

## 26 Air and water pollution

Climate change is now on the top of the global agenda, so one of the most scrutinized indicators in the coming years will be greenhouse gas emissions. Most of these emissions – over 80 per cent – come from CO<sub>2</sub>, largely a result of fuel combustion.

Asia and the Pacific is a huge and populous region, and by far the largest overall emitter of CO<sub>2</sub>, some 12 billion tons annually. And, as a result of rapid economic growth, emissions have increased over the past decade. Most of these have been from the middle-income economies, such as China, The Russian Federation, Indonesia, Thailand, and Malaysia – which are important centres of world production.

According to the IAE 2006 *World Energy Outlook*, Asia and the Pacific is likely to sustain faster than average economic growth. As a result, between 2005 and 2030, the region's share of energy-related CO<sub>2</sub> emissions is likely to increase from 45 to 55 per cent. This will contribute to climate and ecological changes that will increase the

Figure 26.1

CO<sub>2</sub> emissions in Asia and the Pacific, by income grouping, 1990-2004

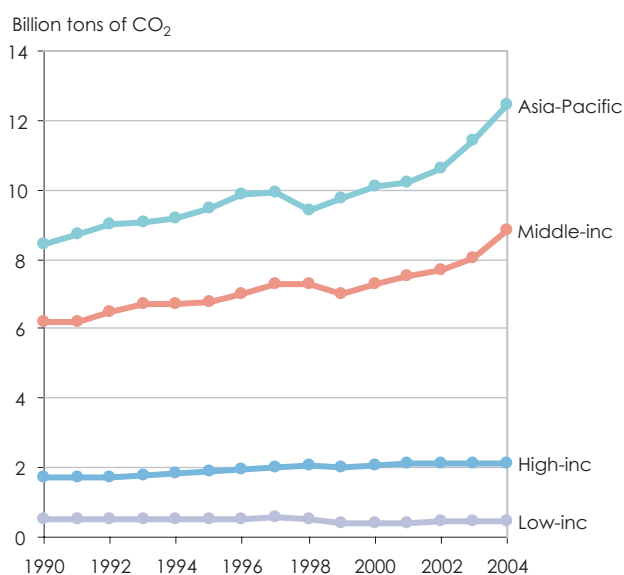
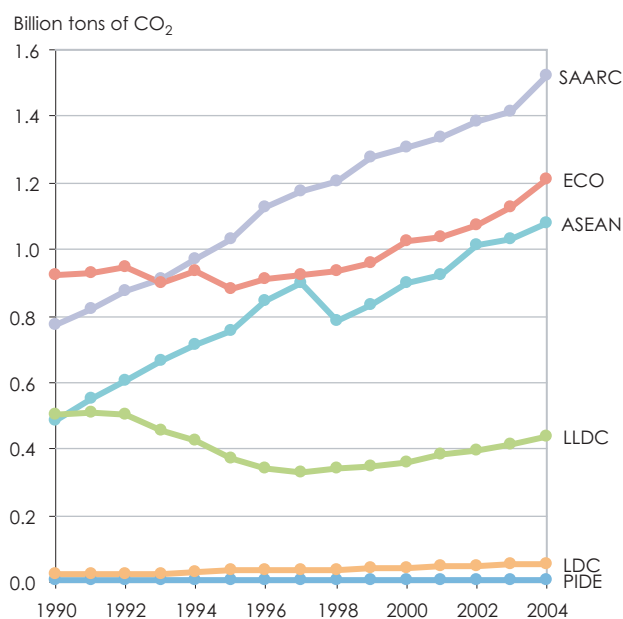


Figure 26.2

CO<sub>2</sub> emissions, Asia and the Pacific groupings, 1990-2004



incidence of natural disasters and make many people more vulnerable. Chapter 19 has considered the contribution of transport to these emissions, and chapter 28 will look more closely at the contribution of energy.

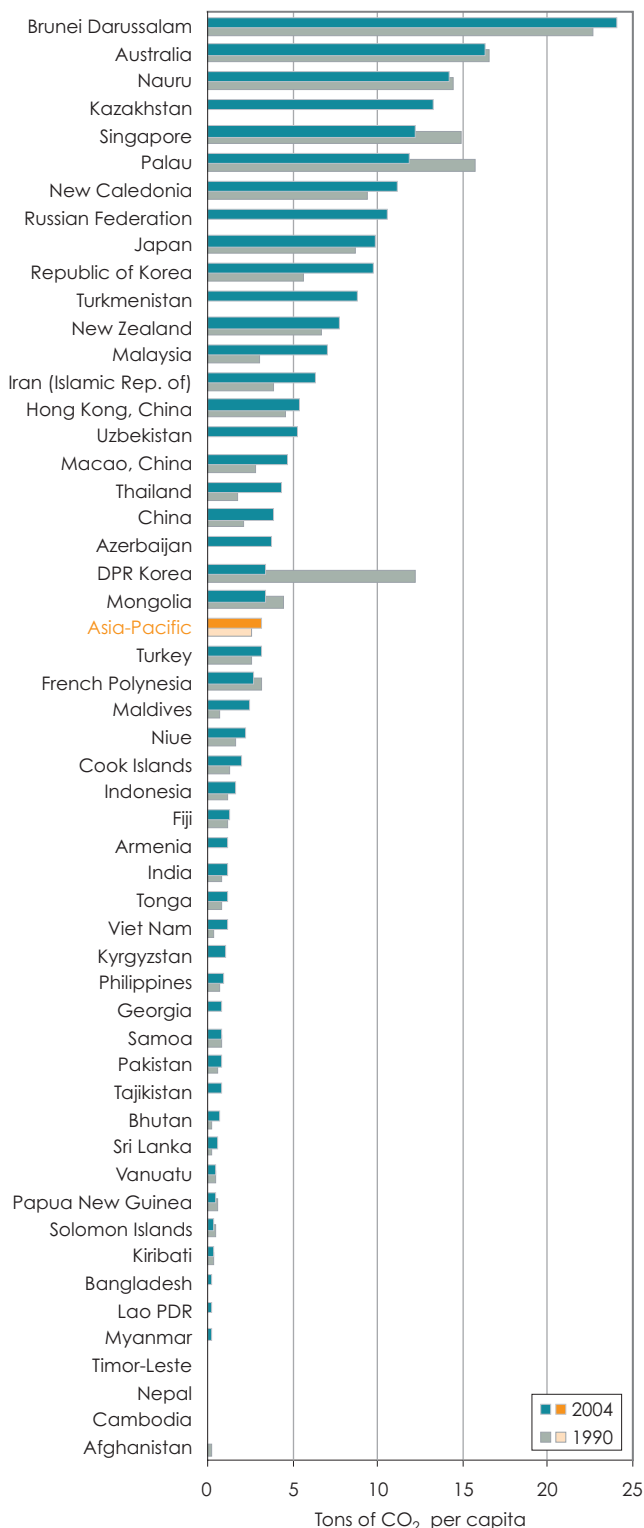
Since 1990, emissions have, with a few exceptions, been increasing throughout the region. Nevertheless, and despite the high total, in most Asia-Pacific countries emissions per capita remain low – 3.2 tons per person per annum in 2004 – compared with 20.3 in North America and 7.8 in Europe, indicating that in many countries in the region millions of people lack access to modern energy.

