	227	42	202	45	12	251	182	*63*	1.50	1.48	33[a]	14[a]
Sierra Leone	*5*	*2*	*3*	..	..	..	..	..	0.94	0.94	87	38
Singapore	150	218	114	475	13	494	305	*167*	1.42	1.04	107	31
Slovak Republic	*319*	*35*	*272*	89	11	379	230	*115*	1.70	1.53	46	13
Slovenia	565	29	520	192	26	985	628	*316*	1.67	1.62	*38*	29
Somalia	..	..	..	..	..	..	..	..	*1.12*	*1.15*	94	31
South Africa	*159*	..	*108*	..	11	293	121	*161*	1.19	1.14	33	22
Spain	606	41	486	*132*	23	703	539	*135*	1.56	1.47	41	28
Sri Lanka	61	13	19	*148*	19	86	56	*25*	1.19	0.66	94	74
Sudan	*28*	..	*20*	..	14	54	36	*15*	0.62	0.43	282	159
Swaziland	*89*	*25*	*46*	*21*	..	..	..	..	1.07	1.10	55	35
Sweden	521	8	464	128	16	844	410	*365*	1.87	1.82	15	11
Switzerland	567	61	522	173	22	754	283	*441*	1.66	1.77	35	22
Syrian Arab Republic	62	20	27	35	20	189	118	*62*	0.96	0.45	145	69
Tajikistan	*38*	..	*29*	..	4	15	0	*12*	1.02	0.91	*112*	43
Tanzania	*73*	*3*	*4*	9	6	26	19	*6*	1.22	1.19	56	22
Thailand	..	..	*54*	*35*	16	262	153	*73*	1.41	0.95	77	55
Timor-Leste	..	..	..	..	..	..	..	..	1.40	0.90	..	..
Togo	*2*	..	*2*	*21*	11	45	15	*27*	1.18	1.17	57	29
Trinidad and Tobago	*351*	..	..	..	4	587	229	*327*	*0.36*	*0.24*	135	105
Tunisia	114	61	76	12	17	151	101	*41*	0.94	0.82	71	26
Turkey	138	24	92	*54*	14	181	114	*31*	2.52	2.03	76	37
Turkmenistan	106	22	80	..	5	191	0	*182*	0.22	0.20	*259*	65
Uganda	7	3	3	*29*	..	..	..	..	1.42	1.11	33	12
Ukraine	152	41	138	28	6	177	55	*114*	1.01	0.92	71	18
United Arab Emirates	*313*	..	*293*	5	14	1,884	964	*829*	0.47	0.71	281	87
United Kingdom	526	77	462	172	19	641	335	*271*	1.92	1.98	24	13
United States	809	38	451	68	23	1,703	399	*1,148*	0.76	0.84	30	19
Uruguay	*176*	..	*151*	*44*	21	259	163	*81*	1.49	1.44	236	160
Uzbekistan	..	..	..	..	3	63	8	*49*	0.92	0.83	145	40
Venezuela, RB	*147*	..	*107*	..	24	553	81	*416*	0.02	0.01	21	9
Vietnam	*13*	*7*	*13*	*48*	13	90	50	*38*	0.88	0.77	123	53
West Bank and Gaza	39	29	30	*85*	..	..	..	..	1.71	1.54	..	..
Yemen, Rep.	*35*	..	..	*14*	27	90	18	*62*	0.35	0.23	*137*	67
Zambia	*18*	..	*11*	..	2	10	0	*10*	1.66	1.52	124	*39*
Zimbabwe	*106*	..	*91*	*25*	4	27	15	*11*	1.29	1.15	55	*40*
World	**.. w**	**.. w**	***118* w**	***28* w**	**14 w**	**261 w**	**103 w**	***135* w**	**1.21 m**	**1.07 m**	**80 w**	**46 w**
Low income	..	..	..	..	5	19	10	*7*	1.18	1.11	128	60
Middle income	*42*	..	*36*	*25*	10	129	56	*61*	1.08	0.96	96	53
Lower middle income	*23*	*8*	*15*	50	8	78	37	*36*	1.05	0.89	121	63
Upper middle income	..	..	*129*	..	15	320	127	*156*	1.14	1.03	57	31
Low & middle income	..	..	*35*	*22*	10	116	51	*55*	1.11	0.98	98	54
East Asia & Pacific	47	16	33	36	7	97	42	*50*	1.08	0.93	112	61
Europe & Central Asia	*185*	*30*	*152*	*8*	8	228	82	*128*	1.17	1.11	58	24
Latin America & Carib.	*169*	..	*118*	*18*	23	302	121	*136*	1.04	0.98	58	32
Middle East & N. Africa	88	..	66	*12*	19	259	128	*111*	0.94	0.56	124	71
South Asia	*16*	*4*	*10*	129	7	36	23	*9*	1.12	0.83	133	72
Sub-Saharan Africa	*34*	..	*25*	..	8	57	24	*31*	1.22	1.15	119	49
High income	622	38	432	43	19	964	356	*526*	1.63	1.54	38	24
Euro area	592	..	*418*	*140*	18	665	422	*194*	1.78	1.62	33	20

a. Includes Montenegro.

About the data

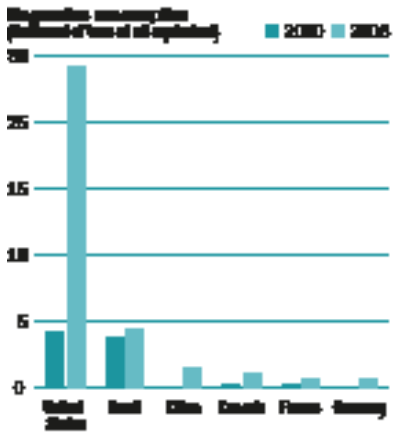
Traffic congestion in urban areas constrains economic productivity, damages people's health, and degrades the quality of life. In recent years ownership of passenger cars has increased, and the expansion of economic activity has led to more goods and services being transported by road over greater distances (see table 5.10). These developments have increased demand for roads and vehicles, adding to urban congestion, air pollution, health hazards, and traffic accidents and injuries. The data on motor vehicles, passenger cars, and road density in the table are compiled by the International Road Federation (IRF) through questionnaires sent to national organizations. The IRF uses a hierarchy of sources to gather as much information as possible. Primary sources are national road associations. If they lack data or do not respond, other agencies are contacted, including road directorates, ministries of transport or public works, and central statistical offices. As a result, data quality is uneven. Coverage of each indicator may differ across countries because of different definitions. Comparability is also limited when time series data are reported. The IRF is taking steps to improve the quality of the data in its *World Road Statistics 2010*. Because this effort covers 2003–08 only, time series data may not be comparable. Another reason is coverage. Road density is a rough indicator of accessibility and does not capture road width, type, or condition. Thus comparisons over time and across countries should be made with caution.

Biogasoline consumption as a share of total consumption is highest in Brazil . . . **3.13a**



Source: International Energy Agency.

. . . but the United States consumes the most biogasoline **3.13b**



Source: International Energy Agency.

Road sector energy consumption includes energy from petroleum products, natural gas, renewable and combustible waste, and electricity. Biodiesel and biogasoline, forms of renewable energy, are biodegradable and emit less sulfur and carbon monoxide than petroleum-derived ones. They can be produced from vegetable oils, such as soybean, corn, palm, peanut, or sunflower oil, and can be used directly only in a modified internal combustion engine. Data are provided by the International Energy Agency.