Countries in the region are now more aware of the need to develop low-carbon societies, but they are not yet on the path towards green economies. This is clear from data on carbon intensities – CO<sub>2</sub> emissions per unit of GDP. After a decline from 1990, intensities started rising in 2002 – mainly in middle- and low-income economies. Europe and the Americas do not show similar rises. Because they use

## 26. Air and water pollution

### Figure 26.3

CO<sub>2</sub> emissions per capita, selected Asia-Pacific countries, 1990 and 2004

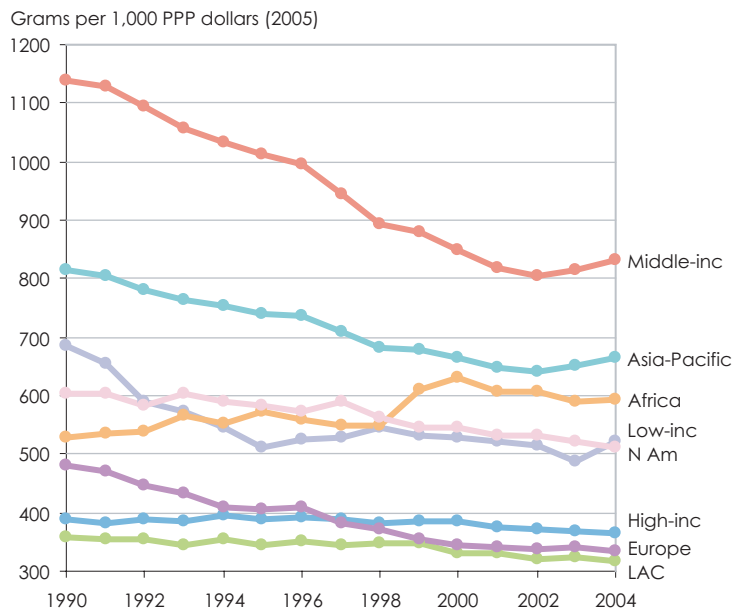


energy and other resources fairly inefficiently, developing countries do, however, have considerable potential to slow their escalation of greenhouse gas emissions.

The region is also a major producer of another greenhouse gas, nitrous oxide (N<sub>2</sub>O) – which is the result of both natural processes (aerobic decomposition of organic matter in soils and oceans) and

### Figure 26.4

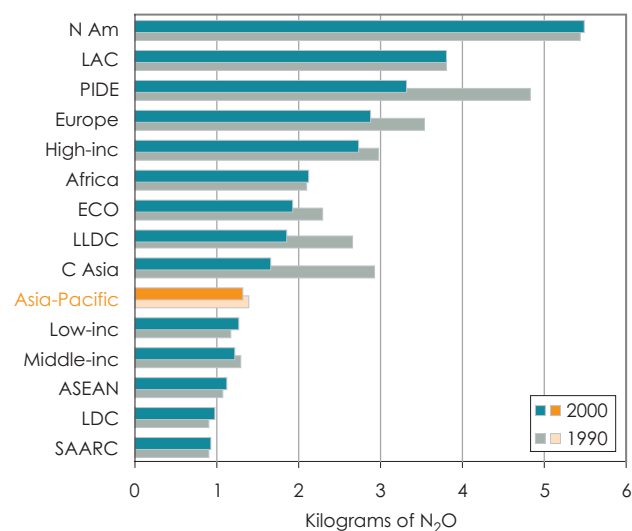
CO<sub>2</sub> emissions, per unit of GDP, global regions, 1990-2004



human activities (using motor vehicles, industrial activities, using nitrogenous fertilizers, and burning fuels and biomass). N<sub>2</sub>O emissions increased worldwide during 1990-2000 except in Europe and the Asia-Pacific high-income economies. In 2000 the Asia-Pacific economies emitted 41 per cent of the world's N<sub>2</sub>O.

### Figure 26.5

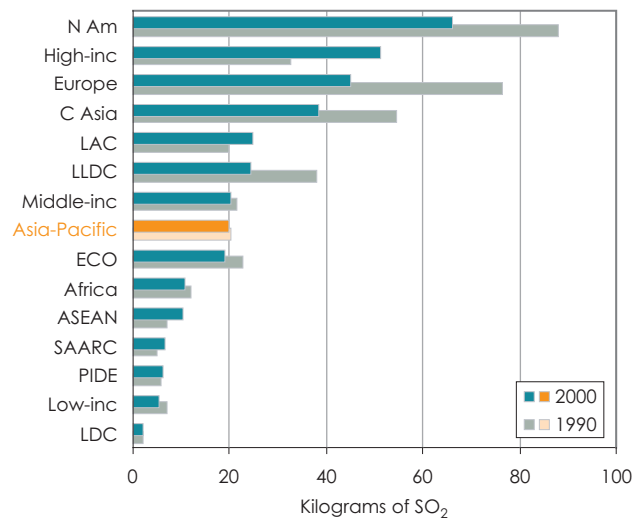
Nitrous oxide emissions per capita, 1990 and 2000



Another air pollutant is sulphur dioxide, which contributes to acid rain and can damage human health. The region contributes 50 per cent of global emissions, which is less than the 60 per cent share of global population. Sulphur dioxide comes mainly

Figure 26.6

Sulphur dioxide emissions per capita, 1990 and 2000

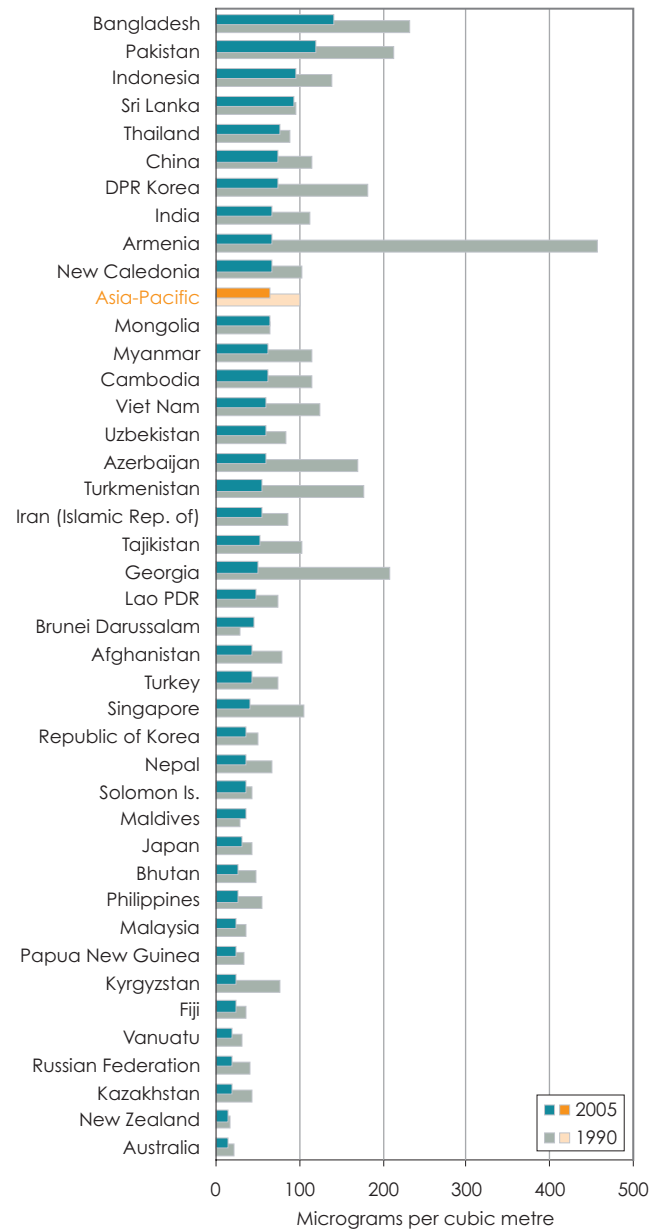


from burning fossil fuel, especially coal. In Asia and the Pacific most of this is produced in middle-income economies, and to a lesser extent in the low-, and high-income economies.

Another public health hazard is the dispersal of particulate matter, or PM10, which refers to fine suspended particulates less than 10 microns in diameter. These can penetrate deep into the respiratory tract and cause significant health damage, including respiratory diseases, lung cancer and heart disease. Alone, or with sulphur dioxide, particulate pollution has implications for both public health and economic well being. This is a growing problem across the region as urban populations expand. Most comes from traffic and industry, so the extent of emissions depends on levels of technology and the effectiveness of pollution control. However, a substantial proportion also results from natural processes.

Figure 26.7

Concentration of particulate matter in urban areas, selected Asia-Pacific countries, 1990 and 2005



### Carbon dioxide emissions per capita (tons of CO<sub>2</sub>)

The quantity of estimated carbon dioxide emissions (tons of carbon dioxide) divided by total population. **Aggregates:** Averages are calculated using total population as weight. **Source:** United Nations Millennium Development Goals Indicators (online database, accessed in July 2008), and World Population Prospects: The 2006 Revision Population Database (online database accessed in July 2008).

### Carbon dioxide emissions per unit of GDP (grams per 1,000 (2005 PPP dollars))

The quantity of estimated carbon dioxide emissions divided by 1,000 units of GDP (2005 PPP dollars). **Aggregates:** Averages are calculated using GDP, PPP (constant 2005) as weight. **Source:** Calculated by ESCAP using data from United Nations Millennium Development Goals Indicators and World Bank, World Development Indicators (online database, accessed in June 2008).

### Consumption of ozone-depleting substances per capita (ODP kilograms per 1,000 population)

The sum of the national annual consumption in weighted tons of the individual substances in the group of ozone-depleting substances multiplied by their ozone-depleting potential. Ozone-depleting substances are any substance containing chlorine or bromine that destroys the stratospheric ozone layer. Expressed as ODP kilograms per 1,000 population. **Aggregates:** Averages are calculated using total population as weight. **Source:** United Nations Millennium Development Goals Indicators (online database, accessed in July 2008), and World Population Prospects: The 2006 Revision Population Database (online database accessed in July 2008).