Data on fuel prices are compiled by the German Agency for International Cooperation (GIZ), from its global network, and other sources, including the Allgemeiner Deutscher Automobile Club (for Europe) and the Latin American Energy Organization for Latin America. Local prices are converted to U.S. dollars using the exchange rate in the *Financial Times* international monetary table on the survey date. When multiple exchange rates exist, the market, parallel, or black market rate is used. Prices were compiled in mid-November 2010, based on the crude oil price of $81 per barrel Brent.

Considerable uncertainty surrounds estimates of particulate matter concentrations, and caution should be used in interpreting them. They allow for cross-country comparisons of the relative risk of particulate matter pollution facing urban residents. Major sources of urban outdoor particulate matter pollution are traffic and industrial emissions, but nonanthropogenic sources such as dust storms may also be a substantial contributor for some cities. Country technology and pollution controls are important determinants of particulate matter. Data on particulate matter for selected cities are in table 3.14.

Definitions

• **Motor vehicles** include cars, buses, and freight vehicles but not two-wheelers. Population figures refer to the midyear population in the year for which data are available. Roads refer to motorways, highways, main or national roads, and secondary or regional roads. A motorway is a road designed and built for motor traffic that separates the traffic flowing in opposite directions. • **Passenger cars** are road motor vehicles, other than two-wheelers, intended for the carriage of passengers and designed to seat no more than nine people (including the driver). • **Road density** is the ratio of the length of the country's total road network to the country's land area. The road network includes all roads in the country—motorways, highways, main or national roads, secondary or regional roads, and other urban and rural roads. • **Road sector energy consumption** is the total energy used in the road sector, including energy from petroleum products, natural gas, combustible and renewable waste, and electricity. • **Total energy consumption** is the country's total energy consumption from all sources (see table 3.7). • **Gasoline** is light hydrocarbon oil use in internal combustion engines such as motor vehicles, excluding aircraft. • **Diesel** is heavy oils used as a fuel for internal combustion in diesel engines. • **Fuel price** is the pump price of super grade gasoline and of diesel fuel, converted from the local currency to U.S. dollars (see *About the data*). • **Particulate matter concentration** is fine suspended particulates of less than 10 microns in diameter (PM10) that are capable of penetrating deep into the respiratory tract and causing severe health damage. Data are urban-population-weighted PM10 levels in residential areas of cities with more than 100,000 residents. The estimates represent the average annual exposure level of the average urban resident to outdoor particulate matter.

Data sources

Data on vehicles and road density are from the IRF's electronic files and its annual *World Road Statistics,* except where noted. Data on road sector energy consumption are from the IRF and the International Energy Agency. Data on fuel prices are from the GIZ's electronic files. Data on particulate matter concentrations are from Pandey and others' "Ambient Particulate Matter Concentrations in Residential and Pollution Hotspot Areas of World Cities: New Estimates Based on the Global Model of Ambient Particulates (GMAPS)" (2006b).

3.14 Air pollution

	City	City population	Particulate matter concentration		Sulfur dioxide	Nitrogen dioxide
		thousands	Urban-population-weighted PM10 micrograms per cubic meter		micrograms per cubic meter	micrograms per cubic meter
		2009	1990	2008	2001[a]	2001[a]
Argentina	Buenos Aires	12,988	159	104	..	..
	Córdoba	1,479	78	51	..	97
Australia	Melbourne	3,813	17	11	..	30
	Perth	1,578	16	11	5	19
	Sydney	4,395	27	18	28	81
Austria	Vienna	1,693	45	34	14	42
Belgium	Brussels	1,892	33	23	20	48
Brazil	Rio de Janeiro	11,836	49	26	129	..
	São Paulo	19,960	57	30	43	83
Bulgaria	Sofia	1,192	118	55	39	122
Canada	Montréal	3,750	24	15	10	42
	Toronto	5,377	29	17	17	43
	Vancouver	2,197	17	10	14	37
Chile	Santiago	5,883	103	69	29	81
China	Anshan	1,632	132	75	115	88
	Beijing	12,214	141	80	90	122
	Changchun	3,504	117	66	21	64
	Chengdu	4,869	136	77	77	74
	Chongqing	9,348	194	110	340	70
	Dalian	3,252	79	45	61	100
	Guangzhou	8,735	99	56	57	136
	Guiyang	2,125	111	63	424	53
	Harbin	4,224	121	69	23	30
	Jinan	3,186	148	84	132	45
	Kunming	3,062	111	63	19	33
	Lanzhou	2,243	145	82	102	104
	Liupanshui	*1,221*	94	53	102	..
	Nanchang	2,648	124	70	69	29
	Shanghai	16,344	115	65	53	73
	Shenyang	5,074	160	90	99	73
	Shenzhen	8,847	89	50	..	..
	Tianjin	7,759	198	112	82	50
	Wuhan	7,582	125	71	40	43
	Zhengzhou	2,914	154	87	63	95
	Zibo	2,396	117	66	198	43
	Foshan	4,876	107	61	..	..
	Chengdu	4,869	136	77	..	..
	Xi'an	4,704	221	125	..	..
Colombia	Bogotá	8,262	51	27	..	..
Croatia	Zagreb	779[b]	48	28	31	..
Cuba	Havana	2,140	47	26	1	5
Czech Republic	Prague	1,162	68	19	14	33
Denmark	Copenhagen	1,174	30	17	7	54
Ecuador	Guayaquil	2,634	33	18	15	..
	Quito	1,801	44	24	22	..
Egypt, Arab Rep.	Cairo	10,902	272	124	69	..
Finland	Helsinki	1,107	24	17	4	35
France	Paris	10,410	14	10	14	57
Germany	Berlin	3,438	30	18	18	26
	Frankfurt	680[b]	27	16	11	45
	Munich	1,334	27	16	8	53
Ghana	Accra	2,269	37	24	..	..
Greece	Athens	3,252	69	34	34	64
Hungary	Budapest	1,705	35	16	39	51
Iceland	Reykjavik	319[b]	23	14	5	42
India	Ahmadabad	5,606	127	68	30	21

About the data

Indoor and outdoor air pollution places a major burden on world health. More than half the world's people rely on dung, wood, crop waste, or coal to meet basic energy needs. Cooking and heating with these fuels on open fires or stoves without chimneys lead to indoor air pollution, which is responsible for 1.6 million deaths a year—one every 20 seconds. In many urban areas air pollution exposure is the main environmental threat to health. Long-term exposure to high levels of soot and small particles contributes to a range of health effects, including respiratory diseases, lung cancer, and heart disease. Particulate pollution, alone or with sulfur dioxide, creates an enormous burden of ill health.

Sulfur dioxide and nitrogen dioxide emissions lead to deposition of acid rain and other acidic compounds over long distances, which can lead to the leaching of trace minerals and nutrients critical to trees and plants. Sulfur dioxide emissions can damage human health, particularly that of the young and old. Nitrogen dioxide is emitted by bacteria, motor vehicles, industrial activities, nitrogen fertilizers, fuel and biomass combustion, and aerobic decomposition of organic matter in soils and oceans.

Where coal is the primary fuel for power plants without effective dust controls, steel mills, industrial boilers, and domestic heating, high levels of urban air pollution are common—especially particulates and sulfur dioxide. Elsewhere the worst emissions are from petroleum product combustion.

Sulfur dioxide and nitrogen dioxide concentration data are based on average observed concentrations at urban monitoring sites, which not all cities have.

The data on particulate matter are estimated average annual concentrations in residential areas away from air pollution "hotspots," such as industrial districts and transport corridors. The data are from the World Bank's Development Research Group and Environment Department estimates of annual ambient concentrations of particulate matter in cities with populations exceeding 100,000 (Pandey and others 2006b). A country's technology and pollution controls are important determinants of particulate matter concentrations.