### Consumption of ozone-depleting substances per unit of GDP (ODP kilograms per 1,000,000 (2005 PPP dollars))

The sum of the national annual consumption in weighted tons of the individual substances in the group of ozone-depleting substances multiplied by their ozone-depleting potential. Ozone-depleting substances are any substance

containing chlorine or bromine that destroys the stratospheric ozone layer. Expressed as ODP kilograms per 1,000,000 units of GDP measured in 2005 PPP dollars. **Aggregates:** Averages are calculated using GDP, PPP (constant 2005) as weight. **Source:** Calculated by ESCAP using data from United Nations Millennium Development Goals Indicators, and World Bank, World Development Indicators (online database, accessed in July 2008).

### Nitrous oxide emissions (gigagrams of N<sub>2</sub>O)

Total emissions of nitrous oxide estimated through a model (RIVM). **Aggregates:** Sum of individual country values. **Source:** United Nations Environment Programme, Emission Database for Global Atmospheric Research (EDGAR 3.2) (online database, accessed in September 2007).

### Sulphur dioxide emissions (gigagrams of SO<sub>2</sub>)

Total emissions of sulphur dioxide estimated through a model (RIVM). **Aggregates:** Sum of individual country values. **Source:** United Nations Environment Programme, Emission Database for Global Atmospheric Research (EDGAR 3.2) (online database, accessed in 27 September 2007).

### PM10 concentration in urban area (micrograms per cubic metre)

Atmospheric particles of 10 micrometres or smaller from natural and human sources. **Aggregates:** Average calculated using urban population as weight. **Source:** World Bank, World Development Indicators (online database, accessed in July 2008).

### Industrial organic water pollutant (BOD) emissions (kilograms per day)

Biochemical oxygen demand, which refers to the amount of oxygen that bacteria in water will consume in breaking down waste. **Aggregates:** None. **Source:** United Nations Environment Programme, Emission Database for Global Atmospheric Research (EDGAR 3.2) (online database, accessed on 24 August 2007).

## 26.1 Carbon dioxide emissions

	Carbon dioxide emissions per capita					Carbon dioxide emissions per unit of GDP				
	Tons of carbon dioxide					Grams per 1,000 (2005 PPP dollars)				
	1990	1995	2000	2003	2004	1990	1995	2000	2003	2004
<b>East and North-East Asia</b>	<b>3.0</b>	<b>3.5</b>	<b>3.5</b>	<b>4.0</b>	<b>4.5</b>	<b>742</b>	<b>727</b>	<b>626</b>	<b>647</b>	<b>688</b>
China	2.1	2.6	2.6	3.3	3.8	1 917	1 433	989	969	1 037
DPR Korea	12.2	11.9	3.4	3.3	3.4					
Hong Kong, China	4.6	4.8	5.8	5.6	5.4	205	179	194	184	165
Japan	8.7	9.1	9.5	9.6	9.8	334	329	334	333	331
Macao, China	2.8	3.0	3.7	4.0	4.7	137	123	166	147	135
Mongolia	4.5	3.3	3.0	3.2	3.3	2 033	1 861	1 541	1 431	1 377
Republic of Korea	5.6	8.3	9.2	9.6	9.8	530	563	524	482	472
<b>South-East Asia</b>	<b>1.1</b>	<b>1.6</b>	<b>1.7</b>	<b>1.9</b>	<b>2.0</b>	<b>472</b>	<b>509</b>	<b>534</b>	<b>538</b>	<b>528</b>
Brunei Darussalam	22.7	17.7	25.6	22.5	24.1	458	351	538	463	503
Cambodia	0.0	0.0	0.0	0.0	0.0		61	41	33	30
Indonesia	1.2	1.5	1.7	1.9	1.7	576	558	651	640	565
Lao PDR	0.1	0.1	0.2	0.2	0.2	56	56	133	139	133
Malaysia	3.1	5.8	5.4	6.3	7.0	454	624	523	586	622
Myanmar	0.1	0.2	0.2	0.2	0.2	314	383	348	254	255
Philippines	0.7	0.9	1.0	0.9	1.0	295	379	388	342	338
Singapore	15.0	13.5	14.1	11.3	12.2	632	430	382	308	309
Thailand	1.8	3.2	3.3	4.0	4.3	426	534	580	614	630
Timor-Leste				0.2	0.2				76	83
Viet Nam	0.3	0.4	0.7	0.9	1.2	358	337	434	506	601
<b>South and South-West Asia</b>	<b>0.9</b>	<b>1.1</b>	<b>1.2</b>	<b>1.3</b>	<b>1.3</b>	<b>570</b>	<b>595</b>	<b>595</b>	<b>556</b>	<b>553</b>
Afghanistan	0.2	0.1	0.0	0.0	0.0				22	36
Bangladesh	0.1	0.2	0.2	0.2	0.2	195	232	223	245	241
Bhutan	0.2	0.5	0.7	0.6	0.7	130	215	247	189	191
India	0.8	1.0	1.1	1.1	1.2	668	700	665	615	603
Iran (Islamic Rep. of)	3.9	4.3	5.3	5.9	6.3	640	666	713	688	703
Maldives	0.7	1.1	1.8	2.1	2.5		440	535	526	584
Nepal	0.0	0.1	0.1	0.1	0.1	47	118	147	122	121
Pakistan	0.6	0.7	0.7	0.7	0.8	376	372	398	345	398
Sri Lanka	0.2	0.3	0.5	0.5	0.6	113	134	184	171	182
Turkey	2.6	2.7	3.3	3.1	3.1	458	457	489	460	433
<b>North and Central Asia</b>	<b>11.5</b>	<b>8.5</b>	<b>8.3</b>	<b>8.8</b>	<b>9.0</b>		<b>1 402</b>	<b>1 247</b>	<b>1 100</b>	<b>1 040</b>
Armenia		1.1	1.1	1.1	1.2		620	491	344	331
Azerbaijan		4.3	3.7	3.6	3.8		2 296	1 481	1 072	1 031
Georgia		0.5	1.0	0.8	0.9		274	410	276	272
Kazakhstan		10.9	9.3	11.9	13.3		2 439	1 738	1 630	1 667
Kyrgyzstan		1.0	0.9	1.1	1.1		824	629	647	643
Russian Federation		10.1	10.0	10.5	10.5		1 294	1 167	1 023	956
Tajikistan		0.9	0.6	0.7	0.8		836	645	571	552
Turkmenistan		8.4	8.3	9.7	8.8					
Uzbekistan		4.6	5.2	5.2	5.3		3 177	3 196	2 932	2 809
<b>Pacific</b>	<b>11.7</b>	<b>12.0</b>	<b>12.3</b>	<b>11.1</b>	<b>11.3</b>	<b>622</b>	<b>589</b>	<b>539</b>	<b>456</b>	<b>457</b>
Australia	16.5	17.3	17.6	15.9	16.3	670	639	571	479	483
American Samoa										
Cook Islands	1.2	1.2	1.8	2.0	2.0					
Fiji	1.1	1.2	1.1	1.4	1.3		315	273	332	304
French Polynesia	3.1	2.6	2.7	2.8	2.7					
Guam										
Kiribati	0.3	0.3	0.4	0.3	0.3	111	91	103	84	86
Marshall Islands										
Micronesia (F.S.)										
Nauru	14.4	14.0	13.5	14.2	14.2					
New Caledonia	9.4	8.9	10.5	12.2	11.2					
New Zealand	6.6	6.8	8.4	8.1	7.8	350	332	377	337	317
Niue	1.6	1.6	2.0	2.1	2.2					
Northern Mariana Is.										
Palau	15.7	14.0	12.4	12.0	11.9		1 057	967	1 002	955
Papua New Guinea	0.6	0.5	0.5	0.4	0.4	395	259	260	249	238
Samoa	0.8	0.8	0.8	0.8	0.8	218	219	190	181	175
Solomon Islands	0.5	0.4	0.4	0.4	0.4	247	190	214	246	227
Tonga	0.8	1.1	1.2	1.2	1.2	221	261	265	229	233
Tuvalu										
Vanuatu	0.4	0.4	0.4	0.4	0.4	136	99	112	131	125
<b>Asia and the Pacific</b>	<b>2.6</b>	<b>2.7</b>	<b>2.7</b>	<b>2.9</b>	<b>3.2</b>	<b>815</b>	<b>739</b>	<b>664</b>	<b>652</b>	<b>666</b>
LLDC	5.0	3.3	3.0	3.3	3.4		2 044	1 634	1 375	1 367
LDC	0.1	0.2	0.2	0.2	0.2	186	220	215	201	199
ASEAN	1.1	1.6	1.7	1.9	2.0	472	509	534	538	528
ECO	3.1	2.7	2.8	3.0	3.1	928	746	721	683	689
SAARC	0.7	0.8	0.9	1.0	1.0	580	608	590	544	542
Central Asia	7.5	5.2	5.0	5.6	5.8		2 270	1 826	1 612	1 596
Pacific island dev. econ.	1.0	1.0	1.0	1.0	0.9					
Low-income	1.2	1.1	0.8	0.8	0.9	684	511	527	488	520
Middle-income	2.3	2.5	2.5	2.8	3.1	1 140	1 011	847	816	832
High-income	8.6	9.5	10.2	10.1	10.3	388	388	385	368	364
<b>Other world regions</b>										
Africa	1.1	1.1	1.3	1.2	1.3	529	573	629	589	593
Europe	8.9	7.8	7.5	7.8	7.8	481	406	343	341	334
Latin America & Carib.	2.5	2.6	2.6	2.5	2.6	359	345	331	322	318
North America	18.5	19.1	20.7	20.2	20.3	602	583	545	521	510
Other countries/areas	6.9	7.1	7.7	8.0	7.8	741	669	753	780	734
<b>World</b>	<b>4.0</b>	<b>3.9</b>	<b>4.0</b>	<b>4.1</b>	<b>4.2</b>	<b>610</b>	<b>563</b>	<b>517</b>	<b>510</b>	<b>511</b>