Pollutant concentrations are sensitive to local conditions, and even monitoring sites in the same city may register different levels. Thus these data should be considered only a general indication of air quality, and comparisons should be made with caution. Current World Health Organization (WHO) air quality guidelines are annual mean concentrations of 20 micrograms per cubic meter for particulate matter less than 10 microns in diameter and 40 micrograms for nitrogen dioxide and daily mean concentrations of 20 micrograms per cubic meter for sulfur dioxide.

Air pollution 3.14

	City	City population	Particulate matter concentration		Sulfur dioxide	Nitrogen dioxide
		thousands	Urban-population-weighted PM10 micrograms per cubic meter		micrograms per cubic meter	micrograms per cubic meter
		2009	1990	2008	2001[a]	2001[a]
	Bangalore	7,079	69	37	..	..
	Chennai	7,416	57	30	15	17
	Delhi	21,720	229	122	24	41
	Hyderabad	6,627	62	33	12	17
	Kanpur	3,298	166	89	15	14
	Kolkata	15,294	195	104	49	34
	Lucknow	2,815	167	89	26	25
	Mumbai	19,695	96	51	33	39
	Nagpur	2,556	85	45	6	13
	Pune	4,898	71	38	..	..
Indonesia	Jakarta	9,121	138	74	..	..
Iran, Islamic Rep.	Tehran	7,190	86	55	209	..
Ireland	Dublin	1,084	24	13	20	..
Italy	Milan	2,962	46	26	31	248
	Rome	3,357	44	25	..	..
	Turin	1,662	66	38	..	..
Japan	Osaka-Kobe	11,325	48	31	19	63
	Tokyo	36,507	54	35	18	68
	Yokohama	3,654[b]	42	27	100	13
Kenya	Nairobi	3,375	67	32	..	..
Korea, Rep	Pusan	3,439	52	31	60	51
	Seoul	9,778	55	33	44	60
	Taegu	2,458	59	36	81	62
Malaysia	Kuala Lumpur	1,493	36	20	24	..
Mexico	Mexico City	19,319	89	43	74	130
Netherlands	Amsterdam	1,044	45	31	10	58
New Zealand	Auckland	1,360	13	11	3	20
Norway	Oslo	875	27	20	8	43
Philippines	Manila	11,449	78	26	33	..
Poland	Katowice	309[b]	62	36	83	79
	Lódz	742[b]	61	36	21	43
	Warsaw	1,710	67	39	16	32
Portugal	Lisbon	2,808	44	19	8	52
Romania	Bucharest	1,933	40	14	10	71
Russian Federation	Moscow	10,523	42	16	109	..
	Omsk	1,128	44	17	20	34
Singapore	Singapore	4,737	107	31	20	30
Slovak Republic	Bratislava	500[b]	44	13	21	27
South Africa	Cape Town	3,353	20	13	21	72
	Durban	2,837	40	27	31	..
	Johannesburg	3,607	42	28	19	31
Spain	Barcelona	5,029	43	29	11	43
	Madrid	5,762	37	25	24	66
Sweden	Stockholm	1,279	14	10	3	20
Switzerland	Zurich	1,143	33	21	11	39
Thailand	Bangkok	6,902	88	63	11	23
Turkey	Ankara	3,846	74	36	55	46
	Istanbul	10,378	87	42	120	..
Ukraine	Kiev	2,779	91	22	14	51
United Kingdom	Birmingham	2,296	22	11	9	45
	London	8,615	27	17	25	77
	Manchester	2,247	24	12	26	49
United States	Chicago	9,134	33	21	14	57
	Los Angeles	12,675	45	29	9	74
	New York-Newark	19,300	28	18	26	79
Venezuela, RB	Caracas	3,051	32	14	33	57

a. Data are for the most recent year available. b. Data are from national sources.

Definitions

• **City population** is the number of residents of the city or metropolitan area as defined by national authorities and reported to the United Nations. • **Particulate matter concentration** is fine suspended particulates of less than 10 microns in diameter (PM10) that are capable of penetrating deep into the respiratory tract and causing severe health damage. Data are urban-population-weighted PM10 levels in residential areas of cities with more than 100,000 residents. The estimates represent the average annual exposure level of the average urban resident to outdoor particulate matter. • **Sulfur dioxide** is an air pollutant produced when fossil fuels containing sulfur are burned. • **Nitrogen dioxide** is a poisonous, pungent gas formed when nitric oxide combines with hydrocarbons and sunlight, producing a photochemical reaction. These conditions occur in both natural and anthropogenic activities.

Data sources

Data on city population are from the United Nations Population Division's *World Urbanization Prospects: The 2009 Revision*. Data on particulate matter concentrations are from Kiran D. Pandey, David Wheeler, Bart Ostro, Uwe Deichman, Kirk Hamilton, and Kathrine Bolt's "Ambient Particulate Matter Concentration in Residential and Pollution Hotspot Areas of World Cities: New Estimates Based on the Global Model of Ambient Particulates (GMAPS)" (2006). Data on sulfur dioxide and nitrogen dioxide concentrations are from the WHO's Healthy Cities Air Management Information System and the World Resources Institute.

3.15 Government commitment

	Environmental strategies or action plans	Biodiversity assessments, strategies, or action plans	Participation in treaties[a]								
			Climate change[b]	Ozone layer	CFC control	Law of the Sea[c]	Biological diversity[b]	Kyoto Protocol[b]	CITES	CCD	Stockholm Convention
Afghanistan			2002	2004[d]	2004[d]		2002		1985[d]	1996[d]	
Albania	1993		1995	1999[d]	1999[d]	2003[d]	1994[d]	2005	2003[d]	2000[d]	2004
Algeria	2001		1994	1992[d]	1992[d]	1996	1995	2005	1983[d]	1996	2006
Angola			2000	2000[d]	2000[d]	1994	1998	2007		1997	2006[d]
Argentina	1992		1994	1990	1990	1995	1994	2005	1981	1997	2005
Armenia			1994	1999[d]	1999[d]	2002[d]	1993[e]	2005		1997	2003
Australia	1992	1994	1994	1987[d]	1989	1994	1993	2008	1976	2000	2004
Austria			1994	1987	1989	1995	1994	2005	1982[d]	1997[d]	2002
Azerbaijan	1998		1995	1996[d]	1996[d]		2000[f]	2005	1998[d]	1998[d]	2004[d]
Bangladesh	1991	1990	1994	1990[d]	1990[d]	2001	1994	2005	1981	1996	2007
Belarus			2000	1986[e]	1988[e]	2006[d]	1993	2005	1995[d]	2001[d]	2004[d]
Belgium			1996	1988	1988	1998	1996	2005	1983	1997[d]	2006
Benin	1993		1994	1993[d]	1993[d]	1997	1994	2005	1984[d]	1996	2004
Bolivia	1994	1988	1995	1994[d]	1994[d]	1995	1994	2005	1979	1996	2003
Bosnia and Herzegovina			2000	1992[f]	1992[f]	1994[f]	2002[d]	2007	2002	2002[d]	2010
Botswana	1990	1991	1994	1991[d]	1991[d]	1994	1995	2005	1977[d]	1996	2002[d]
Brazil		1988	1994	1990[d]	1990[d]	1994	1994	2005	1975	1997	2004
Bulgaria		1994	1995	1990[d]	1990[d]	1996	1996	2005	1991[d]	2001[d]	2004
Burkina Faso	1993		1994	1989	1989	2005	1993	2005	1989[d]	1996	2004
Burundi	1994	1989	1997	1997[d]	1997[d]		1997	2005	1988[d]	1997	2005
Cambodia	1999		1996	2001[d]	2001[d]		1995[d]	2005	1997	1997	2006
Cameroon		1989	1995	1989[d]	1989[d]	1994	1994	2005	1981[d]	1997	2009
Canada	1990	1994	1994	1986	1988	2003	1992	2005	1975	1996	2001
Central African Republic			1995	1993[d]	1993[d]		1995	2008	1980[d]	1996	2008
Chad	1990		1994	1989[d]	1994		1994	2009	1989[d]	1996	2004
Chile		1993	1995	1990	1990	1997	1994	2005	1975	1998	2005
China	1994	1994	1994	1989[d]	1991[d]	1996	1993	2005	1981[d]	1997	2004
Hong Kong SAR, China											
Colombia	1998	1988	1995	1990[d]	1993[d]		1994	2005	1981	1999	2008
Congo, Dem. Rep.		1990	1995	1994[d]	1994[d]	1995	1996	2005	1976[d]	2004	2005[d]
Congo, Rep.		1990	1997	1994[d]	1994[d]	2008	1994	2007	1983[d]	1997	2007
Costa Rica	1990	1992	1994	1991[d]	1991[d]	1994	1994	2005	1975	1998	2007
Côte d'Ivoire	1994	1991	1995	1993[d]	1993[d]	1994	1994	2007	1994[d]	1997	2004
Croatia	2001	2000	1996	1991[e]	1991[e]	1994[f]	1996	2007	2000[d]	2001[e]	2007
Cuba			1994	1992[d]	1992[d]	1994	1994	2005	1990[d]	1997	2007
Czech Republic	1994		1994	1993[e]	1993[e]	1996	1993[g]	2005	1993[f]	2000[d]	2002
Denmark	1994		1994	1988	1988	2004	1993	2005	1977	1996[d]	2003
Dominican Republic		1995	1999	1993[d]	1993[d]		1996	2005	1986[d]	1997[d]	2007
Ecuador	1993	1995	1994	1990[d]	1990[d]		1993	2005	1975	1996	2004
Egypt, Arab Rep.	1992	1988	1995	1988	1988	1994	1994	2005	1978	1996	2003
El Salvador	1994	1988	1996	1992	1992		1994	2005	1987[d]	1997[d]	2008
Eritrea	1995		1995	2005[d]	2005[d]		1996[d]	2005	1994[d]	1996	2005[d]
Estonia	1998		1994	1996[d]	1996[d]	2005[d]	1994	2005	1992[d]		2008[d]
Ethiopia	1994	1991	1994	1994[d]	1994[d]		1994	2005	1989[d]	1997	2003
Finland	1995		1994	1986	1988	1996	1994[e]	2005	1976[d]	1996[e]	2002[e]
France	1990		1994	1987[g]	1988[g]	1996	1994	2005	1978	1997	2004[g]
Gabon		1990	1998	1994[d]	1994[d]	1998	1997	2007	1989[d]	1996[d]	2007
Gambia, The	1992	1989	1994	1990[d]	1990[d]	1994	1994	2005	1977[d]	1996	2006
Georgia	1998		1994	1996[d]	1996[d]	1996[d]	1994[d]	2005	1996[d]	1999	2006
Germany			1994	1988	1988	1994[d]	1993	2005	1976	1996	2002
Ghana	1992	1988	1995	1989[d]	1989	1994	1994	2005	1975	1997	2003
Greece			1994	1988	1988	1995	1994	2005	1992[d]	1997	2006
Guatemala	1994	1988	1996	1987[d]	1989[d]	1997	1995	2005	1979	1998[d]	2008
Guinea	1994	1988	1994	1992[d]	1992[d]	1994	1993	2005	1981[d]	1997	2007
Guinea-Bissau	1993	1991	1996	2002[d]	2002[d]	1994	1995	2005	1990[d]	1996	2008
Haiti	1999		1996	2000[d]	2000[d]	1996	1996	2005		1996	
Honduras	1993		1996	1993[d]	1993[d]	1994	1995	2005	1985[d]	1997	2005

Government commitment

	Environmental strategies or action plans	Biodiversity assessments, strategies, or action plans	Participation in treaties[a]								
			Climate change[b]	Ozone layer	CFC control	Law of the Sea[c]	Biological diversity[b]	Kyoto Protocol[b]	CITES	CCD	Stockholm Convention
Hungary	1995		1994	1988[d]	1989[d]	2002	1994	2005	1985[d]	1999[d]	2008
India	1993	1994	1994	1991[d]	1992[d]	1995	1994	2005	1976	1997	2006
Indonesia	1993	1993	1994	1992[d]	1992	1994	1994	2005	1978[d]	1998	
Iran, Islamic Rep.			1996	1990[d]	1990[d]		1996	2005	1976	1997	2006
Iraq						1994		2009		2010	
Ireland			1994	1988[d]	1988	1996	1996	2005	2002	1997	2010
Israel			1996	1992[d]	1992		1995	2005	1979	1996	
Italy			1994	1988	1988	1995	1994	2005	1979	1997	
Jamaica	1994		1995	1993[d]	1993[d]	1994	1995	2005	1997[d]	1998[d]	2007
Japan			1994	1988[d]	1988	1996	1993[e]	2005	1980	1998[e]	2002[d]
Jordan	1991		1994	1989[d]	1989[d]	1995[d]	1993	2005	1978[d]	1997	2004
Kazakhstan			1995	1998[d]	1998[d]		1994	2009	2000[d]	1997	2007
Kenya	1994	1992	1994	1988[d]	1988	1994	1994	2005	1978	1997	2004
Korea, Dem. Rep.			1995	1995[d]	1995[d]		1994[g]	2005		2004[d]	2002[d]
Korea, Rep.			1994	1992	1992	1996	1994	2005	1993[d]	1999	2007
Kosovo											
Kuwait			1995	1992[d]	1992[d]	1994	2002	2005	2002	1997	2006
Kyrgyz Republic	1995		2000	2000[d]	2000[d]		1996[g]	2005		1997[d]	2006
Lao PDR	1995		1995	1998[d]	1998[d]	1998	1996[g]	2005	2004[d]	1996[e]	2006
Latvia			1995	1995[d]	1995[d]	2004[d]	1995	2005	1997[d]	2003[d]	2004
Lebanon			1995	1993[d]	1993[d]	1995	1994	2007		1996	2003
Lesotho	1989		1995	1994[d]	1994[d]	2007	1995	2005	2003	1996	2002
Liberia			2003	1996[d]	1996[d]	2008	2000	2005	2005[d]	1998[d]	2002[d]
Libya			1999	1990[d]	1990[d]		2001	2006	2003[d]	1996	2005[d]
Lithuania			1995	1995[d]	1995[d]	2003[d]	1996	2005	2001[d]	2003[d]	2006
Macedonia, FYR			1998	1994[f]	1994[f]	1994[f]	1997[d]	2005	2000[d]	2002[d]	2004
Madagascar	1988	1991	1999	1996[d]	1996[d]	2001	1996	2005	1975	1997	2005
Malawi	1994		1994	1991[d]	1991[d]		1994	2005	1982[d]	1996	2009
Malaysia	1991	1988	1994	1989[d]	1989[d]	1996	1994	2005	1977[d]	1997	
Mali		1989	1995	1994[d]	1994[d]	1994	1995	2005	1994[d]	1996	2003
Mauritania	1988		1994	1994[d]	1994[d]	1996	1996	2005	1998[d]	1996	2005
Mauritius	1990		1994	1992[d]	1992[d]	1994	1992	2005	1975	1996	2004
Mexico		1988	1994	1987	1988	1994	1993	2005	1991[d]	1996	2003
Moldova	2002		1995	1996[d]	1996[d]	2007	1995	2005	2001[d]	1999[d]	2004
Mongolia	1995		1994	1996[d]	1996[d]	1996	1993	2005	1996[d]	1996	2004
Morocco		1988	1996	1995	1995	2007	1995	2005	1975	1997	2004
Mozambique	1994		1995	1994[d]	1994[d]	1997	1995	2005	1981[d]	1997	2005
Myanmar		1989	1995	1993[d]	1993[d]	1996	1995	2005	1997[d]	1997[d]	2004[d]
Namibia	1992		1995	1993[d]	1993[d]	1994	1997	2005	1990[d]	1997	2005[d]
Nepal	1993		1994	1994[d]	1994[d]	1998	1993	2005	1975[d]	1997	2007
Netherlands	1994		1994	1988[d]	1988[e]	1996	1994[e]	2005	1984	1996[e]	2002[e]
New Zealand	1994		1994	1987	1988	1996	1993	2005	1989[d]	2000[d]	2004
Nicaragua	1994		1996	1993[d]	1993[d]	2000	1995	2005	1977[d]	1998	2005
Niger		1991	1995	1992[d]	1992[d]		1995	2005	1975	1996	2006
Nigeria	1990	1992	1994	1988[d]	1988[d]	1994	1994	2005	1974	1997	2004
Norway		1994	1994	1986	1988	1996	1993	2005	1976	1996	2002
Oman			1995	1999[d]	1999[d]	1994	1995	2005		1996	2005
Pakistan	1994	1991	1994	1992[d]	1992[d]	1997	1994	2005	1976[d]	1997	2008
Panama	1990		1995	1989[d]	1989	1996	1995	2005	1978	1996	2003
Papua New Guinea	1992	1993	1994	1992[d]	1992[d]	1997	1993	2005	1975[d]	2001[d]	2003
Paraguay			1994	1992[d]	1992[d]	1994	1994	2005	1976	1997	2004
Peru		1988	1994	1989	1993[d]		1993	2005	1975	1996	2005
Philippines	1989	1989	1994	1991[d]	1991	1994	1993	2005	1981	2000	2004
Poland	1993	1991	1994	1990[d]	1990[d]	1998	1996	2005	1989	2002	2008
Portugal	1995		1994	1988[d]	1988	1997	1993	2005	1980	1996	2004[d]
Puerto Rico											
Qatar								2005		1999	2004[d]