## 26. Air and water pollution

### 26.2 Ozone-depleting substances

	Consumption of ozone-depleting substances per capita						Consumption of ozone-depleting substances per unit of GDP					
	ODP kilograms per 1,000 population						ODP kilograms per 1,000,000 (2005 PPP dollars)					
	1990	1995	2000	2004	2005	2006	1990	1995	2000	2004	2005	2006
<b>East and North-East Asia</b>	<b>165.6</b>	<b>115.7</b>	<b>76.1</b>	<b>31.3</b>	<b>25.2</b>	<b>25.7</b>	<b>44.0</b>	<b>25.4</b>	<b>14.1</b>	<b>4.7</b>	<b>3.7</b>	<b>3.6</b>
China	51.9	91.0	71.6	27.2	23.9	23.9	47.6	49.5	26.9	7.3	5.9	5.3
DPR Korea		61.2	49.1	93.8	12.0	1.0						
Hong Kong, China												
Japan	972.0	287.7	47.1	15.3	8.3	8.3	37.5	10.4	1.7	0.5	0.3	0.3
Macao, China												
Mongolia		3.1	4.6	1.8	1.7	1.0		1.8	2.3	0.7	0.6	0.4
Republic of Korea		333.3	293.8	156.7	111.5	134.5		22.6	16.7	7.6	5.2	6.0
<b>South-East Asia</b>		<b>58.5</b>	<b>32.4</b>	<b>19.4</b>	<b>13.8</b>	<b>8.2</b>		<b>18.9</b>	<b>10.0</b>	<b>5.2</b>	<b>3.6</b>	<b>2.1</b>
Brunei Darussalam		228.2	143.3	173.1	111.3	74.9		4.5	3.0	3.6	2.4	1.5
Cambodia		8.5	7.6	5.4	3.6	2.4		10.7	7.5	4.2	2.5	1.6
Indonesia		46.6	25.8	19.1	12.1	2.4		16.9	9.7	6.4	3.9	0.7
Lao PDR		9.2	8.7	4.1	3.8	3.4		7.7	6.0	2.4	2.1	1.8
Malaysia	231.7	191.5	104.6	58.9	26.6	37.0	34.4	20.6	10.1	5.2	2.3	3.0
Myanmar		1.2	0.6	0.7	0.3	0.0		2.8	1.0	0.9	0.4	
Philippines	56.8	54.0	40.2	19.0	14.6	9.4	23.4	22.4	15.3	6.6	4.9	3.1
Singapore	1 609.6	285.2	41.8	50.5	34.8	75.6	68.1	9.1	1.1	1.3	0.8	1.7
Thailand	128.6	161.9	84.1	40.4	36.8	23.1	31.1	27.4	14.7	5.9	5.2	3.1
Timor-Leste												
Viet Nam		9.5	4.7	5.0	5.4	4.7		7.9	3.0	2.6	2.6	2.1
<b>South and South-West Asia</b>		<b>17.0</b>	<b>19.5</b>	<b>11.9</b>	<b>5.3</b>	<b>5.0</b>		<b>9.4</b>	<b>9.4</b>	<b>4.9</b>	<b>2.1</b>	<b>1.9</b>
Afghanistan		20.9	0.0	7.5	5.8	3.8				9.4	6.6	4.3
Bangladesh	1.8	2.3	5.9	2.1	1.8	1.4	2.6	3.0	6.5	2.0	1.7	1.2
Bhutan		0.2		0.2	0.2	0.2		0.1		0.0	0.0	0.0
India		10.8	17.9	9.1	3.8	4.6		7.9	10.8	4.6	1.8	2.0
Iran (Islamic Rep. of)	24.6	75.4	86.1	90.1	35.3	16.3	4.1	11.6	11.6	10.0	3.8	1.7
Maldives	20.9	23.8	16.9	7.6	9.1	14.7		9.4	4.9	1.8	2.3	3.0
Nepal		1.4	4.1	0.0	0.0	0.0		1.7	4.5	0.0	0.0	0.0
Pakistan	12.9	21.7	18.0	10.2	3.8	4.6	8.0	12.2	9.7	5.0	1.8	2.0
Sri Lanka	12.7	30.5	13.5	10.4	8.6	6.1	6.5	12.7	4.5	3.1	2.4	1.6
Turkey	76.0	73.4	23.4	12.3	10.9	12.2	13.7	12.3	3.5	1.7	1.4	1.5
<b>North and Central Asia</b>	<b>620.8</b>	<b>125.4</b>	<b>122.0</b>	<b>6.6</b>	<b>4.6</b>	<b>6.4</b>	<b>62.7</b>	<b>20.8</b>	<b>18.6</b>	<b>0.7</b>	<b>0.5</b>	<b>0.6</b>
Armenia		62.5	8.3	37.9	28.8	20.9		36.7	3.6	10.4	6.9	4.4
Azerbaijan			10.8	1.8	2.6	0.1			4.3	0.5	0.6	0.0
Georgia		15.5	14.0	12.4	7.7	3.3		9.3	6.0	3.9	2.2	0.8
Kazakhstan	142.5		40.0	3.0	2.6	5.2	20.3		7.4	0.4	0.3	0.5
Kyrgyzstan		21.2	10.9	7.1	3.2	1.7		17.3	7.3	4.1	1.8	1.0
Russian Federation	878.6	158.5	174.6	7.6	5.4	8.3	69.7	20.3	20.4	0.7	0.5	0.7
Tajikistan		5.7	4.6	0.5	0.5	0.5		5.3	4.6	0.3	0.4	0.3
Turkmenistan	39.6	13.5	5.2	12.4	5.6	4.6						
Uzbekistan		13.3	1.8	0.1	0.1			9.1	1.1	0.0	0.1	
<b>Pacific</b>	<b>333.5</b>	<b>124.9</b>	<b>20.9</b>	<b>7.9</b>	<b>7.4</b>	<b>3.8</b>	<b>17.7</b>	<b>6.1</b>	<b>0.9</b>	<b>0.3</b>	<b>0.3</b>	<b>0.1</b>
Australia	440.6	172.7	25.3	9.4	8.3	3.4	17.9	6.4	0.8	0.3	0.2	0.1
American Samoa												
Cook Islands		138.3										
Fiji	57.8	81.5	3.1	6.7	7.2	6.5		22.1	0.8	1.6	1.7	1.5
French Polynesia												
Guam												
Kiribati		11.6						3.3				
Marshall Islands	25.4	25.5	11.5	1.8		1.7	3.1	3.0	1.8	0.3		0.2
Micronesia (F.S.)		12.1	9.3	17.4	4.5	0.9		2.0	1.7	3.2	0.8	0.2
Nauru		60.2	39.8									
New Caledonia												
New Zealand	350.5	87.9	5.0	8.0	10.3	9.2	18.4	4.3	0.2	0.3	0.4	0.4
Niue		44.5										
Northern Mariana Is.												
Palau		99.7	3667.6	49.9	9.9	34.6		7.5	286.9	4.0	0.8	2.5
Papua New Guinea		2.7	9.7	3.5	3.1	1.1		1.4	5.3	2.0	1.8	0.7
Samoa		26.2	3.9	2.2	1.1	1.1		7.3	1.0	0.5	0.2	0.2
Solomon Islands	6.7	6.6	1.9	3.3	2.3		3.2	2.8	1.1	1.9	1.4	
Tonga		22.6	5.1	1.0				5.2	1.1	0.2		
Tuvalu		30.6										
Vanuatu		2.9						0.8				
<b>Asia and the Pacific</b>		<b>69.6</b>	<b>49.3</b>	<b>20.0</b>	<b>14.0</b>	<b>13.3</b>	<b>37.6</b>	<b>20.0</b>	<b>12.5</b>	<b>4.2</b>	<b>2.9</b>	<b>2.6</b>
LLDC		37.2	8.5	3.8	2.8	2.3			5.0	1.5	1.1	0.8
LDC		4.0	4.4	2.3	1.9	1.4	2.2	3.5	5.5	2.3	1.8	1.4
ASEAN		58.5	32.4	19.4	13.8	8.2		18.9	10.0	5.2	3.6	2.1
ECO	34.3	48.0	29.6	23.3	10.5	7.5	9.3	13.5	7.8	5.3	2.3	1.5
SAARC		11.3	16.1	8.3	3.6	4.2		8.2	10.2	4.4	1.8	1.9
Central Asia			13.0	4.5	3.2				5.2	1.1	0.8	0.6
Pacific island dev. econ.		14.2	17.8	4.2	3.6	2.0						
Low-income	7.3	12.6	10.0	8.5	3.3	2.6		8.5	6.5	3.3	1.8	1.7
Middle-income		64.6	52.8	20.3	14.8	13.7	38.0	26.7	18.0	5.5	3.7	3.2
High-income	922.3	283.7	101.7	48.6	33.2	38.9	40.3	11.6	3.9	1.7	1.2	1.3
<b>Other world regions</b>												
Africa		28.0	21.6	12.4	8.0	5.4		13.6	10.5	5.6	3.5	2.2
Europe												
Latin America & Carib.	174.5	93.5	60.0	36.4	26.2	20.6	25.8	12.7	7.6	4.4	3.1	2.3
North America	855.5	177.8	15.6	43.8	34.5	29.8	27.9	5.4	0.4	1.1	0.8	0.7
Other countries/areas		217.2	128.2	74.3	60.1							
<b>World</b>		<b>73.3</b>	<b>44.4</b>	<b>22.3</b>	<b>16.0</b>	<b>14.2</b>		<b>12.9</b>	<b>7.0</b>	<b>3.2</b>	<b>2.2</b>	<b>1.9</b>