3.15 Government commitment

	Environmental strategies or action plans	Biodiversity assessments, strategies, or action plans	Participation in treaties[a]								
			Climate change[b]	Ozone layer	CFC control	Law of the Sea[c]	Biological diversity[b]	Kyoto Protocol[b]	CITES	CCD	Stockholm Convention
Romania	1995		1994	1993[d]	1993[d]	1996	1994	2005	1994[d]	1998	2004
Russian Federation	1999	1994	1995	1986[e]	1988[e]	1997	1995	2005	1992	2003	
Rwanda	1991		1998	2001[d]	2001[d]		1996	2005	1980[d]	1999	2002[d]
Saudi Arabia			1995	1993[d]	1993[d]	1996	2001[g]	2005	1996[d]	1997	
Senegal	1984	1991	1995	1993[d]	1993	1994	1994	2005	1977[d]	1996	2003
Serbia								2008		2008	2009
Sierra Leone	1994		1995	2001[d]	2001[d]	1994	1994[g]	2007	1994[d]	1997	2003[d]
Singapore	1993	1995	1997	1989[d]	1989[d]	1994	1995	2006	1986[d]	1999	2005
Slovak Republic			1994	1993[f]	1993[f]	1996	1994[g]	2005	1993	2002	2002
Slovenia	1994		1996	1992[f]	1992[f]	1995[f]	1996	2005	2000[d]	2001	2004
Somalia				2001[d]	2001[d]	1994		2011	1985[d]	2002	2010[d]
South Africa	1993		1997	1990[d]	1990[d]	1997	1995	2005	1975	1997	2002
Spain			1994	1988[d]	1988	1997	1995	2005	1986[d]	1996	2004
Sri Lanka	1994	1991	1994	1989[d]	1989[d]	1994	1994	2005	1979[d]	1999	2005
Sudan			1994	1993[d]	1993[d]	1994	1995	2005	1982	1996	2006
Swaziland			1997	1992[d]	1992[d]		1994	2006	1997[d]	1997	2006
Sweden			1994	1986	1988	1996	1993	2005	1974	1996	2002
Switzerland			1994	1987	1988		1994	2005	1974	1996	2003
Syrian Arab Republic	1999		1996	1989[d]	1989[d]		1996	2006	2003[d]	1997	2005
Tajikistan			1998	1996[d]	1998[d]		1997[g]	2009		1997	2007
Tanzania	1994	1988	1996	1993[d]	1993[d]	1994	1996	2005	1979	1997	2004
Thailand			1995	1989[d]	1989		2004	2005	1983	2001	2005
Togo	1991		1995	1991[d]	1991	1994	1995[e]	2005	1978	1996	2004
Trinidad and Tobago			1994	1989[d]	1989[d]	1994	1996	2005	1984[d]	2000	2002[d]
Tunisia	1994	1988	1994	1989[d]	1989[d]	1994	1993	2005	1974	1996	2004
Turkey	1998		2004	1991[d]	1991[d]		1997	2009	1996[d]	1998	2009
Turkmenistan			1995	1993[d]	1993[d]		1996[g]	2005		1996	
Uganda	1994	1988	1994	1988[d]	1988	1994	1993	2005	1991[d]	1997	2004[d]
Ukraine	1999		1997	1986[e]	1988[e]	1999	1995	2005	1999[d]	2002	
United Arab Emirates			1996	1989[d]	1989[d]		2000	2005	1990[d]	1999	2002
United Kingdom	1995	1994	1994	1987	1988	1997[d]	1994	2005	1976	1997	2005
United States	1995	1995	1994	1986	1988				1974	2001	
Uruguay			1994	1989[d]	1991[d]	1994	1993	2005	1975	1999	2004
Uzbekistan			1994	1993[d]	1993[d]		1995[g]	2005	1997[d]	1996	
Venezuela			1995	1988[d]	1989		1994	2005	1977	1998	2005
Vietnam		1993	1995	1994[d]	1994[d]	2006[d]	1994	2005	1994[d]	1998	2002
West Bank and Gaza											
Yemen, Rep.	1996	1992	1996	1996[d]	1996[d]	1994	1996	2005	1997[d]	1997	2004
Zambia	1994		1994	1990[d]	1990[d]	1994	1993	2006	1980[d]	1996	2006
Zimbabwe	1987		1994	1992[d]	1992[d]	1994	1994	2009	1981[d]	1997	

a. Ratification of the treaty. b. Year the treaty entered into force in the country. c. Convention became effective November 16, 1994. d. Accession. e. Acceptance. f. Succession. g. Approval.

Government commitment

About the data

National environmental strategies and participation in international treaties on environmental issues provide some evidence of government commitment to sound environmental management. But the signing of these treaties does not always imply ratification, nor does it guarantee that governments will comply with treaty obligations.

In many countries efforts to halt environmental degradation have failed, primarily because governments have neglected to make this issue a priority, a reflection of competing claims on scarce resources. To address this problem, many countries are preparing national environmental strategies—some focusing narrowly on environmental issues, and others integrating environmental, economic, and social concerns. Among such initiatives are conservation strategies and environmental action plans. Some countries have also prepared country environmental profiles and biodiversity strategies and profiles.

National conservation strategies—promoted by the World Conservation Union (IUCN)—provide a comprehensive, cross-sectoral analysis of conservation and resource management issues to help integrate environmental concerns with the development process. Such strategies discuss current and future needs, institutional capabilities, prevailing technical conditions, and the status of natural resources in a country.

National environmental action plans, supported by the World Bank and other development agencies, describe a country's main environmental concerns, identify the principal causes of environmental problems, and formulate policies and actions to deal with them. These plans are a continuing process in which governments develop comprehensive environmental policies, recommend specific actions, and outline the investment strategies, legislation, and institutional arrangements required to implement them.

Biodiversity profiles—prepared by the World Conservation Monitoring Centre and the IUCN—provide basic background on species diversity, protected areas, major ecosystems and habitat types, and legislative and administrative support. In an effort to establish a scientific baseline for measuring progress in biodiversity conservation, the United Nations Environment Programme (UNEP) coordinates global biodiversity assessments.

To address global issues, many governments have also signed international treaties and agreements launched in the wake of the 1972 United Nations Conference on the Human Environment in Stockholm and the 1992 United Nations Conference on Environment and Development (the Earth Summit) in Rio de Janeiro, which produced Agenda 21—an array of actions to address environmental challenges:

- The Framework Convention on Climate Change aims to stabilize atmospheric concentrations of greenhouse gases at levels that will prevent human activities from interfering dangerously with the global climate.
- The Vienna Convention for the Protection of the Ozone Layer aims to protect human health and the environment by promoting research on the effects of changes in the ozone layer and on alternative substances (such as substitutes for chlorofluorocarbon) and technologies, monitoring the ozone layer, and taking measures to control the activities that produce adverse effects.
- The Montreal Protocol for Chlorofluorocarbon Control requires that countries help protect the earth from excessive ultraviolet radiation by cutting chlorofluorocarbon consumption by 20 percent over their 1986 level by 1994 and by 50 percent over their 1986 level by 1999, with allowances for increases in consumption by developing countries.
- The United Nations Convention on the Law of the Sea, which became effective in November 1994, establishes a comprehensive legal regime for seas and oceans, establishes rules for environmental standards and enforcement provisions, and develops international rules and national legislation to prevent and control marine pollution.
- The Convention on Biological Diversity promotes conservation of biodiversity through scientific and technological cooperation among countries, access to financial and genetic resources, and transfer of ecologically sound technologies.

But 10 years after the Earth Summit in Rio de Janeiro the World Summit on Sustainable Development in Johannesburg recognized that many of the proposed actions had yet to materialize. To help developing countries comply with their obligations under these agreements, the Global Environment Facility (GEF) was created to focus on global improvement in biodiversity, climate change, international waters, and ozone layer depletion. The UNEP, United Nations Development Programme, and World Bank manage the GEF according to the policies of its governing body of country representatives. The World Bank is responsible for the GEF Trust Fund and chairs the GEF.

Definitions

• **Environmental strategies or action plans** provide a comprehensive analysis of conservation and resource management issues that integrate environmental concerns with development. They include national conservation strategies, environmental action plans, environmental management strategies, and sustainable development strategies. The date is the year a country adopted a strategy or action plan. • **Biodiversity assessments, strategies, or action plans** include biodiversity profiles (see *About the data*). • **Participation in treaties** covers nine international treaties (see *About the data*). • **Climate change** refers to the Framework Convention on Climate Change (signed in 1992). • **Ozone layer** refers to the Vienna Convention for the Protection of the Ozone Layer (signed in 1985). • **CFC control** refers to the Protocol on Substances That Deplete the Ozone Layer (the Montreal Protocol for Chlorofluorocarbon Control) (signed in 1987). • **Law of the Sea** refers to the United Nations Convention on the Law of the Sea (signed in 1982). • **Biological diversity** refers to the Convention on Biological Diversity (signed at the Earth Summit in 1992). • **Kyoto Protocol** refers to the protocol on climate change adopted at the third conference of the parties to the United Nations Framework Convention on Climate Change in December 1997. • **CITES** is the Convention on International Trade in Endangered Species of Wild Fauna and Flora, an agreement among governments to ensure that the survival of wild animals and plants is not threatened by uncontrolled exploitation. Adopted in 1973, it entered into force in 1975. • **CCD** is the United Nations Convention to Combat Desertification, an international convention addressing the problems of land degradation in the world's drylands. Adopted in 1994, it entered into force in 1996. • **Stockholm Convention** is an international legally binding instrument to protect human health and the environment from persistent organic pollutants. Adopted in 2001, it entered into force in 2004.

Data sources

Data on environmental strategies and participation in international environmental treaties are from the Secretariat of the United Nations Framework Convention on Climate Change, the Ozone Secretariat of the UNEP, the World Resources Institute, the UNEP, the Center for International Earth Science Information Network, and the United Nations Treaty Series.

3.16 Contribution of natural resources to gross domestic product

	Total natural resources rents	Oil rents	Natural gas rents	Coal rents, hard and soft	Mineral rents	Forest rents
	% of GDP 2009	% of GDP 2009	% of GDP 2009	% of GDP 2009	% of GDP 2009	% of GDP 2009
Afghanistan	4.0	0.0	0.0	0.0	..	4.0
Albania	1.8	1.7	0.0	0.0	0.0	0.1
Algeria	25.2	15.1	9.7	0.0	0.2	0.1
Angola	39.0	38.6	0.1	0.0	0.0	0.2
Argentina	6.0	3.5	1.9	0.0	0.5	0.1
Armenia	0.8	0.0	0.0	0.0	0.8	0.0
Australia	6.7	0.9	0.8	1.2	4.9	0.1
Austria	0.3	0.1	0.1	0.0	0.0	0.1
Azerbaijan	44.5	39.6	4.9	0.0	0.0	0.0
Bangladesh	3.9	0.0	3.2	0.0	0.0	0.6
Belarus	1.7	1.2	0.1	0.0	0.0	0.5
Belgium	0.0	0.0	0.0	0.0	0.0	0.0
Benin	1.9	0.0	0.0	0.0	0.0	1.9
Bolivia	17.5	4.5	10.3	0.0	2.2	0.4
Bosnia and Herzegovina	2.0	0.0	0.0	1.2	1.5	0.5
Botswana	3.5	0.0	0.0	0.4	3.4	0.2
Brazil	5.0	2.1	0.1	0.0	2.4	0.4
Bulgaria	1.2	0.0	0.0	0.6	1.0	0.2
Burkina Faso	3.7	0.0	0.0	0.0	0.0	3.7
Burundi	11.3	0.0	0.0	0.0	1.2	10.1
Cambodia	1.5	0.0	0.0	0.0	0.0	1.5
Cameroon	9.4	6.8	0.3	0.0	0.1	2.2
Canada	3.7	2.1	0.6	0.1	0.6	0.4
Central African Republic	7.3	0.0	0.0	0.0	0.0	7.3
Chad	36.4	33.7	0.0	0.0	0.0	2.7
Chile	15.6	0.0	0.1	0.0	14.8	0.6
China	2.0	1.4	0.2	2.7	0.3	0.2
Hong Kong SAR, China	0.0	0.0	0.0	0.0	0.0	0.0
Colombia	6.3	5.2	0.5	1.0	0.5	0.1
Congo, Dem. Rep.	28.0	3.9	0.0	0.0	11.6	12.5
Congo, Rep.	56.8	52.8	0.0	0.0	0.0	3.9
Costa Rica	0.4	0.0	0.0	0.0	0.1	0.4
Côte d'Ivoire	5.9	3.6	1.0	0.0	0.0	1.3
Croatia	1.1	0.4	0.5	0.0	0.0	0.2
Cuba	..	..	..	..	..	..
Czech Republic	0.3	0.0	0.0	0.3	0.0	0.2
Denmark	1.8	1.4	0.4	0.0	0.0	0.0
Dominican Republic	0.8	0.0	0.0	0.0	0.8	0.0
Ecuador	15.7	15.3	0.1	0.0	0.0	0.2
Egypt, Arab Rep.	10.7	5.3	5.1	0.0	0.2	0.1
El Salvador	0.5	0.0	0.0	0.0	0.0	0.5
Eritrea	1.4	0.0	0.0	0.0	0.0	1.4
Estonia	0.7	0.0	0.0	1.1	0.0	0.7
Ethiopia	5.0	0.0	0.0	0.0	0.2	4.8
Finland	0.6	0.0	0.0	0.0	0.1	0.5
France	0.1	0.0	0.0	0.0	0.0	0.0
Gabon	45.0	39.9	0.3	0.0	0.1	4.7
Gambia, The	3.2	0.0	0.0	0.0	0.0	3.2
Georgia	0.3	0.2	0.0	0.0	0.0	0.1
Germany	0.1	0.0	0.1	0.1	..	0.0
Ghana	8.6	0.0	0.0	0.0	6.5	2.1
Greece	0.1	0.0	0.0	0.2	0.1	0.0
Guatemala	1.6	0.7	0.0	0.0	0.0	0.9
Guinea	10.5	0.0	0.0	0.0	5.3	5.3
Guinea-Bissau	3.5	0.0	0.0	0.0	0.0	3.5
Haiti	0.7	0.0	0.0	0.0	0.0	0.7
Honduras	1.8	0.0	0.0	0.0	0.6	1.2