## 26.3 Other pollutants

	Nitrous oxide emissions		Sulphur dioxide emissions		Concentration of PM10 in urban area				Industrial, organic water pollutant (BOD) emissions			
	Gigagrams of N <sub>2</sub> O		Gigagrams of SO <sub>2</sub>		Micrograms per m <sup>3</sup>				Kilograms per day			
	1990	2000	1990	2000	1990	1995	2000	2005	1990	1995	2000	2002
<b>East and North-East Asia</b>	<b>1 645.3</b>	<b>1 997.0</b>	<b>31 462.4</b>	<b>42 219.9</b>	<b>98.5</b>	<b>80.6</b>	<b>75.6</b>	<b>67.2</b>				
China	1 454.3	1 765.3	25 565.9	34 454.3	114.0	92.0	85.0	75.0	7 124.3	7 610.0	6 268.9	
DPR Korea	29.7	44.9	1 363.8	867.4	181.0	100.0	93.0	73.0				
Hong Kong, China												
Japan	99.6	93.7	2 084.9	2 596.7	43.0	37.0	34.0	31.0	1 556.6	1 456.1	1 332.3	
Macao, China	0.0	0.0	3.0	4.3					7.1	5.0	5.4	5.1
Mongolia	32.3	54.5	14.9	12.2	65.0	66.0	74.0	64.0	10.2	7.9		
Republic of Korea	29.4	38.6	2 429.9	4 285.0	51.0	51.0	47.0	37.0	369.2	353.6	310.9	
<b>South-East Asia</b>	<b>476.1</b>	<b>583.0</b>	<b>3 049.6</b>	<b>5 327.6</b>	<b>103.7</b>	<b>86.6</b>	<b>84.4</b>	<b>67.4</b>				
Brunei Darussalam	0.2	1.2	2.7	8.6	28.0	42.0	54.0	46.0				
Cambodia	12.0	11.2	16.5	29.3	116.0	66.0	70.0	62.0	11.8			
Indonesia	194.6	222.8	712.0	1 347.6	138.0	115.0	120.0	96.0	495.6	749.9	752.9	720.3
Lao PDR	10.0	14.4	11.8	52.6	73.0	48.0	51.0	47.0				
Malaysia	37.5	28.6	369.6	418.4	37.0	32.0	27.0	25.0	104.7	158.5	186.1	
Myanmar	46.5	71.1	56.9	127.8	116.0	91.0	76.0	63.0	7.7	4.4	5.7	6.2
Philippines	60.8	59.5	619.0	688.1	55.0	58.0	48.0	26.0	228.3	164.2		
Singapore	0.6	3.3	334.8	1 093.7	106.0	53.0	44.0	40.0	32.4	33.9	32.2	33.6
Thailand	68.9	83.4	760.9	1 305.5	88.0	85.0	79.0	77.0	291.6			
Timor-Leste												
Viet Nam	45.0	87.5	165.6	255.9	124.0	78.0	70.0	61.0				
<b>South and South-West Asia</b>	<b>1 329.5</b>	<b>1 623.3</b>	<b>8 584.8</b>	<b>12 559.1</b>	<b>122.9</b>	<b>115.8</b>	<b>101.6</b>	<b>74.8</b>				
Afghanistan	18.1	19.3	115.7	32.7	79.0	64.0	50.0	44.0				0.2
Bangladesh	72.5	108.2	186.2	221.7	231.0	195.0	162.0	140.0	171.1	251.0		
Bhutan	0.9	0.5	3.7	3.8	48.0	45.0	36.0	27.0				
India	731.1	900.7	5 019.5	7 919.6	112.0	109.0	93.0	68.0	1 410.6	1 686.9	1 616.9	
Iran (Islamic Rep. of)	156.8	189.4	1 155.0	1 401.4	86.0	89.0	81.0	55.0	102.7	125.8	140.8	
Maldives	0.0	0.0	0.6	1.0	28.0	29.0	33.0	35.0				
Nepal	18.4	21.0	56.0	83.3	67.0	57.0	49.0	36.0	20.9			26.9
Pakistan	181.2	238.7	415.3	713.2	212.0	190.0	182.0	120.0	104.1			
Sri Lanka	7.8	9.1	38.4	107.7	95.0	88.0	97.0	94.0	53.0	83.9	88.9	
Turkey	142.7	136.4	1 594.3	2 074.7	75.0	64.0	56.0	43.0	177.3	170.9	188.2	
<b>North and Central Asia</b>	<b>610.5</b>	<b>284.4</b>	<b>21 184.1</b>	<b>12 518.3</b>	<b>60.5</b>	<b>38.2</b>	<b>36.1</b>	<b>25.5</b>				
Armenia	2.9	1.6	86.3	13.9	456.0	123.0	91.0	68.0	37.9	14.8	8.0	
Azerbaijan	13.1	11.4	174.0	164.7	169.0	102.0	98.0	59.0	53.3	41.3	20.0	17.5