Contribution of natural resources to gross domestic product

	Total natural resources rents	Oil rents	Natural gas rents	Coal rents, hard and soft	Mineral rents	Forest rents
	% of GDP 2009	% of GDP 2009	% of GDP 2009	% of GDP 2009	% of GDP 2009	% of GDP 2009
Hungary	0.5	0.2	0.2	0.1	0.0	0.1
India	4.0	0.8	0.5	2.2	1.7	1.0
Indonesia	5.9	2.4	1.3	2.5	1.6	0.5
Iran, Islamic Rep.	28.4	21.4	6.6	0.0	0.3	0.0
Iraq	68.6	68.1	0.5	0.0	0.0	0.0
Ireland	0.1	0.0	0.0	0.0	0.0	0.0
Israel	0.3	0.0	0.2	0.0	0.1	0.0
Italy	0.1	0.1	0.0	0.0	0.0	0.0
Jamaica	1.2	0.0	0.0	0.0	1.1	0.2
Japan	0.0	0.0	0.0	0.0	..	0.0
Jordan	1.7	0.0	0.1	0.0	1.6	0.0
Kazakhstan	27.3	20.9	4.7	4.3	1.7	0.0
Kenya	1.4	0.0	0.0	0.0	0.0	1.4
Korea, Dem. Rep.	..	..	..	..	..	..
Korea, Rep.	0.0	0.0	0.0	0.0	..	0.0
Kosovo	0.0	0.0	0.0	..	..	..
Kuwait	..	..	..	..	..	..
Kyrgyz Republic	0.5	0.5	0.0	0.3	0.0	0.0
Lao PDR	1.9	0.0	0.0	0.0	0.0	1.9
Latvia	1.1	0.0	0.0	0.0	0.0	1.1
Lebanon	0.0	0.0	0.0	0.0	0.0	0.0
Lesotho	1.8	0.0	0.0	0.0	0.0	1.8
Liberia	15.6	0.0	0.0	0.0	0.7	14.9
Libya	48.4	44.7	3.7	0.0	0.0	0.0
Lithuania	1.4	0.1	0.0	0.0	0.0	1.3
Macedonia, FYR	0.1	0.0	0.0	0.0	0.0	0.1
Madagascar	2.0	0.0	0.0	0.0	0.1	1.9
Malawi	2.5	0.0	0.0	0.0	0.0	2.5
Malaysia	12.3	6.1	5.7	0.0	0.0	0.5
Mali	1.3	0.0	0.0	0.0	0.0	1.3
Mauritania	30.1	0.0	0.0	0.0	29.4	0.6
Mauritius	0.0	0.0	0.0	0.0	0.0	0.0
Mexico	6.8	5.5	0.7	0.1	0.4	0.1
Moldova	0.2	0.1	0.0	0.0	0.0	0.1
Mongolia	12.7	1.4	0.0	3.9	11.0	0.3
Morocco	2.3	0.0	0.0	0.0	2.2	0.1
Mozambique	8.5	0.0	5.1	0.0	0.0	3.4
Myanmar	..	..	..	..	..	..
Namibia	0.5	0.0	0.0	0.0	0.5	0.0
Nepal	5.6	0.0	0.0	0.0	0.0	5.6
Netherlands	1.1	0.1	1.1	0.0	0.0	0.0
New Zealand	2.3	0.7	0.5	0.1	0.4	0.6
Nicaragua	2.9	0.0	0.0	0.0	1.0	1.8
Niger	1.7	0.0	0.0	0.0	..	1.7
Nigeria	23.3	20.3	1.8	0.0	0.0	1.2
Norway	13.2	9.5	3.6	0.0	0.0	0.1
Oman	40.1	32.3	7.7	0.0	0.0	0.0
Pakistan	4.4	0.7	2.7	0.1	0.0	1.0
Panama	0.1	0.0	0.0	0.0	0.0	0.1
Papua New Guinea	32.7	0.0	0.0	0.0	29.7	3.0
Paraguay	1.7	0.0	0.0	0.0	0.0	1.7
Peru	8.2	0.9	0.4	0.0	6.8	0.1
Philippines	1.7	0.0	0.4	0.1	1.1	0.2
Poland	0.8	0.1	0.1	0.9	0.4	0.2
Portugal	0.1	0.0	0.0	0.0	..	0.1
Puerto Rico	..	..	..	..	..	..
Qatar	28.6	14.0	14.6	0.0	0.0	..