Georgia	8.7	5.2	42.8	10.7	208.0	139.0	66.0	51.0				
Kazakhstan	76.3	32.4	2 604.2	2 040.6	43.0	34.0	27.0	19.0				
Kyrgyzstan	13.7	10.2	71.7	32.9	76.0	33.0	29.0	24.0	30.9	16.4	14.1	20.8
Russian Federation	415.5	165.8	17 551.2	9 792.9	41.0	27.0	28.0	19.0		1 695.1	1 479.2	1 518.7
Tajikistan	10.1	6.2	11.4	6.3	104.0	69.0	51.0	52.0				
Turkmenistan	23.7	11.7	166.1	71.3	177.0	86.0	81.0	56.0				
Uzbekistan	46.5	39.9	476.3	385.2	84.0	85.0	81.0	61.0				
<b>Pacific</b>	<b>483.4</b>	<b>458.5</b>	<b>1 597.7</b>	<b>2 728.6</b>	<b>22.2</b>	<b>20.7</b>	<b>20.1</b>	<b>15.9</b>				
Australia	342.8	336.2	1 484.6	2 583.0	22.0	20.0	19.0	15.0	186.1	103.6	105.2	
American Samoa	19.0	12.6	0.8	1.0								
Cook Islands	0.0	0.0	0.1	0.1								
Fiji	3.0	3.0	3.2	2.8	37.0	38.0	34.0	23.0	4.8			
French Polynesia	0.1	0.1	1.8	1.9								
Guam	0.0	0.0	0.4	0.4								
Kiribati	0.0	0.0	0.1	0.1								
Marshall Islands	0.0	0.0	0.0	0.0								
Micronesia (F.S.)	0.0	0.0	0.7	0.8								
Nauru	0.0	0.0	0.4	0.5								
New Caledonia	0.6	0.5	6.4	7.3	104.0	71.0	93.0	66.0				
New Zealand	109.5	95.5	76.5	96.7	16.0	17.0	18.0	15.0	50.2	50.0	46.1	
Niue	0.0	0.0	0.0	0.0								
Northern Mariana Is.	0.0	0.0	0.1	0.1								
Palau	0.0	0.0	0.0	0.0								
Papua New Guinea	6.4	9.1	20.2	32.0	34.0	35.0	33.0	24.0				
Samoa	0.4	0.3	0.5	0.5								
Solomon Islands	0.3	0.2	0.9	0.7	44.0	30.0	34.0	35.0				
Tonga	0.1	0.1	0.3	0.4					0.2			
Tuvalu	0.0	0.0	0.0	0.0								
Vanuatu	1.0	0.7	0.9	0.3	31.0	34.0	27.0	20.0				
<b>Asia and the Pacific</b>	<b>4 544.8</b>	<b>4 946.2</b>	<b>65 878.7</b>	<b>75 353.5</b>	<b>100.8</b>	<b>87.1</b>	<b>80.7</b>	<b>65.4</b>				
LLDC	266.0	223.0	3 792.2	2 899.4	111.0	68.5	61.0	45.4				
LDC	180.0	247.1	449.8	553.9	177.6	145.5	121.0	103.2				
ASEAN	476.1	583.0	3 049.6	5 327.6	103.7	86.6	84.4	67.4				
ECO	682.1	695.5	6 784.0	6 922.9	117.2	105.5	99.5	69.2				
SAARC	1 030.0	1 297.5	5 835.5	9 083.0	132.8	124.9	109.2	80.6				
Central Asia	195.0	118.6	3 632.8	2 725.5	127.6	76.6	63.9	46.4				
Pacific island dev. econ.	31.0	26.8	36.7	48.9	42.2	39.2	39.1	28.3				
Low-income	510.4	681.9	2 968.4	2 840.9	172.0	139.5	126.7	96.5				
Middle-income	3 451.4	3 695.1	56 484.9	61 834.4	100.3	87.1	80.3	65.3				
High-income	582.9	569.2	6 424.9	10 677.7	43.5	38.6	35.6	30.6				
<b>Other world regions</b>												
Africa	1 342.5	1 748.4	7 682.2	8 818.1	120.8	101.1	78.9	64.8				
Europe	2 023.5	1 671.7	43 849.4	26 156.8	39.3	31.1	27.2	23.0				
Latin America & Carib.	1 690.9	1 986.6	8 803.4	12 862.8	58.9	47.9	43.0	37.2				
North America	1 546.1	1 731.8	24 983.5	20 821.4	29.5	26.6	23.7	21.7				
Other countries/areas	120.7	123.6	3 082.9	6 325.8	136.8	148.0	122.5	99.2				
<b>World</b>	<b>11 268.6</b>	<b>12 208.3</b>	<b>154 280.1</b>	<b>150 338.3</b>	<b>80.0</b>	<b>69.9</b>	<b>63.5</b>	<b>52.9</b>				