3.16 Contribution of natural resources to gross domestic product

	Total natural resources rents	Oil rents	Natural gas rents	Coal rents, hard and soft	Mineral rents	Forest rents
	% of GDP 2009	% of GDP 2009	% of GDP 2009	% of GDP 2009	% of GDP 2009	% of GDP 2009
Romania	2.0	0.9	0.8	0.2	..	0.2
Russian Federation	20.7	13.4	5.8	1.0	1.1	0.3
Rwanda	3.3	0.0	0.0	0.0	0.0	3.3
Saudi Arabia	47.2	43.8	3.4	0.0	0.0	0.0
Senegal	1.8	0.0	0.0	0.0	0.4	1.3
Serbia and Montenegro	..	..	..	..	..	..
Sierra Leone	4.5	0.0	0.0	0.0	0.6	3.8
Singapore	0.0	0.0	0.0	0.0	0.0	0.0
Slovak Republic	0.3	0.0	0.0	0.0	0.0	0.3
Slovenia	0.1	0.0	0.0	0.1	0.0	0.1
Somalia	..	..	..	..	..	..
South Africa	4.7	0.1	0.1	4.2	3.3	1.2
Spain	0.0	0.0	0.0	0.0	..	0.0
Sri Lanka	0.8	0.0	0.0	0.0	0.0	0.8
Sudan	16.9	16.0	0.0	0.0	0.1	0.8
Swaziland	2.3	0.0	0.0	0.0	..	2.3
Sweden	0.8	0.0	0.0	0.0	0.4	0.5
Switzerland	0.0	0.0	0.0	0.0	0.0	0.0
Syrian Arab Republic	14.4	12.4	1.8	0.0	0.2	0.0
Tajikistan	0.2	0.1	0.1	0.1	0.0	0.0
Tanzania	6.3	0.0	0.4	0.0	3.5	2.4
Thailand	3.6	1.6	1.7	0.1	0.0	0.3
Timor-Leste	0.4	0.0	0.0	0.0	0.0	0.4
Togo	4.5	0.0	0.0	0.0	2.1	2.4
Trinidad and Tobago	35.2	10.3	24.9	0.0	0.0	0.0
Tunisia	4.9	3.8	0.9	0.0	..	0.2
Turkey	0.3	0.1	0.0	0.1	0.1	0.1
Turkmenistan	41.0	17.1	24.0	0.0	0.0	..
Uganda	5.2	0.0	0.0	0.0	0.0	5.2
Ukraine	3.6	0.9	2.4	2.4	0.0	0.3
United Arab Emirates	20.9	17.6	3.3	0.0	0.0	..
United Kingdom	1.4	1.0	0.4	0.0	0.0	0.0
United States	0.9	0.5	0.2	0.2	0.1	0.1
Uruguay	0.7	0.0	0.0	0.0	0.0	0.7
Uzbekistan	28.2	2.8	25.4	0.1	0.0	0.0
Venezuela, RB	15.6	13.8	1.2	0.0	0.5	0.0
Vietnam	8.1	6.0	1.3	2.2	0.1	0.7
West Bank and Gaza	..	..	..	..	..	..
Yemen, Rep.	19.7	19.4	0.3	0.0	0.0	0.0
Zambia	18.4	0.0	0.0	0.1	16.4	2.0
Zimbabwe	5.2	0.0	0.0	3.2	1.9	3.3
World	**3.7 w**	**1.9 w**	**0.6 w**	**0.5 w**	**0.5 w**	**0.2 w**
Low income	6.3	0.7	0.9	0.1	2.0	2.6
Middle income	8.7	4.7	1.4	1.4	1.0	0.3
Lower middle income	6.8	2.9	0.8	2.1	0.6	0.4
Upper middle income	11.2	6.8	2.1	0.5	1.5	0.3
Low & middle income	8.7	4.6	1.3	1.3	1.0	0.4
East Asia & Pacific	5.3	1.6	0.6	2.4	0.4	0.2
Europe & Central Asia	13.7	8.2	3.7	0.9	0.7	0.2
Latin America & Carib.	7.0	4.1	0.5	0.1	2.0	0.3
Middle East & N. Africa	22.7	17.6	4.6	0.0	0.4	0.1
South Asia	5.8	0.8	0.8	1.8	1.4	1.1
Sub-Saharan Africa	14.2	8.8	0.5	1.3	1.8	1.7
High income	1.6	0.9	0.3	0.1	0.2	0.1
Euro area	0.2	0.0	0.1	0.0	..	0.0

Note: Components may not sum to 100 percent because of rounding.

Contribution of natural resources to gross domestic product

About the data

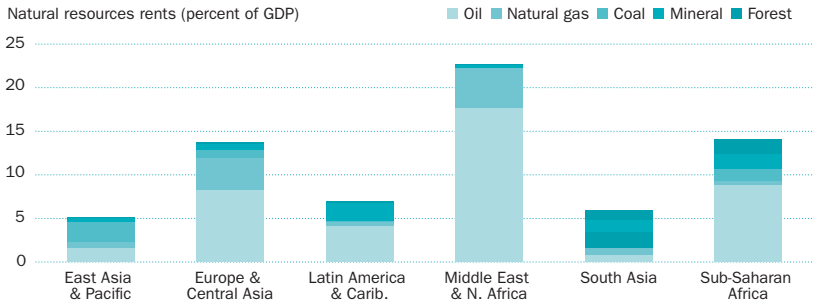
Accounting for the contribution of natural resources to economic output is important in building an analytical framework for sustainable development. In some countries earnings from natural resources, especially from fossil fuels and minerals, account for a sizable share of GDP, and much of these come in the form of economic rents—revenues above the cost of extracting them. Natural resources give rise to economic rents because they are not produced. For produced goods and services competitive forces expand supply until economic profits are driven to zero, but natural resources in fixed supply often command returns well in excess of their cost of production. Rents from nonrenewable resources—fossil fuels and minerals—as well as rents from overharvesting of forests indicate the liquidation of a country's capital stock. When countries use such rents to support current consumption rather than to invest in new capital to replace what is being used up, they are, in effect, borrowing against their future.

The estimates of natural resources rents shown in the table are calculated as the difference between the price of a commodity and the average cost of producing it. This is done by estimating the world price of units of specific commodities and subtracting estimates of average unit costs of extraction or harvesting costs (including a normal return on capital). These unit rents are then multiplied by the physical quantities countries extract or harvest to determine the rents for each commodity as a share of gross national income.

This definition of economic rent differs from that used in the System of National Accounts, where rents are a form of property income, consisting of payments to landowners by a tenant for the use of the land or payments to the owners of subsoil assets by institutional units permitting them to extract subsoil deposits.

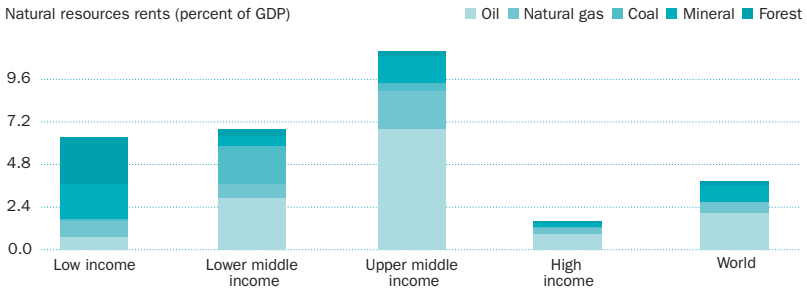
The Environment section of previous editions of the *World Development Indicators* included a table *"Toward a broader measure of savings,"* which showed the derivation of adjusted net savings taking into account consumption of fixed and natural capital and pollution damage and additions to human capital. Adjusted net savings measures the net additions or subtractions from a country's stock of tangible and intangible capital. This table is now included in the *Economy* section as table 4.11 along with the closely related table 4.10 "Toward a broader measure of income."

Oil dominates the contribution of natural resources in the Middle East and North Africa **3.16a**



Source: Table 3.16.

Upper middle-income countries have the highest contribution of natural resources to GDP **3.16b**



Source: Table 3.16.

Definitions

• **Oil rents** are the difference between the value of crude oil production at world prices and total costs of production. • **Natural gas rents** are the difference between the value of natural gas production at world prices and total costs of production. • **Coal rents** are the difference between the value of both hard and soft coal production at world prices and their total costs of production. • **Mineral rents** are the difference between the value of production for a stock of minerals at world prices and their total costs of production. Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate. • **Forest rents** are roundwood harvest times the product of average prices and a region-specific rental rate (based on a number of reviews, World Bank 2011). • **Total natural resources rents** are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.

Data sources

Data on contributions of natural resources to GDP are estimates based on sources and methods described in *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium* (World Bank 2011a).